A

SYNOPSIS

On

"SMART HOME USING IOT"

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CERTIFICATE

This is to certify that **Mr.Dattatray Puri** have carried out Seminar Work on **"SMART HOME USING IOT"** under my guidance in partial fulfillment for degree of Bachelor of Engineering in Information Technology of Pune University during the academic year 2022-2023.

They have satisfactorily completed Seminar Work as prescribed by the **University of Pune** for the Third Year of Engineering in Information Technology Department.

Place: Pune
Date:

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Acknowledgement

It's been a few years since we started hearing the buzz about a new type of domestic technology. Smart mirrors, robot vacuum cleaners, wireless kitchen appliances— interactive, internet-connected devices that would transform our lives. In 2019, IoT smart home device sales will reach $13 billion, and are forecasted to reach a value of more than 53$ billion by 2022.

But in this always-connected IoT home of mood-sensing music systems, smart lighting, intelligent heating and cooling, motorized blinds, and automated windows and doors, there seems to be little discussion about why consumers haven't unequivocally bought into the IoT home hype, or whether domestic life has actually improved as a result of it.

Best Regards,
Dattatray puri

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Abstract

Internet of Things (IoT) is fast becoming a disruptive technology business opportunity, with standards emerging primarily for wireless communication between sensors, actuators and gadgets in day-to-day human life, all in general being referred to as "Things". This offers the capability to measure for understanding environment indicators.

This paper addresses the internet of things (IoT) as the main enabling factor of promising paradigm for integration and comprehensive of several technologies for communication solution, Identification and integrating for tracking of technologies as wireless sensor and actuators. IoT as envisioned is billion sensors connected to the internet through the sensors that would be generate large amount of data which need to analyzed, interpreted and utilized. Context aware capturing enables modeling, interpreting and storing of sensor data which is linked to appropriate context variable dynamically. Building or home automation, social smart communication for enhancement of quality of life, that could be considered as one of the applications of IoT where the sensors, actuators and controllers can be connected to internet and controlled. .

This paper introduces the concept of application for internet of things and with the discussion of social and governance issues that arise as the future vision of internet of things.

CHAPTER 1

1 INTRODUCTION

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an aero plane, into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us smarter and more responsive, merging the digital and physical universes.

What is the Internet of Things? In a nutshell, the Internet of Things is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. The IoT is a giant network of connected things and people – all of which collect and share data about the way they are used and about the environment around them.

That includes an extraordinary number of objects of all shapes and sizes – from smart microwaves, which automatically cook your food for the right length of time, to self-driving cars, whose complex sensors detect objects in their path, to wearable fitness devices that measure your heart rate and the number of steps you've taken that day, then use that information to suggest exercise plans tailored to you. There are even connected footballs that can track how far and fast they are thrown and record those statistics via an app for future training purposes.

1.1 What is the Internet of Things?

Devices and objects with built in sensors are connected to an Internet of Things platform, which integrates data from the different devices and applies analytics to share the most valuable information with applications built to address specific needs.

These powerful IoT platforms can pinpoint exactly what information is useful and what can safely be ignored. This information can be used to detect patterns, make recommendations, and detect possible problems before they occur.

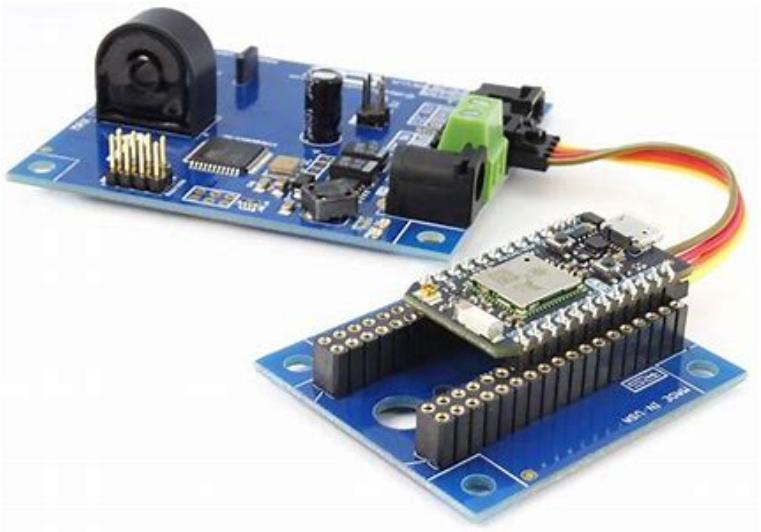

Figure 1.1: IOT Sensors

1.2 What is an example of an Internet of Things device?

Pretty much any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information. A lightbulb that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. An IoT device could be as fluffy as a child's toy or as serious as a driverless truck. Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, smart cities projects are filling entire regions with sensors to help us understand and control the environment

1.2.1 Home Security

The key driver behind smart and secure homes is IoT. A variety of sensors, lights, alarms and cameras (all of which can be controlled from a smartphone) are connected via IoT to provide 24x7 security..

1.2.2 Activity Trackers

Smart home security cameras provide alerts and peace of mind. Activity trackers are sensor devices that can monitor and transmit key health indicators in real-time. You can track and manage your blood pressure, appetite, physical movement and oxygen levels. .

1.3 Industrial Security and Safety

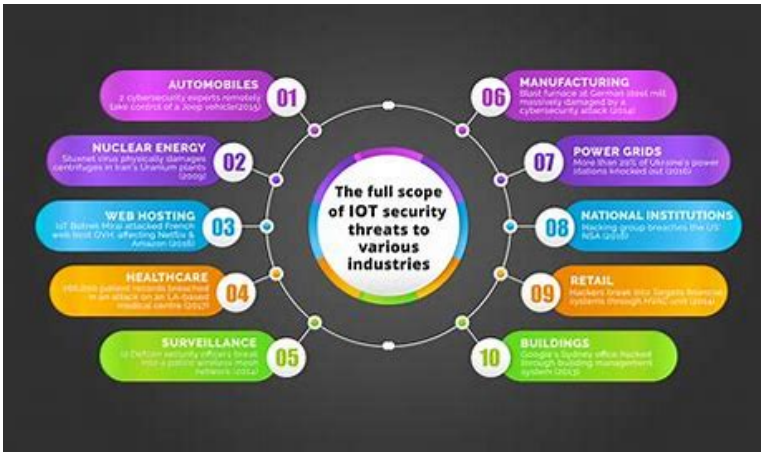

Figure 1.2: Industrial security safety

IoT-enabled detection systems, sensors and cameras can be placed in restricted areas to detect trespassers. They can also identify pressure buildups and small leaks of hazardous chemicals and fix them before they become serious problems.

1.3.1 Types Industrial security safety

a. Safety system (PSS)-

b. Process shutdown system (PSS)-

1.4 Augmented Reality Glasses

Augmented Reality (AR) glasses are wearable computer-enabled glasses that help you get extra information such as 3D animations and videos to the user's real-world scenes. The information is presented within the lenses of the glasses and can help users access Internet applications.

• 2 The history of the Internet of Things

2.1 What is the history of the Internet of Things?

The idea of adding sensors and intelligence to basic objects was discussed throughout the 1980s and 1990s (and there are arguably some much earlier ancestors), but apart from some early projects – including an internet-connected vending machine – progress was slow simply because the technology wasn't ready. Chips were too big and bulky and there was no way for objects to communicate effectively. Processors that were cheap and power-frugal enough to be all but disposable were needed before it finally became cost-effective to connect up billions of devices.

The adoption of RFID tags – low-power chips that can communicate wirelessly – solved some of this issue, along with the increasing availability of broadband internet and cellular and wireless networking. The adoption of IPv6 – which, among other things, should provide enough IP addresses for every device the world (or indeed this galaxy) is ever likely to need – was also a necessary step for the IoT to scale "The IoT integrates the interconnectedness of human culture – our 'things' – with the interconnectedness of our digital information system – 'the internet.' That's the IoT," Ashton told ZDNet. Adding RFID tags to expensive pieces of equipment to help track their location was one of the first IoT applications. But since then, the cost of adding sensors and an internet connection to objects has continued to fall, and experts predict that this basic functionality could one day cost as little as 10 cents, making it possible to connect nearly everything to the internet.

The main concept of a network of smart devices was discussed as early as 1982, with a modified Coca-Cola vending machine at Carnegie Mellon University becoming the first ARPANET-connected appliance, able to report its inventory and whether newly loaded drinks were cold or not.Mark Weiser's 1991 paper on ubiquitous computing, "The Computer of the 21st Century", as well as academic venues such as UbiComp and PerCom produced the contemporary vision of the IOT. In 1994, Reza Raji described the concept in IEEE Spectrum as "[moving] small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories". Between 1993 and 1997, several companies proposed solutions like Microsoft's at Work or Novell's NEST. The field gained momentum when Bill Joy envisioned device-to-device communication as a part of his "Six Webs" framework, presented

at the World Economic Forum at Davos in 1999. The concept of the "Internet of things" and the term itself, first appeared in a speech by Peter T. Lewis, to the Congressional Black Caucus Foundation 15th Annual Legislative Weekend in Washington, D.C, published in September 1985 According to Lewis, "The Internet of Things, or IoT, is the integration of people, processes and technology with connectable devices and sensors to enable remote monitoring, status, manipulation and evaluation of trends of such devices." The term "Internet of things" was coined independently by Kevin Ashton of Procter Gamble, later of MIT's Auto-ID Center, in 1999, though he prefers the phrase "Internet for things". At that point, he viewed radio-frequency identification (RFID) as essential to the Internet of things,which would allow computers to manage all individual things.
The main theme of the Internet of things is to embed short-range mobile transceivers in various gadgets and daily necessities to enable new forms of communication between people and things, and between things themselves In 2004 Cornelius "Pete" Peterson, CEO of NetSilicon, predicted that, "The next era of information technology will be dominated by [IoT] devices, and networked devices will ultimately gain in popularity and significance to the extent that they will far exceed the number of networked computers and workstations." Peterson believed that medical devices and industrial controls would become dominant applications of the technology. he extensive set of applications for IoT devices is often divided into consumer, commercial, industrial, and infrastructure spaces.

2.2 A Brief History of IoT Technologies

The concept of adding sensors and intelligence to physical objects was first discussed in the 1980s, when some university students decided to modify a Coca-Cola vending machine to track its contents remotely. But the technology was bulky and progress was limited.

The term 'Internet of Things' was coined in 1999 by the computer scientist Kevin Ashton. While working at Procter Gamble, Ashton proposed putting radio-frequency identification (RFID) chips on products to track them through a supply chain.

He reportedly worked the then-buzzword 'internet' into his proposal to get the executives' attention. And the phrase stuck.

Over the next decade, public interest in IoT technology began to take off, as more and more connected devices came to market.

In 2000, LG announced the first smart refrigerator, in 2007 the first iPhone was launched and by 2008, the number of connected devices exceeded the number of people on the planet.

In 2009, Google started testing driverless cars and in 2011, Google's Nest smart thermostat hit the market, which allowed remote control of central heating.

2.3 Everyday Examples of Use Cases

Businesses use IoT to optimize their supply chains, manage inventory and improve customer experience, while smart consumer devices such as the Amazon Echo speaker, are now ubiquitous in homes due to the prevalence of low-cost and low-power sensors.

Cities have been deploying IoT technology for more than a decade – to streamline everything from water meter readings to traffic flow.

"In New York City, for example, every single building (so more than 817,000) was retrofitted with a wireless water meter, starting back in 2008, which replaced the manual system where you had to walk up to a meter read the numbers and generate bills that way," says Jeff Merritt, the World Economic Forum's head of IoT and Urban Transformation.

"Many cities now leverage license plate readers, traffic counters, red light cameras, radiation sensors and surveillance cameras to manage day-to-day operations."

In medicine, the IoT can help improve healthcare through real-time remote patient monitoring, robotic surgery and devices such as smart inhalers.

In the past 12 months, the role of the IoT in the COVID-19 pandemic has been invaluable.

"IoT applications such as connected thermal cameras, contact tracing devices and health-monitoring wearables are providing critical data needed to help fight the disease, while temperature sensors and parcel tracking will help ensure that sensitive COVID-19 vaccines are distributed safely," according to the Forum's State of the Connected World report.

Beyond healthcare, IoT has helped make COVID disrupted supply chains more resilient, automated activities in warehouses and on factory floors to help promote social distancing and provided safe remote access to industrial machines.

2.4 The future of IoT

The range of potential IoT applications is "limited only by the human imagination" – and many of these applications can benefit the planet, as well as its people.

A 2018 analysis of more than 640 IoT deployments, led by the World Economic Forum in collaboration with research firm IoT Analytics, showed that 84

These include promoting more efficient use of natural resources, building better, fairer "smart cities", and developing clean, affordable energy alternatives.f-driving cars could improve driver safety and optimize traffic flow, potentially reducing the average commute time by 30 minutes. Emergency responder times could also be cut significantly Real-time crime mapping and predictive policing tools could also help prevent crime. McKinsey estimates that using data to deploy scarce resources more effectively could save 300 lives a year in a city with the population and profile of Rio de Janeiro.

3 Literature Survey

Automation performs an increasingly vital role in daily experience and global economy. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. The concept of home automation has been around since the late 1970s. But with the enhancement of technology and smart services, people's expectations have changed a lot during the course of time to perfectly turn the traditional house into smart home, and also think that what a home should do or how the services should be provided and accessed at home to became a smart home and so has the idea of home automation systems. A home automation system means to grant the endusers to manage and handle the electric appliances. If we look at different home automation systems over time, they have always tried to provide efficient, convenient, and safe ways for home inhabitants to access their homes. Regardless of the change in user's hope, growing technology, or change of time, the appearance of a home automation system has remained the same

Many existing, well-established home automation systems are based on wired communication such as Arduino based and raspberry pi based home automation systems. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems like Bluetooth, Wi-Fi and IOT based home automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. Challenges of Home automation systems Home automation systems suffers four main challenges; these are poor manageability, inflexibility, difficulty in achieving securityand high cost of ownership,The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an

easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

3.1 Bluetooth based home automation system using cell phones:

In Bluetooth based home automation system the home appliances are connected to the Arduino BT board at input output ports using relay. The program of Arduino BT board is based on high level interactive C language of microcontrollers; the connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances.

The Bluetooth connection is established between Arduino BT board and phone for wireless communication. In this system the python script is used and it can install on any of the Symbian OS environment, it is portable.

One circuit is designed and implemented for receiving the feedback from the phone, which indicate the status of the device.

1. Zigbee based home automation system using cell phones: -

   To monitor and control the home appliances the system is designed and implemented using Zigbee. The device performance is record and store by network coordinators. For this the Wi-Fi network is used, which uses the four switch port standard wireless ADSL modern router. The network SSID and security Wi-Fi parameter are preconfigured. The message for security purpose first process by the virtual home algorithm and when it is declared safe it is re-encrypted and forward to the real network device of the home. Over Zigbee network, Zigbee controller sent messages to the end. The safety and security of all messages that are received by the virtual home algorithm. To reduce the expense of the system and the intrusiveness of respective installation of the system Zigbee communication is helpful

2. GSM based home automation system using cell phones:

   Because of the mobile phone and GSM technology, the GSM based home automation is lure to research. The SMS based home automation, GPRS based home automation and dual tone multi frequency (DTMF) based home automation, these options we considered mainly for communication in GSM. In figure shows the logical diagram the work of A. Alheraish, it shows how the home sensors and devices interact with the home network and communicates through GSM and SIM (subscriber identity module). The system use transducer which convert machine function into electrical signals which goes into microcontroller. The sensors of system convert the physical qualities like sound, temperature and humidity into some other quantity like voltage. The microcontroller analysis all signal and convert them into command to understand by GSM module. Select appropriate communication method among SMS, GPRS and DTFC based on the command which received GSM module.

3. Wi-Fi based home automation system using cell phones:

   Wi-Fi based home automation system mainly consist three modules, the server, the hardware interface module, and the software package. The figure shows the system model layout. Wi-Fi technology is used by server, and hardware Interface module to communicate with each other. The same technology uses to login to the server web based application. The server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. Software of the latest home automation system is split to server application software, and Microcontroller (Arduino) firmware. The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and preprogramed in the server. Another job is to report the and record the history in the server DB. The server application software package for the proposed home automation system, is a web based appli-

cation built using asp.net. The server application software can be accessed from internal network or from internet if the server has real IP on the internet using any internet navigator supports asp.net technology. Server application software is culpable of, maintain the whole home automation system, setup, configuration. Server use database to keep log of home automation system components, we choose to use XML files to save system log..

4. Home automation using RF module:

   The important goal of Home Automation System is to build a home automation system using a RF controlled remote. Now technology is accelerating so homes are also getting smarter. Modern homes are deliberately relocating from current l switches to centralized control system, containing RF controlled switches. Todaytraditional wall switches situated in various parts of the home makes it laborious t for the end user to go near them to control and operate. Even further itturnsinto moreproblematic for the old persons or physically handicapped people to do so. Home Automation using remote implements an easier solution with RF technology. In order to accomplish this, a RF remote is combined to the microcontroller on transmitter side that sends ON/OFF signals to the receiver where devices are connected. By operating the stated remote switch on the transmitter, the loads can be turned ON/OFF globally using wireless technology

4 Why is IoT important

4.1 Service Models-

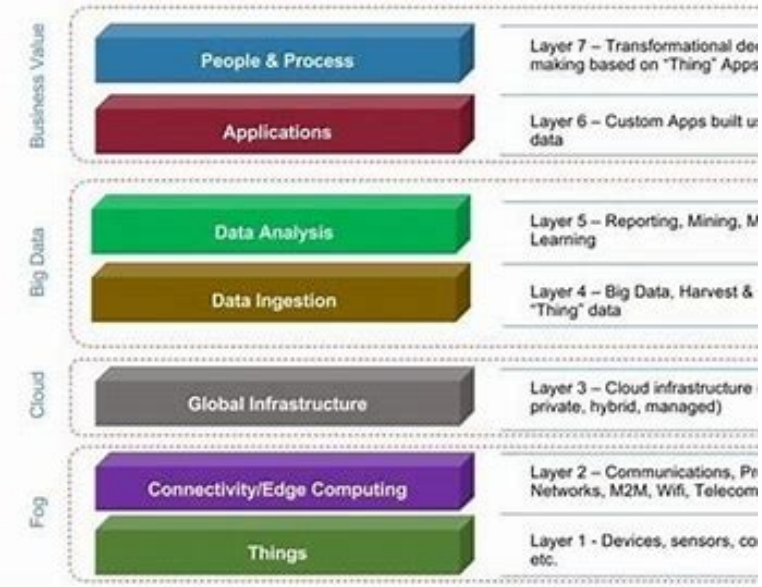

Figure 4.1: Service Models

1. How does IoT work?

   The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

   A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

   Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another.

4.2 Types of IoT:

Figure 4.2: Types Of Iot

1. CIoT

   CIoT often focuses on convenience for individual customers, whereas IIoT is strongly focused on the industry sector, improving the efficiency, security, and output of operations with a focus on Return on Investment (ROI).
   For IIoT, the scope can be within an organization (smart factory) or between organizations (retailer supply chain). This is definitely the most established and mature part of IoT. The IIoT will help a business to achieve:
   Efficiency
   Harness intelligence from a wide range of equipment
   Improve operations (productivity)
   Increase customer satisfaction
   For CIoT, the scope can be a single individual, family, small

group, or community. The CIoT will help make life easier for consumers by improving:
Quality
Comfort
Security
Convenience
Efficiency.

2. IIoT

   Industry + Internet + Things = Industrial Internet of Things (IIoT)
   The IIoT represents industry-oriented applications where:
   Devices are gadgets functioning in industrial, transportation, energy, or medical environment.
   Data quantity and rates tend to vary from sustained to relatively high.
   Applications are safety-critical, for example, the misbehaving of a smart traffic system can threaten drivers.

   IIoT applications tend to be system-centric. IIoT incorporates machine learning and big data technology by utilizing the sensor data, M2M communication, and automation technologies that have existed in the industrial landscape for a long time.
   The driving force behind the IIoT is that smart gadgets are better than humans at accurately, consistently capturing, and communicating data.

   This data can support organizations to discover inefficiencies and problems sooner, save time and money, and support business intelligence efforts. In the manufacturing sector, IIoT holds promising potential for quality checks, sustainable and environmental-friendly practices, supply chain traceability, and overall supply chain efficiency.

5 Advantages & Disadvantages

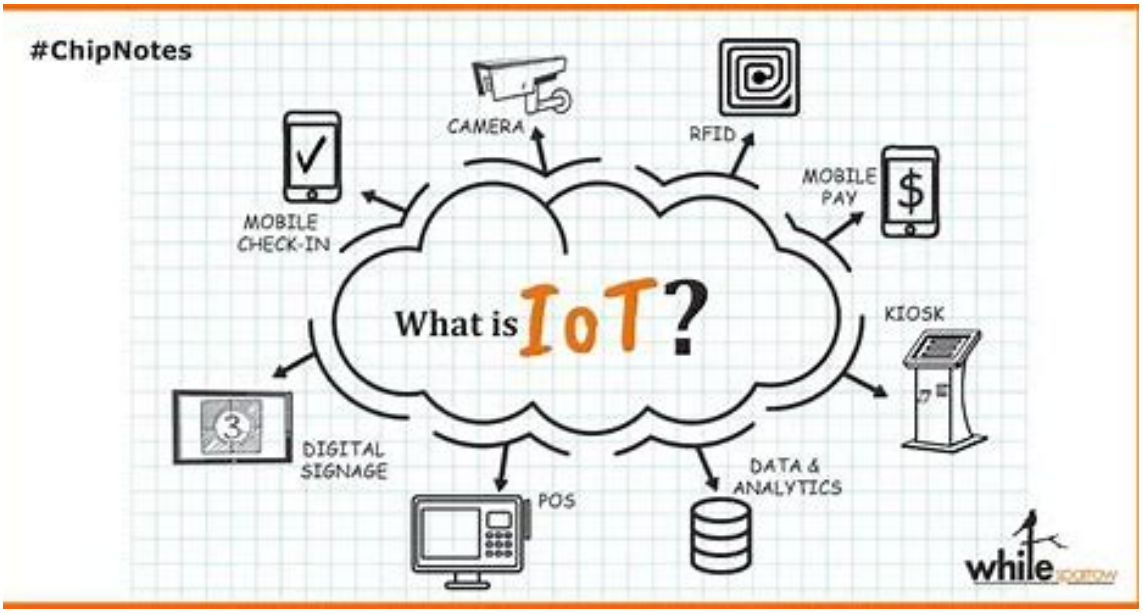

Figure 5.1: Advantages Of Cloud Computing

5.1 Advantages

- Easy installation
- IO-Link increases machine availability
- IO-Link enables need-oriented maintenance
- IO-Link makes operation more efficient
- IO-Link offers a high-performance, consistent network
- We Speak IO-Link

5.2 Disadvantages

- Increased privacy concerns.
- Increased unemployment rates.
- Highly dependent on the internet

6 Characteristics

- Characteristics of the Internet of Things :

  Connectivity – Connectivity is an important requirement of the IoT infrastructure. Things of IoT should be connected to the IoT infrastructure. Anyone, anywhere, anytime can connect, this should be guaranteed at all times. For example, connection between people through internet devices like mobile phones ,and other gadgets, also connection between Internet devices such as routers, gateways, sensors, etc. Intelligence and Identity – The extraction of knowledge from the generated data is very important. For example, a sensor generates data, but that data will only be useful if it is interpreted properly. Each IoT device has a unique identity. This identification is helpful in tracking the equipment and at times for querying its status.

  Scalability – The number of elements connected to the IoT zone is increasing day by day. Hence, an IoT setup should be capable of handling the massive expansion. The data generated as an outcome is enormous, and it should be handled appropriately.

  Dynamic and Self-Adapting (Complexity) – IoT devices should dynamically adapt themselves to the changing contexts and scenarios. Assume a camera meant for the surveillance. It should be adaptable to work in different conditions and different light situations (morning, afternoon, night).

  Architecture – IoT architecture cannot be homogeneous in nature. It should be hybrid, supporting different manufacturers ' products to function in the IoT network. IoT is not owned by anyone engineering branch. IoT is a reality when multiple domains come together.

  Safety – There is a danger of the sensitive personal details of the users getting compromised when all his/her devices are connected to the internet. This can cause a loss to the user. Hence, data security is the major challenge. Besides, the equipment involved is huge. IoT networks may also be at the risk. Therefore, equipment safety is also critical.

  Self Configuring – This is one of the most important characteristics of IoT. IoT devices are able to upgrade their software in accordance with requirements with a minimum of user participation. Additionally, they can set up the network, allowing for the addition of new devices to an already-existing network.

By using a technique called "virtualization," the cloud provider pools his computing resources. This resource pool enables the sharing of virtual and physical resources by multiple consumers, "dynamically assigning and releasing resources according to consumer demand" (NIST 2009a). The consumer has no explicit knowledge of the physical location of the resources being used, except when the consumer requests to limit the physical location of his data to meet legal requirements.

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