

# A Review on Internet of Things (IoT)

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Summary of the work of the same name by M.U. Farooq, Muhammad Waseem, Sadia Mazhar, Anjum Khairi, Talha Kamal [2]

## Abstract

For now, we communicate either human to human or human to a device. The Internet of Things (IoT) makes a change through machine-to-machine (M2M) communication. This Paper provides a comprehensive overview of the IoT scenario and reviews its technologies and sensor networks. Further, we discuss a six-layered architecture of IoT and the related key challenges and the associated safety threats.

## 1 INTRODUCTION

IoT is continually evolving. The opportunities seem infinite. It could provide a global computing network where everything and everyone connects to the Internet. The number of devices availing of internet services is increasing every day. The approach of IoT is converging data obtained from different kinds of things to any virtual platform on existing Internet infrastructure.

The first IoT device dates back to 1982. A modified coke machine was competent to report the drinks contained and whether the drinks were cold by communicating through the Internet[5].

The basic idea of IoT is to allow an autonomous exchange of valuable information between invisibly embedded different uniquely identifiable real-world devices around us, fueled by the leading technologies like Radio-Frequency Identification (RFID) and Wireless Sensor Networks (WSNs) [6] which are sensed

by the sensor devices and further processed for decision making, based on which an automated action is performed [3].

The paper is structured as follows. Section 2 describes the generic architecture of the IoT. Section 3 forecasts future applications. Section 4 discusses the privacy and security challenges posed by IoT. Finally, Section 5 concludes the paper.

## 2 ARCHITECTURE

The existing architecture of the Internet with TCP/ IP protocols cannot handle a network as extensive as IoT. For this issue, there is a need for a new open architecture. This architecture should ensure security and Quality of Service (QoS). Without proper privacy assurance, IoT is not likely to be adopted by many [4]. [8] proposed a six-layered architecture divided into the six layers shown in Fig. 1. This section will present the six layers of the IoT architecture.

### 2.1 Coding Layer

In this layer, each object gets its unique ID to provide an easy discern [8].

### 2.2 Perception Layer

This layer consists of data sensors like RFID Tags, IR Sensors, etc. [1] This could sense the temperature, humidity, location, etc. It converts the sensor data into a digital signal and

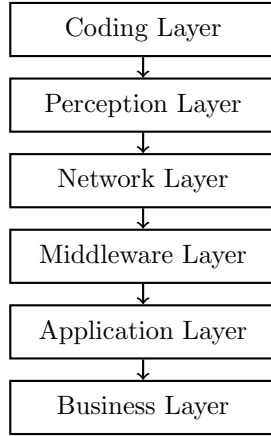


Figure 1: Six-Layered Architecture of IoT

passes it onto the Network Layer for further action.

### 2.3 Network Layer

This layer receives the information as digital signals from the Perception layer and transmits it to the Middleware layer through transmission mediums like WiFi, Bluetooth, 3G, etc. protocols like IPV4, IPV6, etc. are used for this [10].

### 2.4 Middleware Layer

This layer processes the information provided by the Perception layer through the Network layer. It includes technologies like Cloud computing with direct access to a database to store the data. In some Intelligent Processing Equipment, based on the information a fully automated action is taken based on the processed results of the information.

### 2.5 Application Layer

This layer realizes the applications of IoT With the processed data. The IoT-related applications could be smart homes, transportation, planet, etc.

### 2.6 Business Layer

This layer manages the applications and services of IoT.

## 3 APPLICATIONS

Several possible future applications can be of great advantage like smart Hospitals, smart agriculture, etc. In this section, we present three of them:

### 3.1 Smart Traffic System

Providing an intelligent traffic monitoring system with automatic identification of vehicles and other traffic factors needs IoT technologies instead of using technologies like image processing methods [44]. It will provide features like theft detection, reporting of traffic accidents, and less environmental pollution. The roads of this smart city will give diversions with climatic changes or unexpected traffic jams so that driving and walking routes will be optimized [1]. The traffic lighting system will be weather adaptive to save energy. The availability of parking spaces throughout the city will be accessible to everyone.

### 3.2 Smart Environment

IoT will predict natural disasters such as floods, fires, earthquakes, etc. Also, there will be proper monitoring of air pollution in the environment.

### 3.3 Smart Home

IoT will provide solutions for Home Automation. We could remotely control our appliances, monitor utility meters, energy, and water supply to help save resources, and build an encroachment detection system that could prevent burglaries. Also, gardening sensors could measure light, humidity, temperature, and other gardening vitals. IoT could water plants according to their needs.

## 4 SECURITY AND PRIVACY CHALLENGES

IoT makes everything and a person localizable and addressable. So IoT must have a robust security infrastructure. This section will present some of the possible IoT-related issues.

#### 4.1 Unauthorized Access to RFID

Unauthorized access to tags is a fundamental issue. Some real-life threats of RFID are RFID Viruses, Side Channel Attacks with a cell phone, and SpeedPass Hack.

#### 4.2 Sensor-Nodes Security Breach

WSNs are vulnerable to attacks because sensor nodes are part of a bi-directional sensor network. [9] described some of the possible attacks that include Jamming, tampering, Sybil, Flooding, and some other kinds of attacks

#### 4.3 Cloud Computing Abuse

The shared resources can face security threats like Man-in-the-middle attacks (MITM), Phishing, etc. The Cloud Security Alliance (CSA) draws attention to hazard like Data Loss, Accounts Hijacking, the Monstrous use of Shared Computers, etc. [7] describes this and other problems closer.

### 5 CONCLUSION

The IoT is getting bigger and will affect every part of our life. It ranges from automated houses to monitoring health and the environment. We discussed future applications and a six-layered architecture for their use. And the associated safety threats. The development of IoT explains solutions for its security and data protection threats.

### References

- [1] Jaydip Sen Debasis Bandyopadhyay. Internet of things - applications and challenges in technology and standardization. in *Wireless Personal Communications*, 58(1):49–69, 2011.
- [2] M.U. Farooq, Muhammad Waseem, Sadia Mazhar, Anjum Khairi, and Talha Kamal. A review on internet of things (iot). *International Journal of Computer Applications (0975 8887)*, 113(1), March 2015.
- [3] Rafiullah Khan, Sarmad Ullah Khan, Rifaqat Zaheer, and Shahid Khan. Future internet: The internet of things architecture, possible applications and key challenges. in *Proceedings of Frontiers of Information Technology (FIT)*, pages 257–260, 2012.
- [4] Lan Li. Study of security architecture in the internet of things. in *Measurement, Information and Control (MIC)*, 1:374–377, 2012.
- [5] Carnegie Mellon. The "only" coke machine on the internet. *The Carnegie Mellon University Computer Science Department*, 2014.
- [6] Guicheng Shen and Bingwu Liu. The visions, technologies, applications and security issues of internet of things. *Business and E -Government (ICEE)*, pages 1–4, 2011.
- [7] S.R.Taghizadeh V. Ashktorab. Security threats and countermeasures in cloud computing. in *International Journal of Application or Innovation in Engineering and Management (IJAIEEM)*, 1(2), Oct'12.
- [8] Fuquan Sun Xu Cheng, Minghui Zhang. Architecture of internet of things and its key technology integration based-on rfid. in *Fifth International Symposium on Computational Intelligence and Design*, pages 294–297, 2012.
- [9] G.Attebury Y.Wang and B.Ramamurthy. A survey on security issues in wireless sensor networks. in *IEEE communications Survey and Tutorials*, 2nd Quarter 2006.
- [10] Ying Zhang. Technology framework of the internet of things and its application. in *Electrical and Control Engineering (ICECE)*, pages 4109–4112, 2011.