

# Internet of Things: A Vision for Better Future

Siddhartha Agarwal

Electronics and Communication Engineering JSSATE, Noida  
E-mail: [aggarwal\\_sid@yahoo.com](mailto:aggarwal_sid@yahoo.com)

**Abstract**—With the rapid advancement in the field of technology, a ubiquitous network has surrounded us in a way far away from the realms of reality. This rapid and dense structure forms what we call “Internet Of Things”. Mechanizing each and every equipment around us and controlling it with a single network of layered protocols is not a dream anymore. The paper aims to highlight the ongoing advancements in the field of IoT and analyses projects like bus transportation system and self-implemented Automatic SMS Healthcare System. It tries to establish an analogy between electronics and so connected devices. The network is governed by protocols that are managed by a server, which may be local or global. We finally present the problems with existing technology and the potential ways of improving the same.

**Keywords:** Internet Of Things, layered protocols, IoT.

## 1. INTRODUCTION

Anyone who says that the Internet has fundamentally changed society may be right, but at the same time, the greatest transformation actually still lies ahead of us. Several new technologies are now converging in a way that means the Internet is on the brink of a substantial expansion as objects large and small get connected and assume their own web identity.

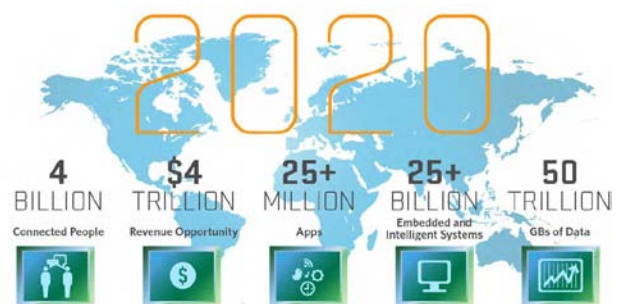
One such instance is connectivity of all the smart gadgets around us by a network that is so fast that it can respond with a click of a button in nanoseconds or even lesser than that. No doubt it has been a great innovation since the very invention of ‘INTRANET’, but this is not the extreme end, its just a beginning. A beginning to a new era, a beginning to a better world- a world which is connected-“THE SMART WORLD”. The so connected world is the world of “Internet Of Things”.

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of WiFi and 5G wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to disappear from the consciousness of the user, the Internet of

Things demands: a shared understanding of the situation of its users and their appliances, software architectures and pervasive communication networks to process and convey the contextual information to where it is relevant, and the analytics tools in the Internet of Things that aim for autonomous and smart behavior. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

A radical evolution of the current Internet into a Network of interconnected objects that not only harvests information from the environment (sensing) and interacts with the physical world (actuation/ command/control), but also uses existing Internet standards to provide services for information transfer, analytics, applications, and communications. Fueled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes, IoT has stepped out of its infancy and is on the verge of transforming the current static Internet into a fully integrated Future Internet[1].

The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment.



## 2. IOT: FORMAL DEFINITION

“Things are active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data and information sensed about the

environment, while reacting autonomously to the real/physical world events and influencing it by running processes that trigger actions and create services with or without direct human intervention.”—Cluster of European research projects on the Internet of Things.

“The Internet of Things represents an evolution in which objects are capable of interacting with other objects. Hospitals can monitor and regulate pacemakers long distance, factories can automatically address production line issues and hotels can adjust temperature and lighting according to a guest’s preferences, to name just a few examples.”— IBM



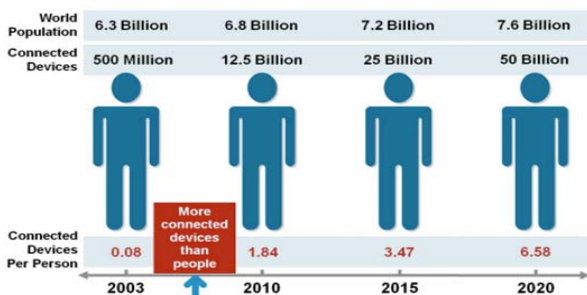
Fig. 1. Internet of Things schematic showing the end users and application areas based on data]

Fig. 1: Shows how various end users and devices can be connected by internet[2].

### 3. A VISION FOR A BETTER FUTURE

Internet of Things is not a gross or relatively newer concept. In January 2009, a team of researchers in China studied Internet routing data in six-month intervals, from December 2001 to December 2006. Similar to the properties of Moore’s Law, their findings showed that the Internet doubles in size every 5.32 years.

Today, IoT is well under way, as initiatives such as Cisco’s Planetary Skin, smart grid, and intelligent vehicles continue to progress[3].



### 3.1 IoT: Network of Networks

As already mentioned, various devices aggregate over a network thereby allowing a smart and well defined controlled world. Thus, IoT can be viewed as loose collection of disparate, purpose-built networks. But obeying a law similar to Moore’s Law as the network will grow in size, so will be its complexity where in various networks will be further having sub networks, thereby creating a mesh of networks. For eg. To get up early we set alarm in our smartphone, the smartphone at the same time by the means of RFID sensors can send an SMS to milk vendor to deliver the milk ca, turn on the geyser and various other appliances, creating a mesh like structure.

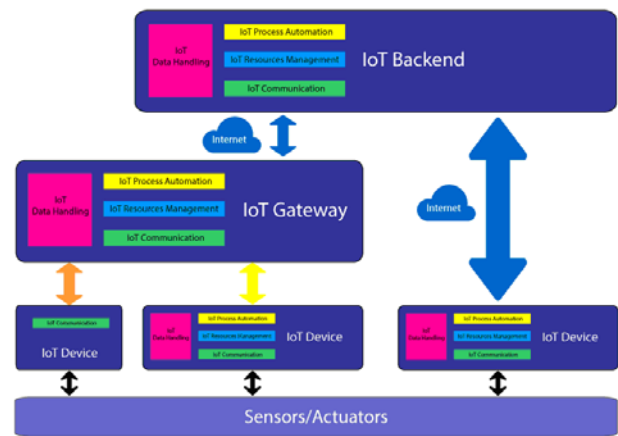
### 3.2 Importance of IoT

Being the first real evolution of Internet IoT becomes immensely important, a leap that will lead to revolutionary applications that have the potential to dramatically improve the way people live, learn, work, and entertain themselves. Already, IoT has made the Internet sensory (temperature, pressure, vibration, light, moisture, stress), allowing us to become more proactive and less reactive. Hence, in the coming years, it can revolutionize not only the networking industry but also electrical, mechanical and electronics world.

## 4. ARCHITECTURE OF IOT

Architecture of internet Of Things contains basically 4 layers:

1. Application Layer
2. Gateway and the network layer
3. Management Service layer
4. Sensor layer



### 4.1 Application Layer

It is the lowest abstraction level generally incorporated to measure physical quantities. It thus collects and processes real time information and interconnects physical and digital world.

## 4.2 Gateway and network

It is a robust and high performance network infrastructure that supports communication requirements for latency, bandwidth or security.

## 4.2 Management Service layer

Data analytics, Streaming analytics and capturing of sensory data come under this category.

## 4.3 Sensor layer

The layer of sensors that help in interfacing the real world data into a stream of bytes as fed to associated machinery, thereby making networks more correspondent and responsive.

## 5. CASE STUDY: SMART BUS SYSTEM

Google Maps[4] is already a popular application where in Internet of things is being exploited extensively. We tend to analyze the system adopted by google maps and comparing the same with SMRT bus transportation system in Singapore.

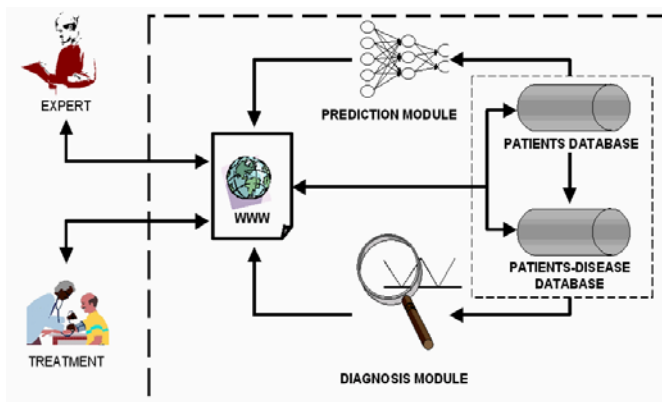
There is a host server which depending on the demands of a person, provides necessary data as when is the next bus arrival scheduled and what if bus is trapped in a traffic jam, what is the possibility of getting next bus service.

The cloud server by the means of place and time tags sends information to the person who then can start accordingly from his place, or complete activities near the bus stop.

But this overall system though is quite lucrative, yet has problems like that of internet connectivity, data pack costs etc.[5].

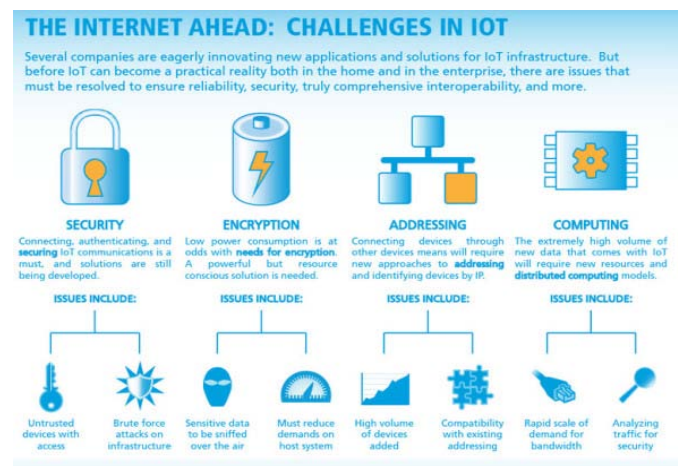
## 6. HEALTHCARE SYSTEM

The healthcare system as implemented by us comprises of an automatic SMS service, where in the blood pressure and heartbeat data are collected by using sensors. The so collected data is then combined by a controller and depending upon the lower and higher threshold levels an SMS is sent to the doctor for emergency visit. The network can be implemented using sensors, transmitters and receivers.



## 7. CHALLENGES

1. Data security: The thought of always being tracked and your data being recorded does bring a fear to a consumers mind, but we have to move away from it to see the benefits that this great technology is going to bring to us[6].
2. Service providers: The Internet of Things can be widely accepted if and only if proper business enterprises and individuals take the initiative to make the world a connected place[7].
3. Cost: To make the widespread networks cost effective, devices consuming low power and the network with minimal losses must come into existence. Thus, its not a singly studied subject, but is a multidimensional approach.
4. Interfacing: Interfacing of various data from different sources so as to produce viable outputs is another challenging issue.



## 8. CONCLUSION

Internet from its very invention has undergone legitimate changes followed by technological innovations. But gone are the days when internet was just used for browsing. Today as we see it, it's a mesh of various connected networks, wherein electronic devices are embedded so as to make it more application specific. The so called smart connected world is governed by a layer of protocols. These protocols tend to establish communication between end user and various connected devices. It appears as if entire earth core is laid with devices interconnected in one way or the other. The problems like cost effectiveness and interfacing are being regularly solved to make the experience better and better.

In conclusion, IoT represents the next evolution of the Internet. Given that humans advance and evolve by turning data into information, knowledge, and wisdom, IoT has the potential to change the world as we know it today—for the better.

---

**REFERENCES**

- [1] Briand, L. C., Daly, J., and Wüst, J., "A unified framework for coupling measurement in objectoriented systems", *IEEE Transactions on Software Engineering*, 25, 1, January 1999, pp. 91-121.
- [2] Internet of Things (IoT): A vision, architectural elements, and future directions by Jayavardhana Gubbia, Rajkumar Buyyab,\*, Slaven Marusic a, Marimuthu Palaniswami , "Source Code Files as Structured Documents", in *Proceedings 10th IEEE International Workshop on Program Comprehension (IWPC'02)*, Paris, France, June 27-29 2002, pp. 289-292.
- [3] The Internet of Things:How the Next Evolution of the Internet is Changing Everything,Dave Evans,April 2011
- [4] Brain, M. (2009, May 27). How do Google traffic maps work?Retrieved May 17, 2013, from How Stuff works: <http://blogs.howstuffworks.com/2009/05/27/how-dogoogle-traffic-maps-work/>
- [5] Implementation of internet of things in bus transport,SYSTEM OF SINGAPORE,A. Menon, R. Sinha, D. Ediga, Prof. Subba Iyer.
- [6] Gobble, M. M. (2013). Big Data: The Next Big Thing in Innovation. *Research Technology Management* , 64-66.
- [7] Boos, D., Gunter, H., & Kinder, K. (2012). Controllable Accountabilities: The Internet of Things and its challenges for organisations. Online first .