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A STUDY ON THE ROLE OF IOT IN THE SMARTER WORLD

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Abstract

The "Internet of things" (IoT) is becoming an increasingly growing topic both in the workplace and outside of it. This concept is of basically connecting any device with an on and off switch to the Internet. This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. The IOT is a giant network of connected "things" which also includes people. The relationship will be between people-people, people-things, and things-things. The main areas we will see the Internet of Things begin to take hold will be buildings (automation), the energy sector, consumer goods and services, healthcare, industrial and manufacturing, transportation, retail, security and of course any IT networks. Conversations about the IoT are taking place all over the world as we seek to understand how this will impact our lives. In this paper, we understand the opportunities and challenges that are going to be, as more and more devices start to join the IoT. Here, we try to educate ourselves about what the IoT is and the potential impacts that can be seen on how we work and live.

***Keywords*:** Internet of Things, security, RFID, sensors, smart objects

Introduction

The Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring humanto-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet [1]. The concept may also be referred to as the Internet of Everything. The main areas we will see the Internet of Things begin to take hold will be buildings (automation), the energy sector, consumer good & services, healthcare, industrial & manufacturing, transportation, retail, security and of course any IT networks. Like any other new technology, the Internet of Things has the potential to drastically improve our personal lives, our work places and our industrial / manufacturing efficiencies & capabilities. On the other hand, the smarter the objects in our lives become, there is more scope for misuse that may arise in future. Always being connected to the things around us would mean the possibility of more surveillance, both good and bad. It also means the possibility for more fraud, scams and other vicious hacking & cyber attacks [2].

History

British entrepreneur Kevin Ashton first coined the term IoT in 1999 [3, 4] while working at Auto-ID Labs (originally called Auto-ID centers - referring to a global network of Radio-frequency identification (RFID) connected objects). Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications and covers a variety of protocols, domains, and applications.The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid, and expanding to the areas such as smart cities.

Although the concept wasn't named until 1999, the Internet of Things has been in development for decades. The first Internet appliance, for example, was a Coke machine at Carnegie Melon University in the early 1980s. [5] The programmers could connect to the machine over the Internet, check the status of the machine and determine there would be a cold drink awaiting them.

Why IoT is growing in popularity?

The IoT sensation is rapidly embracing entire societies and holds the potential to empower and advance nearly each and every individual and business. This creates tremendous opportunities for enterprises to develop new services and products that will offer increased convenience and satisfaction to their consumers. Google is currently developing a new Android platform that will connect cars to the Internet. Soon, car owners will be able to lock or unlock their vehicles, start the engine or even monitor vehicle performance from a computer or Smartphone. The promises of IoT go far beyond those for individual users. Enterprise mobility management is a rapidly evolving example of the impact of IoT devices. The IoT possibilities are limitless, and so is the number of devices that could manifest.

Enabling technologies for the IOT :

There are mainly three types of technologies that enable IOT.[2]
1. RFID and Near-field communication - In the 2000s, RFID was the dominant technology. Later, NFC became dominant (NFC). NFC has become common in smart phones during the early 2010s, with uses such as reading NFC tags or for access to public transportation.
2. Optical tags and quick response codes - This is used for low cost tagging. Phone cameras decode QR code using image-processing techniques. In reality QR advertisement campaigns gives less turnout as users need to have another application to read QR codes.
3. Bluetooth low energy - This is one of the latest techs. All newly releasing smart phones have BLE hardware in them. Tags based on BLE can signal their presence at a power budget that enables them to operate for up to one year on a lithium coin cell battery.[2]

This technology has a lot of applications in various fields. Following are some possible areas where we can leverage the power of the Internet of Things (IoT) to solve day-to-day problems. However, it can be put to many more uses.

Applications

The day when virtually every electronic device, from phones and cars to refrigerators and light switches will be connected to the Internet is not far away. The number of Internet-connected devices is growing rapidly and is expected to reach 50 billion by 2020. However innovative and promising it seems, this so-called Internet of Things (IoT) phenomenon significantly increases the number of security risks businesses and consumers will inevitably face. Any device connecting to the Internet with an operating system comes with the possibility of being compromised, in turn becoming a backdoor for attackers into the enterprise.
In this article, we will discuss the scope of the Internet of Things and explore what enterprises can do to manage the security risks associated with IoT devices.

Smart Cities:

The IoT can be used to monitor the vibrations of buildings, bridges, and monuments in case the building material is threatened or overloaded. It can be used to manage traffic especially during traffic jams, peak hours, accidents, and rains. It can be used to manage street lights automatically switch them off in the presence of sunlight and switch them on at the onset of darkness.

Home Automation:

The IoT can be used to remotely control and program the appliances in your home. It can be useful in detecting and avoiding thefts.ADT, which

is a home security system, allows individuals to monitor their security systems at home through their phones, with the ability to control it.

Industrial Automation:

By using this technology, we can automate manufacturing processes .It can also prove useful in optimizing the production processes. We can manage the inventory and the supply chain. We can also diagnose if the machines require repair and maintenance. We can monitor the emission of toxic gases to avoid damage to workers' health and the environment.

Health Monitoring:

We can use this technology to identify health problems. [6]The patterns of heart rate, pulse, digestive system, and blood pressure can be monitored and diagnosed for anomalies. The information can be sent to the doctor for analysis. The hospital can also be contacted in times of emergencies. This system will be very useful to senior citizens and disabled people who live independently. The integration of IoT into the health care system could prove to be incredibly beneficial for both an individual and a society. A chip could be implemented into each individual, allowing for hospitals to monitor the vital signs of the patient. By tracking their vital signs, it could help indicate whether or not serious assessment is necessary.

Smart Environment:

A very important application of IoT is detecting pollution and natural calamities.[7] We can monitor the emissions from factories and vehicles to minimize air pollution. We can track the release of harmful chemicals and waste in rivers and the sea, thereby arresting water pollution. We can also keep tabs on the quality of water being supplied for drinking. We can send warnings of earthquakes and tsunamis by detecting tremors. We can keep the water level of rivers and dams under surveillance to be alert in case of floods. The detection of forest fire is also possible with this technology.

"Settings" for IoT Applications (Source: McKinsey Global Institute [3])

Setting	Description	Examples
Human	Devices attached or inside the human body	Devices (wearables and ingestibles) to monitor and maintain human health and wellness; disease management, increased fitness, higher productivity
Home	Buildings where people live	Home controllers and security systems
Retail Environments	Spaces where consumers engage in commerce	Stores, banks, restaurants, arenas – anywhere consumers consider and buy; self-checkout, in-store offers, inventory optimization
Offices	Spaces where knowledge workers work	Energy management and security in office buildings; improved productivity, including for mobile employees
Factories	Standardized production environments	Places with repetitive work routines, including hospitals and farms; operating efficiencies, optimizing equipment use and inventory
Worksites	Custom production environments	Mining, oil and gas, construction; operating efficiencies, predictive maintenance, health and safety
Vehicles	Systems inside moving vehicles	Vehicles including cars, trucks, ships, aircraft, and trains; condition-based maintenance, usage-based design, pre-sales analytics
Cities	Urban environments	Public spaces and infrastructure in urban settings; adaptive traffic control, smart meters, environmental monitoring, resource management
Outside	Between urban environments (and outside other settings)	Outside uses include railroad tracks, autonomous vehicles (outside urban locations), and flight navigation; real-time routing, connected navigation, shipment tracking

Table-1

Positive effects of IOT

Automation of daily tasks leads to better monitoring of devices. The IoT allows you to automate and control the tasks that are done on a daily basis, avoiding human intervention. Machine-to-Machine communication helps to maintain transparency in the processes. It also leads to uniformity in the tasks. It can also maintain the quality of service. **Efficient and Saves Time**: The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same tasks every day, it enables people to do other creative jobs.

Saves Money: Optimum utilization of energy and resources can be achieved by adopting this technology and keeping the devices under

surveillance. We can be alerted in case of possible bottlenecks, breakdowns, and damages to the system. Hence, we can save money by using this technology.

Better Quality of Life: All the applications of this technology culminate in increased comfort, convenience, and better management, thereby improving the quality of life.

Negative effects of IOT

Loss of privacy and security: As all the household appliances, industrial machinery, public sector services like water supply and transport, and many other devices all are connected to the Internet, a lot of information is available on it. This information is prone to attack by hackers. It would be very disastrous if private and confidential information is accessed by unauthorized intruders.

Compatibility: As devices from different manufacturers will be interconnected; the issue of compatibility in tagging and monitoring crops up. Although this disadvantage may drop off if all the manufacturers agree to a common standard, even after that, technical issues will persist. Today, we have Bluetooth-enabled devices and compatibility problems exist even in this technology! Compatibility issues may result in people buying appliances from a certain manufacturer, leading to its monopoly in the market.

Complexity: The IoT is a diverse and complex network. Any failure or bugs in the software or hardware will have serious consequences. Even power failure can cause lot of inconvenience.

Lesser Employment of Menial Staff: The unskilled workers and helpers may end up losing their jobs in the effect of automation of daily activities**.** This can lead to unemployment issues in the society. This is a problem with the advent of any technology and can be overcome with education.

Technology Takes Control of Life: Our lives will be increasingly controlled by technology, and will be dependent on it. The younger generation is already addicted to technology for every little thing. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology. This technology, just like every other technology, has its advantages and disadvantages. We have to be well-equipped to leverage its power while not letting it control us. The Internet of Things seems an intriguing concept, and is ready to revolutionize our daily lives. According to Gartner Inc., it is estimated that by the year 2020, around 26 billion devices will be connected to it!

Potential Opportunities and challenges

IoT is emerging as the third wave in the development of the Internet.[9,10] The 1990s Internet wave connected 1 billion users while the mobile wave in the 2000s connected another 2 billion. IoT has the potential to connect 10 times as many (approximately 28 billion) "things" to the Internet by 2020, ranging from bracelets to cars. Breakthroughs in the cost of sensors, processing power, and bandwidth to connect devices are enabling ubiquitous connections right now. A number of significant technology changes have come together to enable the rise of the IoT.

Sensor prices have dropped, the cost of bandwidth has also declined, similarly, processing costs have declined by nearly 60 times over the past 10 years, enabling more devices to be not just connected, but smart enough to know what to do with all the new data they are generating or receiving. Smart phones are now becoming the personal gateway to the IoT, serving as a remote control or hub for the connected home, connected car, or the health and fitness devices consumers are increasingly starting to wear. With Wi-Fi coverage now ubiquitous, wireless connectivity is available for free or at a very low cost.

IoT is shaping human life with greater connectivity and ultimate functionality but has to resolve three major issues: unified standards for devices, privacy and strong security for the protection of data. Otherwise, progress of IoT will be hindered by litigation and social resistance. The expansion of IoT will be slow without common standards for the connected devices.

Future impact of IoT on us

The new rule for the future is going to be, “anything that can be connected, will be connected.” But why on earth would you want so many connected devices talking to each other? There are many examples for what this might look like or what the potential value might be. Say for example you are on your way to a meeting, your car could have access to your calendar and already know the best route to take, and if the traffic is heavy your car might send a text to the other party notifying them that you will be late. What if your alarm clock wakes up you at 6 am and then notifies your coffee maker to start brewing coffee for you? What if your office equipment knew when it was running low on supplies and automatically re-ordered more? What if the wearable device you used in the workplace could tell you when and where you were most active and productive and shared that information with other devices that you used while working?

The problem is, people have limited time, attention and accuracy -- all of which means they are not very good at capturing data about things in the real world. If we had computers that knew everything there was to know about things -- using data they gathered without any help from us, we would be able to track and count everything and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling and whether they were fresh or past their best.”On a broader scale the IoT can be applied to things like transportation networks “smart cities” which can help us reduce waste and improve efficiency for things such as energy use; this helps us understand and improve how we work and live.

Conclusion

The Internet of Things has great potential for the consumer as well as for enterprises, but not without risk. Information security organizations must begin preparations to transition from securing PCs, servers, mobile devices and traditional IT infrastructure, to managing a much broader set of interconnected items incorporating wearable devices, sensors and technology we can't even foresee currently. Enterprise security teams should take the initiative now to research security best practices to secure these emerging devices, and be prepared to update risk matrices and security policies as these devices make their way onto enterprise networks to enable machine-to-machine communication, huge data collection and numerous other uses. This increased complexity within the enterprise shouldn't be overlooked, and threat modeling will be necessary to ensure basic security principal of confidentiality, integrity and availability are maintained in what will be an increasingly interconnected digital world.

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