An Audit Course Report

on

“IOT-Application in engineering Field”

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In partial fulfillment for the award of the Degree of

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in

Information Technology

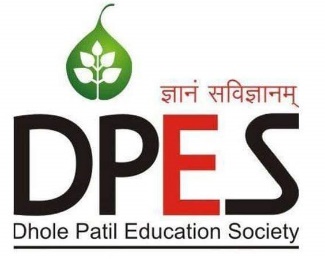
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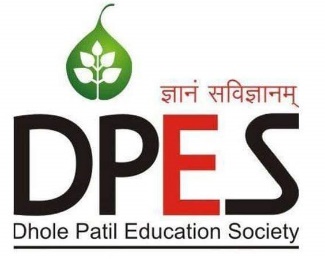


Department Of Information Technology

Dhole Patil College Of Engineering

Pune , Maharashtra, India

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CERTIFICATE

This is to certify that the audit course report entitled “IOT-Application in engineering Field” being submitted by **Subhasish Chatterjee(PRN-71623676B)** is a record of bonafide work carried out by him/her under the supervision and guidance of Prof. Prajakta Lokhande in partial fulfillment of the requirement for BE (Information Technology Engineering) – 2015 course of Savitribai Phule Pune University, Pune in the academic year 2019-20

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I

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**Subhasish Chatterjee**

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This audit course report has been examined by us as per the Savirtibai Phule Pune University, Pune, requirements at Dhole Patil College Of Engineering on . . . . . . . . . . . . . .

II

Abstract

The twenty first century commenced with the rise in the use of internet. In year 2000, the internet comprised of 51 percent of information transfer in the telecommunications which soon surged to 97 percent in 2007. Though the internet began its humble journey interconnecting computers across the world and raise to dominate the telecommunication sector, the idea of internet is now bound to extend beyond computers and leap beyond telecommunications. From internet of computers, this century is going to be an era of Internet of Things (IoT).

The ‘Internet of Things’ seems to have been heard before and there must be some questions lingering in your engineering mind.

– What is Internet of Things (IOT) ?

– Why is it trending ?

– How IOT is going to impact in future?

– Which organizations are developing the IOT technologies and what are their interests?

– What IOT means to a developer?

– What hardware, software and services fall into IOT?

– What are the major challenges in the path of IOT?

For further increasing your appetite, it would be worth mentioning that IOT, Cloud Services, Big Data etc. are things related to each other.

The term **“Internet of things”** has been defined by different organizations in many different ways. There are many organizations which are working towards developing standards and technologies for IOT. Let us look at definitions of IOT dictated by some of these standard organizations to have a brief insight into it.

So, with such integration of information technology, everything of day to day use becomes inter-connected as well as connected to the internet. Like the home appliances could be controlled and operated by a smart phone, the security cameras and locks can be accessed from anywhere in the world, an umbrella can sense the weather conditions and alert that it must be taken before going outside, the medicine caps start blinking indicating that it’s time to take dosage etc. So, basically every common article of use (like home appliances, cars, vehicles, energy grids, health gadgets and every possible commodity in day to day use) is embedded with software intelligence, is interconnected and connected to internet platforms which makes these common objects smarter, better and intelligent in their own way.

III

Contents

Certificate I

Acknowledgement II

Abstract III

List of Tables IV

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | Sr. | | Chapter | Page No | | 1. |  | Introduction | 1 | |  | 1.1 | What is IOT? |  | |  | 1.2 | Why is IOT trending? |  | |  | 1.3 | Objective of the work |  | | 2. |  | **IOT Technologies** | 2 | |  | 2.1 | Introduction |  | |  | 2.2 | Examples |  | | 3. |  | **Understanding IOT as an Industrial Developer** | 5 | |  | 3.1 | Introduction |  | |  | 3.2 | Examples  Conclusion |  | |  |  | References |  | |  |  | Appendix |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

IV

LIST OF FIGURES

Sr. No. Figure Name

1. Image showing Internet of Things Communication Model

2. Image showing Internet of Things Ecosystem

1

CHAPTER 1

INTRODUCTION

* 1. What is IOT?

The Internet is now omnipresent and ever-present. By the year 2016, 47 percent of the world population has been connected to the internet. The smart phones and smart gadgets have a greater contribution to this. In the form of smart phones, now everyone is having a portable and internet connected computer in her pocket. With thousands of apps in use, internet has become a day to day phenomenon and a must have in the modern life. With the rise of ‘Internet of Things’, now not just the computers and smart phones, every possible thing that we use is going to get IT-enabled.

The term **“Internet of things”** has been defined by different organizations in many different ways. There are many organizations which are working towards developing standards and technologies for IOT. Let us look at definitions of IOT dictated by some of these standard organizations to have a brief insight into it.

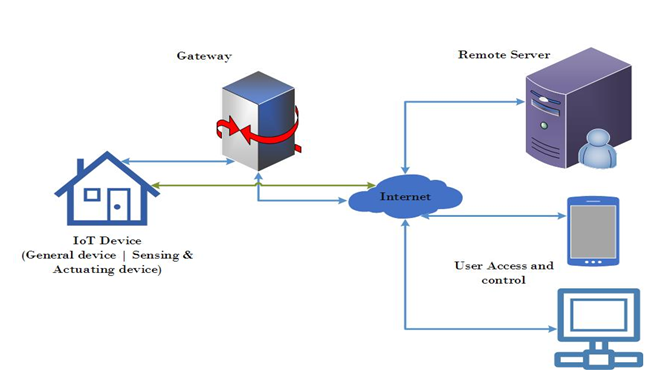


Fig. 1: Image showing Internet of Things Communication Model

* 1. Why is IOT Trending?

The IOT is seen as fourth industrial revolution in line. The third industrial revolution came with information technology and its use for automating the production. And, now the fourth industrial revolution is set to come with internet technology and its use in uncountable methods and applications. The human life is going to be much smarter and easy with the notion of ‘Everything Anywhere Always Connected’.

* 1. Aim and Objective(s) of the report

Aim: -

The aim of this report is to gain understanding of the emerging technology IoT and its benefits in engineering and related fields.

Objective: -

To achieve a deep understanding of IoT in Industries in the upcoming times we perform as exhaustive study as possible.

2

CHAPTER 2

**IOT Technologies**

2.1 Introduction

There are many prominent technologies that will play a greater role in the development of future IOT systems. Some of these technologies are –

Electronic Miniaturization – The development of micro and nano scale electronic components and circuits will enable embedding electronics to more and more objects. So, the future integrated circuits are going play a primary role in the development of IOT systems.

Digitization – The digitization of as many objects as possible with help of tags, stickers, beacons, chips, controllers, wearables, implants and sensors is going to help a lot in the realization of true IOT ecosystems.

Communication technologies – The future communication technologies like 5G, Low Power Bluetooth, Near Field Communication (NFC), RFID, LoRa WAN etc will make device to device and device to cloud communication much faster and efficient.

Clouds and Big Data – The IOT ecosystems will be dealing with a massive scale of data and will be conducting knowledge engineering at real time. So, big data analytics and data mining practices will play a vital role in the functioning of IOT systems.

2.2 Examples

1) Smart Home – Home Area Networks (HAN) and Smart homes are becom-ing the new trend. Almost everyone wants his/her home to be fully auto-mated with most of the domestic operations done without any human in-tervention. There are many companies & startups which are working over smart home IOT products. The aim of these companies is to provide low cost products which would be capable of intelligently managing time and energy resources. Another dimension in which smart home products are under development belongs to home security and access control systems. The companies like Philips, Haier, Nest, Ecobee, Ring, August are deemed to become household brands delivering smart home IOT products and solu-tions.

[Video URL: https://youtu.be/NjYTzvAVozo]

2) Wearable Devices – After smart phones, the new rage is for smart weara-bles. Smart jewelry, bracelets, smart watches, bands and even clothes will be the new fashion. These wearable devices are installed with sensors and software which collect data and information about the users. This data is later pre-processed to extract essential insights about the user. These de-vices in wearable category broadly cover fitness, health, telecommunica-tion and entertainment requirements. The pre-requisite from internet of things technology for wearable applications is to be ultra-low power and small sized. The wearables has grown an explosive demand in the past few years. The companies like Apple, Fitbit, Samsung, Huawei, Blend Style & function, IOTEX, Leaf wearable, Salted venture etc. are developing the IOT based wearable products.

[Video URL: https://youtu.be/h8-TAqzYrno]

3) Smart City – Smart City is the new concept of modern cities evolved through IOT. Smart surveillance, automated transportation, smart energy management systems, water distribution, urban security and environment conservation through electronic monitoring all are examples of internet of things applications for smart cities. The concept of smart cities has been quickly adopted by the governments and various public sector organiza-tions are now working with IOT vendors and IT companies to make cities smarter.

Smart Cities intends to solve the major problems faced by the people living in the cities such as pollution, traffic control, shortage of water and power etc. The sensors and web applications will play a major role in smart city solutions. Evreka, Bigbelly etc. are some companies providing smart city so-lutions and services.

[Video URL: https://youtu.be/Br5aJa6MkBc]

3

CHAPTER 3

**Understanding IOT as a Industrial Developer**

|  |  |
| --- | --- |
| 3.1 | Introduction |

The development of IOT systems is a complex task. It may involve two or more aspects described below –

Smart Devices – The IOT devices are smart devices which may have one or more sensors and actuators embedded in them. The sensors and actuators could be interfaced through a controller or processor. The device must have a wired or wireless communication interface to connect with other devices or internet.

Machine to Machine Communication – The machine to machine communication is primary feature of the IOT devices. Any IOT device needs to interact with other devices, electronic tags, stickers, smart phones, gadgets or computers. The communication technologies are also going through tremendous transformation to meet the communication requirements of IOT devices by boosting data transfer rates and enabling data communication to multiple channels simultaneously. For a ubiquitous Device to Device (D2D) integration, standard bodies, government departments, telecom and IT companies, service providers, system integrators and businesses have come together to materialize IOT ecosystems. In such ecosystem, a myriad of embedded devices will be networked together and interacting through multiple channels at high data speed.

Device to Cloud Integration – The IOT devices can get service enabled only through connecting to one or more service interfaces. This requires device to cloud (D2C) integration. By connecting to different service interfaces, the IOT devices can expose and request their functionalities. By web and cloud enablement, the devices can serve as service providing entities where the actual implementation of the service is hidden behind the service interface. Many devices can team up and coordinate together to accomplish tasks efficiently and in sync. Also, by device to cloud integration, large number of devices can be maintained, monitored, updated and operated through a common platform. For efficient Device to Cloud integration, Open Service Gateway Initiative ([OSGi](https://www.osgi.org/)) model is under development and will prove to be a transformational milestone in the realization of IOT ecosystems.

There are already numerous device specific cloud platforms and dedicated networks scattered across the globe serving millions of IOT devices. Different cloud architectures are developing for device specific applications, big data analytics, critical operations and smart phone services. No doubt, device to Cloud Integration is the most vital aspect of any IOT system without which it even not categorize under IOT paradigm.

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| --- | --- |
| 3.2 | Examples  1.Platform as a Service – The true power of IOT can be featured only through cloud based integrated platforms. The typical Platform as a Service (PaaS) solutions need to be optimized and enhanced for IOT so that they could manage millions of devices, collect and exchange data in real time , manage purpose specific interactions between plethora of devices and can successfully integrate with enterprise applications like Enterprise Resource Planning (ERP), Supply Chain Management (SCM), Knowledge Management (KM) and Customer Relationship Management (CRM).  2. Cloud to Cloud Integration – The cloud service providers (CSP) have their cloud centers located in geographically diverse locations. The typical data centers are evolving to cloud centers by implementing cloud centric platforms and practices. The new emerging cloud centers may be providing cloud infrastructure, platform and applications all together or may be simply providing a cloud infrastructure only. Some of the popular cloud management platforms include [VMware solutions](https://www.vmware.com/in/solutions.html), [OpenStack Distributions](https://www.openstack.org/marketplace/distros/), [Apache Cloudstack](https://cloudstack.apache.org/), [BMC software](http://www.bmcsoftware.in/), [Citrix Cloud](https://www.citrix.co.in/products/citrix-cloud/), [Rackware](http://www.rackwareinc.com/), [IBM Bluemix Cloud](https://www.ibm.com/cloud/), [Microsoft Cloud](https://azure.microsoft.com/en-in/), Cisco Systems, [Oracle Enterprise Manager](http://www.oracle.com/us/products/enterprise-manager/index.html) etc. These platforms integrate internal and external systems to manage multi-cloud services. The platforms are responsible for integrating on premises cloud with private hosted clouds, public cloud services (like Microsoft Azure, IBM Bluemix, Google Cloud Platform, Amazon Web Services etc.), Enterprise Management Systems and Service Automation Applications. In the emerging trend, same cloud services are being provided by multiple CSPs with different Service Level Agreements and Operational Level Agreements. So, this requires a need for cloud orchestration where multiple clouds and services could be exploited  and aggregated to generate a composite data, process, service or application. For enabling cloud orchestration, dedicated software solutions called Cloud Service Brokers (CSBs) are now developing.  Image showing Internet of Things Ecosystem  Fig. 2: Image showing Internet of Things Ecosystem |
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4

CONCLUSION

Internet of Things offers some pretty **interesting applications** in making our lives easier like in Healthcare, Transportation, and Agriculture. However, various factors like security, privacy and data storage also need to be considered.

It is also worth noting that **things have been connected to networks for ages** without the guise of “Internet of Things”.

This report is undertaken to understand IoT and its related emerging technologies. In conclusion, Internet of Things is the concept in which the virtual world of information technology connected to the real world of things. The number of different technologies required to support the deployment and further growth of the IoT places a premium on interoperability and has resulted in widespread efforts to develop standards and technical specifications that support seamless  
communication between IoT devices and components. Collaboration between various standards development groups and consolidation of some current efforts will eventually result in greater clarity for IoT technology companies.

5

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