

PROSPECTS OF INTERNET OF THINGS: THE “NETWORKED” MANKIND

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ABSTRACT

“I never think of the future. It comes soon enough.” This quote, credited to Albert Einstein, aptly summarizes the daunting speed at which the technology is changing and on its way to change is disrupting the existing business models. Technology as well as the Industry is experiencing a tectonic shift in terms of switching to IOT, which in turn makes it increasingly competitive and complex. The concept of the Internet of Everything (IOE) in general may be defined as the convergence of people, process, data and things that is bringing about unprecedented disruption. The Internet of Things (IOT) forms an essential subset of Internet of Everything (IOE) which contains embedded technologies that interact with internal states or the external environment, through which objects can sense and communicate. Hence IOT is an all-encompassing term for a network backbone that will host billions of devices and sensors that communicate intelligently. The 'things' that make up the IoT range from smart phones, RFID chips, sensors built into vehicles, medical devices, buildings (basically anything that needs to be monitored) - all with a unique identity on the network and with the ability to 'machine talk'. IOT has already enabled connecting billions of devices till date. This is the reason for the emergence of IOT as an exciting technological revolution. . IOT is giving the same level of connectivity to the devices that we use in either a personal or professional capacity, as a result of this IOT Penetration in our daily life brings about immense benefits; however the challenges are also manifold. The proliferation of things - systems, machines, equipment and devices - connected to the internet, will need greater data management. A July Google-BCG report expects around 90% of all devices to be Internet-enabled by 2017 and the number of Internet users to touch 650 million by 2020 from 300 million in 2015. Therefore there needs to be a continuous vigil with respect to the challenges that the IOT brings in terms of Cyber security, Privacy of personal data, data management data theft and many other vulnerabilities that IOT is susceptible to. In this paper, therefore there is an attempt to focus on the impact of IOT generally and in Indian Perspective particularly in transforming the existing business models, governance issues, and also look at the challenges and drawbacks that this technology brings with it. The paper and gives insight towards the risks and their remedies with respect to the threats posed by IOT in various spheres of our lives.

Keywords: Data theft IOT, Internet, Privacy, Security,

I. INTRODUCTION

The greatest agent of change in the modern world, after the dominance of Internet for many decades is the evolving of Internet of Things (IOT) .Like In the early days of the evolution of Internet, it could hardly be anticipated that how enormous would be its impact on our daily lives. Similarly the emergence of IOT has also

been quite revolutionary at the very outset. IOE in general and IOT in particular can also be referred to as the beginning of second digital revolution, that will bring us into an era of information age and sharing of data. Technically speaking, Internet of Things (IOT) is considered as the network of physical objects accessed through the Internet that can identify themselves to other devices and use embedded technology to interact with internal states or external conditions. With IOT, the world is wide open, offering a virtually endless array of opportunities and connections at home, at work or at play. Normally Interconnections are thought in terms of computers, tablets and smart phones and IOT talks about a world where just about anything can be connected and communicated in a “*smart mode*” by combining simple data so as to produce usable intelligence. With the presence of IOT, we are on the verge of making the physical world into one big information system with the only objective being of improving quality of life and leading to creation of new opportunities in both interacting and delivery of services as well as empowering new business models. IOT is expected to generate new business models & jobs, and become the biggest opportunity of mankind in the next 30 to 40 years. This is changing how and where decisions are made and by whom. With the advent of IOT, the need to share data between applications, sensors, infrastructure and people becomes imperative. These devices undoubtedly will allow us to become more efficient with our time, energy, and money in ways that are both predictable and unforeseen. But how exactly will we use the IOT to achieve this and, more importantly, what will our daily lives look like once the IOT reaches ubiquity is the main challenge in the coming times. Although the benefits seem to be immense, the threats also need to be looked upon, the threats to the privacy, data theft and accessibility of data at various levels.

II. AREAS OF IOT PENETRATION

The advent of Internet of Thing (IOT) promises innovative solutions to many of the challenges of our times. Internet of Thing (IOT) interconnects emerging and evolving technologies across a variety of vertical domains to achieve open interoperability. As IOT gains momentum, it will impact a number of industry sectors including healthcare, agriculture, education, infrastructure, public services, utilities, manufacturing and many more.

Smart Cities: These will leverage a range of "smart" services to improve the standard of living of citizens like intelligent traffic and parking management, automated building resource management, public safety and surveillance, and Wi-Fi services.

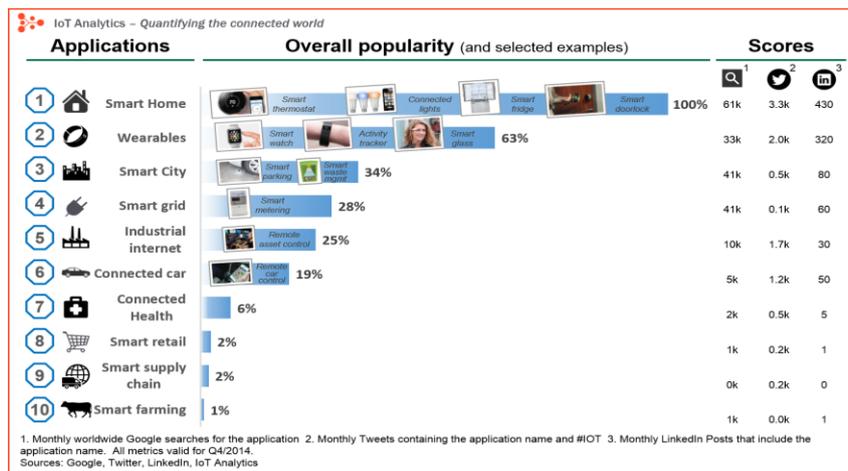
Smart Environment: Where programmes like solid waste management using sensor intelligence and location tracking, smart energy and water management, actionable monitoring of water and air quality and industry waste and pollution will help create a cleaner, greener environment.

Smart Health: Health services delivered to remote populations via a network that supports voice, video and intelligent medical devices will enable actionable monitoring of patient vitals in various settings (hospitals, dementia centers, old-age homes), and provide specialist consultations to hospitals and health centers that lack local medical talent.

Smart Agriculture: Precision farming based on data (temperature, moisture, pests) from field sensors can be used to maximize crop production. Storage facilities can also be controlled for these parameters to minimize spoilage. Real time agricultural and weather updates to mobile devices will keep farmers informed of critical and actionable information.

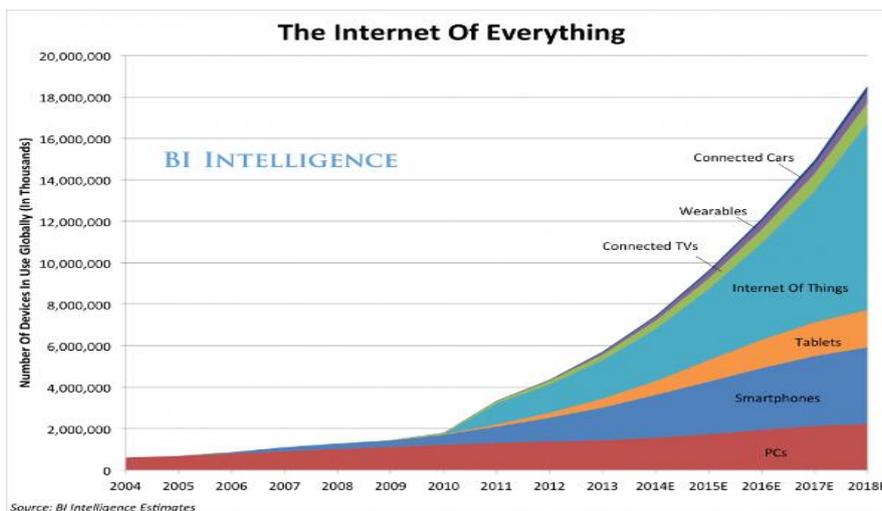
Manufacturing and Industrial: For preventive and in-time maintenance for equipment's in various manufacturing verticals. The sensors for early defect detection will help in reducing equipment malfunction and hence downtime. For monitoring operations and creating warning/alerts for deviation/damages. For example fire, gas leakage sensors together with alerts.

According to 6Wresearch, India IOT market is projected to grow at a CAGR of 28.2% during 2016-22. Similarly according to a survey regarding the ranking of IOT Application areas, there has been an upsurge in the areas to be searched by people where IOT has penetrated. The rankings of various areas in which people generally seem to be interested when it comes to IOT are:



Source: IOT Analytics-Connecting the world

It can be said that the age of Internet ubiquity has arrived. The world is moving beyond standalone devices into a new era where everything is connected. This can be further illustrated by the following graph:



Source: BI Intelligence Estimates

III. FUTURE PERSPECTIVE OF IOT

It can be said with conviction that IOT is the future technology and will impact our lives in every possible way. Already it can be seen that the pioneers of the IOT make use of the technology in a very innovative and, often,

quirky ways. However it's still too early to say who will be the Google or Apple of IOT, but the trends clearly suggest that IOT is here to stay. The Global revenue attributed to residential IOT devices is expected to exceed \$117 billion by 2026.

The very first, most visible, and most widespread application area in which IOT's impact can surely be seen is the automotive industry. With many brands embracing the idea of the connected car, many of us have witnessed firsthand the benefits of machine-to-machine communication. By connecting with smartphones, vehicles now can perform simple tasks such as wirelessly and automatically playing our music and making helpful statistics such as commute times, mileage, and fuel consumption easily accessible. The next decade likely will see sensors installed in roads, traffic signs, street lights, and buildings of the world's major cities, all eager to communicate with our vehicles. They will send automatic alerts concerning road conditions, such as ice or congestion, straight to our cars as they occur. In response, our cars will update their suggested routes and point us in the right direction. In the coming years it can be said that IOT will no longer be the exclusive domain of luxury vehicles. As sensors become more affordable and their practical uses more evident, manufacturers will roll out more models with at least basic connectivity. The impact of the IoT will be felt strongly in the consumer space, but the business world will see the biggest changes. The promises of increased human efficiency, energy efficiency, and cost effectiveness will be most attractive to enterprises, particularly those with the capital to become early adopters. We already have seen logistics companies start to make use of sensors to measure and adjust how efficiently they handle transport. The same applications will spread throughout many, if not all, sectors. Coupling sensors with advanced algorithms will lead to further progress in automation and all types of efficiency. Much like emerging smart homes, the smart office will automatically control energy-consuming devices such as lights and heaters to achieve better efficiency without human intervention or micromanaging. Once the business value of the IOT domain is understood, new products, services, and revenue models will emerge to attract investments and create jobs. This new arena also has the potential to increase imports and exports for IOT products and solutions that, in turn, could bolster economies (similar to what IT services have done for India). IOT may lead to an emergence of ancillary or supporting industries such as manufacturing of smart and connected devices, monitoring and measurement systems, decision control and analytics systems, and security solutions to ensure safe use and address privacy concerns. IOT is most likely to give rise to the adoption of big data and analytics technologies that can provide insight to help you make meaningful decisions. The large number of devices, coupled with the high volume, velocity, and structure of IOT data, creates opportunities in security, storage management, servers and datacenter networks, and data analytics. That means skills such as business analysis, math and statistics, creative design for end-user visualization, big data frameworks, programming and architecting large scalable systems, and knowledge of devices used in IOT ecosystems will be in high demand.

IV. IOT CONCERNS

As the IOT becomes ubiquitous within the industry, regulators have to take note. We already have seen instances of "car hacking." As vehicles increasingly communicate with more devices, hackers will gain more points of entry into vehicles. While the IOT may seem like an industry full of benefits, it's important to consider

the security risks and privacy breaches. The smart home, for example, inevitably will build up an enormous database of personal information. If the records of our movements or absence in the house fall into the wrong hands, our safety could be compromised. Similarly, monitoring the activities of patients or the elderly could be seen as an intrusion into their private lives. This could also lead to unwanted social implications and a change in behavior patterns, this also means that more personal information and business data will exist in the cloud and be passed back and forth through thousands of devices that may have exploitable vulnerabilities. One weak link in the security chain could provide hackers with nearly limitless doorways that could potentially be unlocked and lead them to data.

Privacy is a serious concern not just in the IOT, but in all the applications, devices or systems where we share information. Hackers can now craft attacks with unprecedented sophistication and correlate information not just from public networks, but also from different private sources, such as cars, smartphones, home automation systems and even refrigerators. Currently, more things are connected to the Internet than people, according to an info graphic from Cisco. It goes on to say that 25 billion devices are expected to be connected by 2015 and 50 billion are slated to connect by 2020. In this quickly evolving world, all the things that connect to the Internet are exponentially expanding the attack surface for hackers and enemies. A recent study showed that 70 percent of IOT devices contain serious vulnerabilities. There is undeniable evidence that our dependence on interconnected technology is defeating our ability to secure it. It seems that capable hackers are everywhere, and their growing focus on the IOT is a natural progression since they are looking to where the world's data is flowing. The interconnected world is coming, but so are its hackers. The good news is that the cyber security landscape is already adjusting to the new demands of this widespread network. The bad news is that we are far away from that utopia, where the IOT manages security automatically by the same interconnected devices and provides a safe infrastructure for users and their personal information.

V. SUGGESTIONS AND CONCLUDING REMARKS

IOT is moving from hype to reality, even though consumer use cases are limited Internet of Things (IOT) is one of the most talked about technology trends today. There is a broad consensus among technology vendors, analysts and other stakeholders that IOT would have a significant impact on the technology landscape and society in the coming years. However, there are some voices that warn that IOT is today overhyped, and that it will take a few more years for the real use cases and benefits of IOT to become visible. Some of this skepticism is driven by the fact that we are yet to see real applications of IOT at end consumer level. Apart from these challenges, IOT in India, especially in the consumer space, would need to reckon with a few other hurdles, such as Internet availability / bandwidth / reliability, Cost of IOT enabled systems and devices, Lack of vendor activity, Overall infrastructure challenges to cite a few. Apart from internet the supporting infrastructure such as smart grids, traffic systems, etc., are far from being ready for IOT. Having said that, IOT will continue to evolve in the coming years and one can expect significant growth in the long run. Internet of Thing (IOT) ultimately depends on robust standards, which will allow for much greater innovation, competition and investment. "Once we have established the standard and everyone adopts it, then we don't have to keep manually intervening to make everything work together. Many of the best security practices can be leveraged, such as hardening the

systems, using secure protocols for communication or installing the latest updates, fixes and patches. Innovators need to consider that future security will be managed automatically by the system instead of users, and designing secure technology will require a new approach and mindset.

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