

INTERNET OF THINGS (IoT) THE NEXT BIG REVOLUTION

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ABSTRACT

The internet of things is ushering a new era of technological innovation and evolution. With everything getting connected to the internet, the world around us is going to change completely, IoT has far reaching applications in all walks of life. Although, IoT is an amazing concept it still has a few issues associated with its development and implementation which need to be fixed before the technology can be fully integrated with human life.

I. INTRODUCTION

One of the most talked about upcoming phenomena is the internet of things aka the internet of everything. The internet as we know it, is used by us, humans, for communication and various other things, hence, the internet of people, and what this technology hopes to achieve is to link everyday objects (things) to the internet and let these “share” their experience and information to allow a seamless automated lifestyle for humans and not just that but also improve efficiency thus reducing our resource consumption. Although the term wasn’t coined till 1999, the concept has been around for about 3 decades now, the first “internet appliance” was a coke vending machine in Carnegie Mellon University in the early 1980s, however the technology didn’t gain much popularity at that time due to the limitations of IPv4, but with the coming of IPv6 we can now assign every atom on earth a unique IP address and even then we’ll be left with enough combinations to do the same on 100+ other earths. The coming of the Internet of things will definitely prove to be extremely beneficial, however, as they say, to get some you need to give some, the implementation of IoT poses some challenges and raises quite a few concerns. This article is written with an aim to explain the concept and its application in simple words for everyone to understand.

II. INTERNET OF THINGS (IoT) THE NEXT BIG REVOLUTION

Picture this, you wake up in the morning, the sensors in your t-shirt and smart band are continuously tracking your sleep cycle and vitals while you sleep and thus know the exact time and way to wake you up gently and peacefully, this information is sent to your alarm clock which does its job based on the information sent to it, you wake up and now the t-shirt and band both know you are awake, this information is relayed to various devices across your home, the geyser is switched on automatically, the AC in your room is switched off, if you like to listen to music in the morning, the radio automatically switches on and tunes to your favorite radio station, then you get ready and eat your breakfast, once that is done, once again the sensors come into play, as they see the time and your location, your car automatically switches on, and the AC is switched on so that when you get in, the car is ready and cool for you, your planner which is synced to your e-mail sends your daily

schedule to the car and the car has already charted the shortest route with the least amount of traffic to your meeting location. Gone are the days when you had to worry about locking your home and making sure everything is switched off, all this has already been done the moment the information about you leaving your home was conveyed to the various “things” in your home. You are driving down the highway when suddenly the sensor in your car’s engine indicates a problem with the braking system in your car and prompts you to stop immediately, but don’t worry, this information has already been relayed to your car’s mechanic and to also to your boss so that you don’t have to give explanations for being late to work. You get back home from a tiring day at the office and when you are within 100m of your home, your car sends information to your ACs and TV to switch on, these days almost all smartphones have biometric sensors and that would be the key to your home. You have your dinner and go to sleep, but unaware to you, your t-shirt sensors have picked up unusual activity in your heart and have notified your nearest hospital to quickly dispatch an ambulance, the emergency response team by virtue of its job, is automatically granted access to your home and they carry you to the hospital where it is discovered that you had a stroke and had it not been for the timely intervention things could have ended on a different note.

So we just walked you through your day and saved your life! All this was done without you having to speak or text anyone. This is the dawn of new era, please welcome IoT.

III. APPLICATIONS OF INTERNET OF THINGS

Now, you may wonder: This “Internet of things”: What difference will it make to your life? Will it really be of use or it is just another buzz word? Let’s look at some more examples of its application.

3.1 Office and School Optimization

With all things becoming “smart” and being connected to the internet workplaces can be optimized way more efficiently to keep the workers happy and increase the general productivity. This can be achieved through the use of various types of sensors in the chairs or pens to monitor the attention levels of the students/employees, how many hours do they spend on the desk, their exhaustion levels etc. the employers can also reach out to their employees more personally by catering to their needs by using deep learning algorithms which can calculate the needs based on the information received from these sensors.

3.2 Factory Equipment

With each device and machine equipped with sensors and M2M communication, any problem in any of the machines will be quickly identifiable. Machines will also be able to communicate batch information with each other, thus further improving the factory output and reducing disparity between different workshop sections.

3.3 Smart Cities

I visualize Internet of Things can find major applications in making people’s lives easier, be it as simple as finding a parking spot or more complex ones such as safety and security. If all the “things” in a city are connected and share their information, it is possible to create a personalized suite of information and tools for each and every citizen of the city, accessible with a simple mobile phone app. By having the pavements, roads and cameras communicate with each other, a simple network can be built which informs people of the current status. This system on being connected with the traffic light system can create a network for emergency response systems by creating routes with no blockages thus reducing the response time of the ambulances.



Another application of IoT is in building a smart grid network which minimizes the electricity consumption and wastage by observing usage patterns.

3.4 Entertainment

The internet of things also provides various interesting applications in the field of entertainment. Entire cities can be converted into digital playgrounds or storybooks with the help of internet enabled objects. One such application is being explored by Columbia University’s Digital Storytelling lab in the form of the Sherlock Holmes and the Internet of Things Global Challenge.

3.5 Challenges

There are various other applications of IoT and the technology required for implementing it also exists, by now you would be wondering as to why it hasn’t been widely implemented yet, there are various reasons for this some of them are:

3.6 Cost

Although the technology has become widely available, the costs involved in manufacturing the smart devices is very high which is the leading reason for the current lack of growth in the smart device arena. The cost of connecting so many devices to high speed internet is also very high.

3.7 Infrastructure

Many countries including India still don’t have the infrastructure required to support the basic internet operations let alone the mammoth amount of data that will need to be handled once IoT is implemented.

3.8 Awareness

There seems to be a general lack of awareness about the existence and benefits of IoT amongst the masses which is one of the primary reasons why there is no widespread use and implementation of the concept.

3.9 Cost to Benefit Analysis

At the current stage the implementation costs of IoT are very high, however, the benefits in the long run seem to overweigh the costs involved in the form time and resources saved. The various costs involved in setting up the internet of things are:

IV. COSTS

Parameter	Requirements
Wi-Fi enablement	Giving all the devices internet connectivity wirelessly.
Infrastructure Development	Developing the infrastructure to set-up the internet of things, such as making new mobile communication towers etc.
Equipment	Since it is still new and developing the equipment cost for internet ready “things” is very high.



V. BENEFIT

Parameter	Benefits
Time saving	The internet capable devices will help to save time immensely.
Resource Management	The devices will help optimized use and management of resources.
Problem prediction and identification	The sensors in these devices will help in early detection of issues or problems with either the person using them or the devices near him.

VI. CONCLUSION

6.1 Current Scenario

A lot of implementations have already having been tried and tested, Microsoft is emerging as a leader with various projects being taken up such as the Paris transport system, Google has also shown keen interest in the concept with its recent acquisition of Nest Labs, a home automation company which has developed various new and unique products for home automation. Carnegie Mellon University in partnership with various universities and companies is making its entire campus Internet of Things enabled. It can be observed that there has been a lot of development in the field however cost optimization has still not been achieved due to which widespread implementation is not possible at the moment.

VII. IMPEDIMENTS

7.1 Security

One of the main areas of concern with almost everything today, is security and the internet of things is no different, with every“thing” around us getting connected to the internet, the fear of cybercrimes increases manifold because if a hacker can get into the mainframe of say a smart city as a whole, he can wreak havoc across the city as was picturized in the movie Die Hard 4.0 or in the game Watchdogs. Imagine this, you have a pacemaker which is connected to the internet and hackers can reprogram it. These are just some of the examples of what hackers might be able to do, however the various networking companies across the globe have already started working towards creating routers and switches specifically for the internet of things. Stanford University with its secure internet of things project is trying to find ways to ensure that the Internet of Things stays safe.

7.2 Privacy

Another issue with the advent of IoT is recession of privacy as all devices will know who is where when and why at all times and will be able to communicate the same, a lot of users will have privacy issues. Privacy across the internet has become a major issue of late, due to the exposing of government snooping programs,

thus, to prevent the same from happening with the internet of things, an international monitoring body might have to be created to ensure that the data isn't misused.

VIII. WAY FORWARD

Poor Infrastructure and high costs can play dampeners. However, if developers are able to come up with effective measures to implement the concept at lower rates, we will soon be entering the big new phase after IT revolution. The key enabler for IoT is access to internet, therefore cooperation from governments will help boost implementation. Once the costs have been optimized the final step towards a full integration of IoT would be developing the security infrastructure to safeguard the users' personal and private information. I would say that the concept of IoT is primed and ready and with just a few minor improvements here and there it is ready to take on the world. For sure the next big revolution is the "Revolution of Things".

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BRIEF ABOUT THE AUTHOR

Rishabh Anand, a 17-year-old student of class XII, living in Singapore, is a recipient of prestigious GIIS Global Citizen Scholarship. A 90,000SGD scholarship awarded to five outstanding students across the globe, selected through a stringent multiple stage screening process. He has a naturally developed deep interest in networking, telecommunication and how internet and telecom world works. Being introduced to the concept of Internet of Things he got interested in exploring how far reaching impact it was going to have on our daily lives. This article is written with an aim to explain the concept and its application in simple words for everyone understands.