

INTERNET OF THINGS : Future of IoT

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Abstract: No matter which way you look at it, technology has been headed towards automation for a long time now. It might be making us all lazier every day, or one might argue that it is giving us far greater time to pursue whatever we desire. Whatever might be the effect, there is no doubt that automation is the future and place that it is happening the most significantly is right in our homes.

Nowadays Internet of Things (IoT) gained a great attention from researchers, since it becomes an important technology that promises a smart human being life, by allowing a communications between objects, machines and every things together with peoples. IoT represents a system which consists a things in the real world, and sensors attached to or combined to these things, connected to the Internet via wired and wireless network structure. The IoT sensors can use various types of connections such as RFID, Wi-Fi, Bluetooth, and ZigBee, in addition to allowing wide area connectivity using many technologies such as GSM, GPRS, 3G, and LTE. IoT-enabled things will share information about the condition of things and the surrounding environment with people, software systems and other machines. by the technology of the IoT , the world will becomes smart in every aspects , since the IoT will provides a means of smart cities , smart healthcare , smart homes and building , in addition to many important applications such as smart energy , grid , transportation , waste management and monitoring . In this paper we review a concept of many IoT applications and future possibilities for new related technologies in addition to the challenges that facing the implementation of the IoT.

Keywords: IoT Applications, Future Technologies, Smart Cities, Smart Environment, Smart Energy and Grid, Smart Manufacturing, Smart Healthcare.

1. INTRODUCTION

The Internet of Things (IoT), sometimes referred to as Internet of Objects will change everything including ourselves. The Internet has an impact on education, communication, business, science, government, and humanity^[1]. Clearly, the Internet is one of the most important and powerful creations in all of human history and now with the concept of the internet of things, internet becomes more favorable to have a smart life in every aspects^[2]. Internet of Things is a new technology of the Internet accessing. By the Internet of Things, objects recognize themselves and obtain intelligence behavior by making or enabling related decisions thinks to the fact that they can communicate information about themselves. These objects can access information that has been aggregated by other things, or they can added to other services^[3].

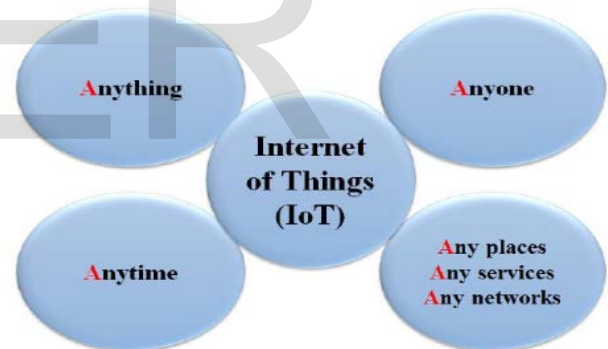


Figure 1. Internet of things Concept

The above figure reviews that the Internet of Things, anything's will be able to communicate to the internet at any time from any place to provide any services by any network to anyone. This concept will create a new types of applications can involve such as smart vehicle and the smart home, to provide many services such as notifications, security, energy saving, automation, communication, computers and entertainment^[4].

IoT has become so vital in our daily life and it is going to create a big impact in the near future^[1]. For example, solutions can be provided instantly

for the traffic flows, reminding about the vehicle maintenance, reduce energy consumption. Monitoring sensors will diagnose pending maintenance issues, and even prioritize maintenance crew schedules for repair equipment. Data analysis systems will help metropolitan and cosmopolitan cities to function easily in terms of traffic management, waste management, pollution control, law enforcement and other major functions efficiently

2. INTERNET OF THINGS STANDARDIZATIONS AND PROTOCOLS

By the 2020 around 50 to 100 billion things will be connected electronically by internet.

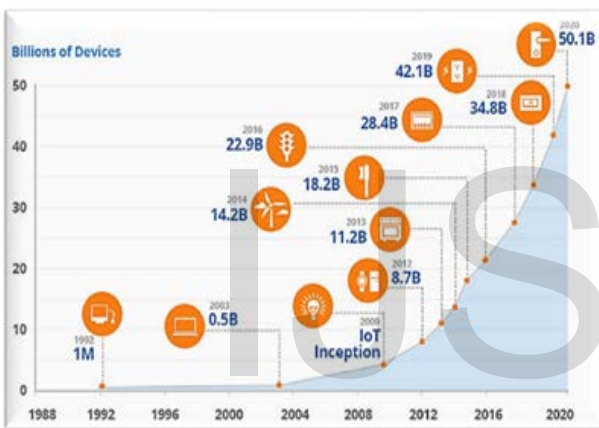


Figure1 Internet of Things Growth

The above figure (figure 1) shows the growth of the things connected to the internet from 1988 to forecast 2020. The Internet of Things(IoT) will provide a technology to creating the means of smart action for machines to communicate with one another and with many different types of information^[2]. The success of IoT depends on standardization, which provides interoperability, compatibility, reliability, and effective operations on a global scale. Today more than 60 companies for leading technology, in communications and energy, working with standards, such as IETF, IEEE and ITU to specify new IP based technologies for the Internet of

Things^[3]. The design of the IoT standards is required to consider the efficient use of energy and network capacity, as well as respecting other constraints such as frequency bands and power levels for radio frequency communications. As IoT evolves, it may be necessary to review such constraints and investigate ways to ensure sufficient capacity for expansion, for example in case of additional radio spectrum allocation as it becomes available.

3. INTERNET OF THINGS APPLICATIONS

Internet of things promises many applications in human life, making life easier, safe and smart. There are many applications such as smart cities, homes, transportation, energy and smart environment.

i.) Home Automation System

It's easy to figure out what home automation entails-it is pretty much just the usage of smart phones and other easily available computing devices to automate and control household items and devices, from electrical appliances to lights to doors, with the help of hardware that can be controlled remotely. Most home automation begins small-people start with controlling simple binary devices, that could either be in an "on" or "off" state. But it's when these devices are hooked up to the internet that they become truly smart and enter the realm of the internet of things. In fact, most automation systems nowadays use their internet-enabled abilities to record and analyze usage patterns of devices, mostly lighting and heating systems, to reduce monthly electricity bills and overall energy expenditure. Any smart home automation system today is generally a central hub that can be configured to control a bunch of smart devices, sensors and switches, all of which communicate with the hub using certain communication protocols. The hub, in turn, is instructed through an app or the web. The main takeaway is the distribution of monitoring and computing functions between the hub and the remote app. For example: in smart lighting system,

a hub would act as the central interface between multiple smart devices, say, a bulb and a door contact sensor.

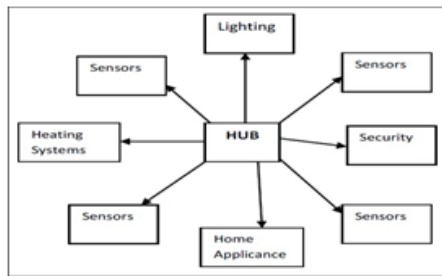


Figure 1. Home Automation System

ii.) Smart Cities

Many major cities were supported by smart projects, like Seoul, New York, Tokyo, Shanghai, Singapore, Amsterdam, and Dubai. Smart cities may still be viewed as cities of the future and smart life, and by the innovation rate of creating smart cities today's, it will become very feasible to enter the IoT technology in cities development. Smart cities demand require careful planning in every stage, with support of agreement from governments, citizens to implement the internet of things technology in every aspects. By the IoT, cities can be improved in many levels, by improving infrastructure, enhancing public transportation, reducing traffic congestion, and keeping citizens safe, healthy and more engaged in the community as shown in the below figure (figure 2).



Figure 2. Smart Cities Aspects

iii.) Smart Energy and the Smart Grid

A smart grid is related to the information and control and developed to have a smart energy management. A smart grid that integrate the information and communications technologies (ICTs) to the electricity network will enable a real time, two way communication between suppliers and consumers, creating more dynamic interaction on energy flow, which will help deliver electricity more efficiently and sustainably. The Key elements of information and communications technologies will include sensing and monitoring technologies for power flows; digital communications infrastructure to transmit data across the grid; smart meters with in home display to inform energy usage; coordination, control and automation systems to aggregate and process various data, and to create a highly interactive, responsive electricity. Many applications can be handling due to the internet of things for smart grids, such as industrial, solar power, nuclear power, vehicles, hospitals and cities power control. The below figure (figure 3) shows the most important application may be enabled by the internet of things as in smart grid aspect.



Figure 3, Smart grid applications

iv.) Smart Health

A close attention that required to hospitalized patients whose physiological status should be monitored continuously can be constantly done by using IoT monitoring technologies. For smart health sensors are used to collect comprehensive physiological information and uses gateways and the cloud to analyze and store the information and then send the analyzed data wirelessly to caregivers for further analysis and review as shown in figure 4 below. It replaces the process of having a health professional come by at regular intervals to check the patient's vital signs, instead providing a continuous automated flow of information. In this way, it simultaneously improves the quality of care through constant attention and lowers the cost of care by reduces the cost of traditional ways of care in addition to data collection and analysis.

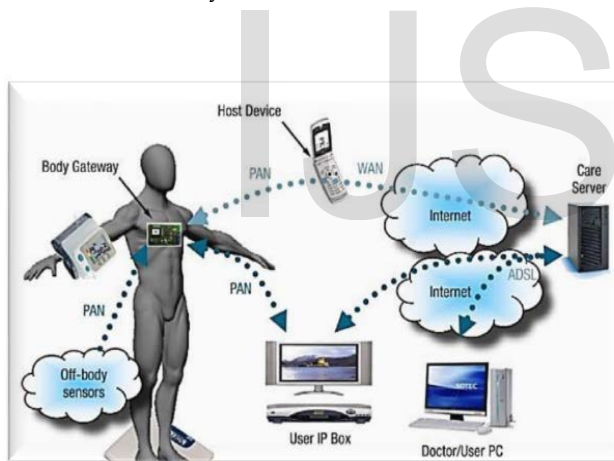


Figure 4. Smart healthcare concept

v.) Smart Transportation and Mobility

IoT can also be used in transportation as an electric vehicle, which is an important means to reduce both the fuel cost and the impact of global warming have also gained considerable attention from drivers. Government in many countries has supported researches on systems to monitor performance of Lithium-ion (Li-on) battery for electric vehicle as explored.

The system presented was designed to detect the functions of Li-on power battery by deriving the driving situation from the realistic working conditions for driver so that the driver was able to get the idea of the route status. This solution was embedded with many essential functions such as dynamic performance test of the Li-on battery, remote monitoring with on-line debugging and error correction that could significantly reduce the maintenance cost.

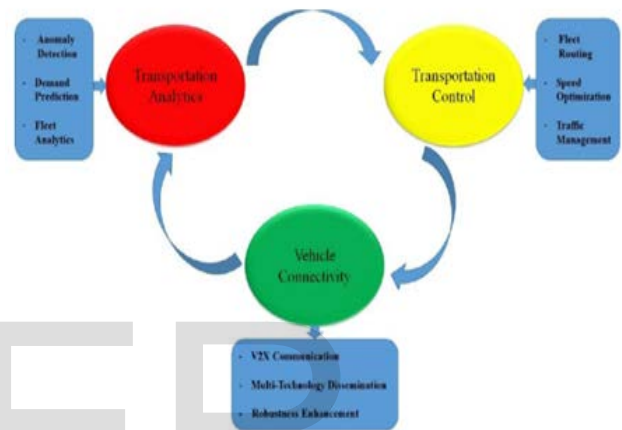


Figure 5 Smart Transportation Aspects

In Figure 5, they are transportation analytic, transportation control, and vehicle connectivity. The transportation analytic represents the analysis of demand prediction and anomaly detection. The routing of vehicles and speed control in addition to traffic management are all known as transportation control which they actually tightly related to the way of the vehicles connectivity (V2X communication), and overall governed by multi-technology dissemination.

4. INTERNET OF THINGS CHALLENGES

The fact that Internet of Things applications and scenarios outlined above are very interesting which provides technologies for smart every thing, , but there are some challenges to the application of the Internet of Things concept in cost of implementation. The expectation that the technology must be available at low cost with a

large number of objects^[4]. IoT also faces many other challenges:

4.1 INTEROPERABILITY:- Each type of smart objects in Internet of Things have different information, processing and communication capabilities. Different smart objects would also be subjected to different conditions such as the energy availability and the communications bandwidth requirements. To facilitate communication and Cooperation of these objects, common standards are required.

4.2 DATA VOLUMES:- Some application scenarios of the internet of things will involve to infrequent communication, and gathering information's form sensor networks, or form logistics and large scale networks, will collect a huge volumes of data on central network nodes or servers. The term represent this phenomena is big data which is requires many operational mechanism in addition to new technologies for storing, processing and management.

4.3 DATA INTERPRETATION:- To support the users of smart things, there is a need to interpret the local context determined by sensors as accurately as possible. For service providers to profit from the disparate data that will be generated, needs to be able to draw some generalizable conclusions from the interpreted sensor data.

5. IOT in Future

The 5G will enable connected cars to send and receive messages 10 times faster. According to a recent report, the global connected car market is expected to grow from 5.1 Million units in 2015 to 37.7 million units by 2022. Adoption of telematics units and advances in tech with emphasis on driver and passenger experience along with safety and cyber security are ushering in a new era of growth for connected cars globally. India is expected to emerge as a huge market for such vehicles^[1]. Currently, less than 2 percent of all vehicles sold in the country have some form of connectivity embedded in them. But our experience with smart phones has shown that mass adoption of technology can happen fast provided we are comfortable with the price tag.

5.1 Safe Driving

With connected cars, insurance companies can offer incentives to drivers to drive well in return for lower premiums. This will make our roads safer and improve the driving experience. Drivers can also use this information to evaluate and improve their driving skills. In a country where we constantly complain about traffic jams, thanks to big data, your car will someday soon wake you up early to remind you that if you don't reach office early, you will have to deal with more traffic. Big data will bring in more predictability in traffic management with data from each vehicle adding up.

5.2 Predictive Maintenance

Drivers and fleet managers will now get inputs on vital vehicle diagnostics data leading to detection of issues before they turn into a major problem. This will reduce vehicle breakdowns and ensure hassle free driving as well as improved mileage. Well maintained vehicles also minimize emissions.

5.3 The Data Opportunity

According to a recent research, a single connected vehicle has the potential to generate more revenue than 10 conventional non connected vehicles. In the future, the market share of OEMs will not be based on units sold but on the data revenue generated per vehicle. Data monetization in an IoT context is still in its infancy and we will see plenty of actions on this front in the near future.

6. END SECTIONS

6.1 CONCLUSION:

Internet of things is a new technology which provides many applications to connect the things to things and human to things through the internet. Each objects in the world can be identified, connected to each other through internet taking decisions independently. All networks and technologies of communication are used in building the concept of the internet of things such technologies are mobile computing, RFID, wireless sensors networks, and embedded systems, in addition to many algorithms and

methodologies to get management processes, storing data, and security issues^[3].

A connected car can dig into its database to come out with suggestions on the best route available to avoid traffic. With the arrival of 5G, connectivity issues will be a thing of the past. 5G will enable connected cars to send and receive messages faster (upto 10 times a second). 5G will also enable more situational awareness and provide advance warning in case of roadblocks or hindrance that were to appear on the road you are driving on thereby giving you more time to react.

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