ISSN - 2348-2397
APPROVED UGC CARE

SHODH SARITA

SHODH SARITA
Vol. 7, Issue 26, April-June, 2020
Page Nos. 155-159

AN INTERNATIONAL BILINGUAL PEER REVIEWED REFEREED RESEARCH JOURNAL

IOT : - THE NEXT GENERATION TECHNOLOGY

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ABSTRACT

Today we live in a world where technologies have become a part and parcel in our lives. People can live without water but not without internet. Given the current situation today Internet is no longer connected to just Computers. We have internet connected to TV, tablets, Car, watches and other gadgets. Given its potential for very wide applicability to almost all vertical and aspects of business, industries, manufacturing, consumer goods, supply chain etc IoT as a whole is very broad area. Although our dependence on internet is a global concern but this doesn't deprive us from the fact that everything around us has been changing rapidly like smart home automation, smart cities, smart healthcare, smart environment etc. We can travel any places in the world and yet can be present with our dear ones with just a click on the phone. Today internet of things is not just the millions who have adapted. Internet of things have shorten the gap between different generation within a short span of time. Connectivity technologies like RFID, 6LoWPAN, sensors and other embedded systems helps in day today life. Sensors used to sense a wide range of different energy forms such as movement, electrical signals, radiant energy, magnetic or thermal energy etc. Arduino is prototype platform used to build IOT products. Raspberry Pi is low-cost mini-computer with physical size of the credit card.

Keywords : Embedded systems, Prototype, cloud computing, RFID, sensors.

INTRODUCTION

In the 2000s, we are heading into a new era of ubiquity, where the "users" of the Internet will be counted in billions and where humans may become the minority as generators and receivers of traffic. Instead, most of the traffic will flow between devices and all kinds of "things", thereby creating a much wider and more complex Internet of Things.

Internet technology connecting devices, machines and tools to the internet by means of wireless technologies.Over 9 billion 'Things' connected to the Internet, as of now.

'Things' connected to the Internet are projected to cross 20 billion in the near future.

Unification of technologies such as low-power embedded systems, cloud computing, big-data, machine learning, and networking.

The Internet of Things (IoT)is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

REVIEW OF LITERATURE

Arshdeep Bahga, Vijay Madisetti (2014)."Internet of Things- A Hands-on Approach". Presents complete guide to Internet of Things Hands-on Approach. This book covers introduction to IOT and its different levels, Domain Specific IOTs, system management etc. This book also helps in developing Internet of Things through many design methodology and case studies.

Thomas Erl, Ricardo Puttini, Zaigham Mahmood (2014). Cloud Computing: Concepts,Technology & Architecture presents cloud computing technologies and practices into series of well defined concepts,models, technology mechanisms and technology architectures. It

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also has templates and formulas for calculating values and numerous explorations of SaaS,PaaS and IaaS delivery models.

Adrian McEwen & Hakim Cassimally (2014). Designing the Internet of Things Covers major part of Prototyping and its principles for connected devices and Embedded systems. It also highlighted how prototype can be converted to reality and Ethics.

David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry (2017). IOT fundamentals:- Networking Technologies, protocols, and Use Cases for the internet of Things. This book contributes to IOT network architecture and design. How we can use IOT in industry and different ways of Engineering IOT Networks is nicely covered.

Perry Lea (2018). Internet of Things for Architects. Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics and security.

Jamil Y.Khan, Mehmet R.Yuce (2019). Internet Of Things (IoT):- Systems and Applications. This book covers major applications of Internet of Things and different communication networks used in dealing IoT.

RESEARCH DESIGN

This study includes secondary data which are mainly books and journals and formal reports. Google was initially used to browse through the topic as well as to understand the subject. No new technology or other forms of Data collection was used while doing this research.

OBJECTIVE OF RESEARCH STUDY

The main Objective of this research study is to show how we can build internet of Things in real world and what are the factors involved in this.

Internet of Things(IoT) can be any object that has a unique identifier which can send receive data over a network.(e.g. Smart phone , Smart TV, Computer etc)

Basic Building blocks of IoT device :

1) Sensing:- sensors can be either on-board the IoT device or attached to device. It can collect various information. types of sensors which are commonly used are Temperature, Humidity, Light, Sound, Compass and Accelerometer.
2) Actuation:- IoT devices can have various types of actuators attached that allow taking actions upon physical entities in vicinity of device. E.g. relay switch connected to IoT device.
3) Communication:- This module responsible for sending collected data to other devices or cloud.
4) Analysis and Processing:- this module responsible for making sense of the collected data.

Some of the IoT devices widely used are Arduino ,Raspberry pi and many more.

1) Arduino is open source platform based on easy to use hardware and software which consist of circuit board which can be programmed on microcontroller and IDE which is used to write and upload code to physical board.
2) Raspberry Pi is low-cost mini-computer with physical size of the credit card. It runs various flavors of Linux and can perform almost all tasks that a normal desktop computer can do. It also allows interfacing sensors and actuators through general purpose input output pins.

Characteristics :

1. Efficient, scalable and associated architecture
2. Unambiguous naming and addressing
3. Abundance of sleeping nodes, mobile and non-IP devices
4. Intermittent connectivity

IOT in Market is as follows :

- Business/Manufacturing :- Real-time analytics of supply chains and equipment, robotic machinery.
- Healthcare :- Portable health monitoring, electronic recordkeeping, pharmaceutical safeguards.
- Retail :- Inventory tracking, smartphone purchasing, anonymous analytics of consumer choices.
- Security : Biometric and facial recognition locks, remote sensors.

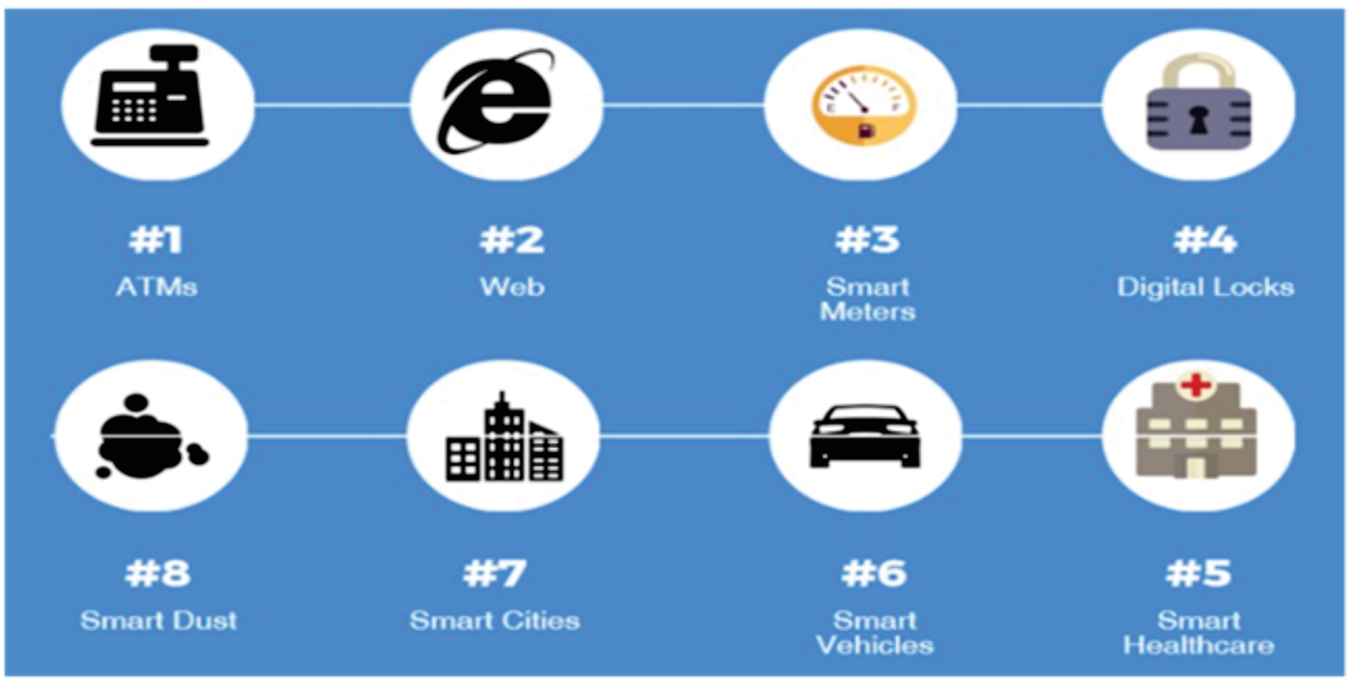
Some of the connected devices which are used nowadays :

- **ATM** :- These ubiquitous money dispensers went online for the first time way back in 1974.
- **WEB** :- World Wide Web made its debut in 1991 to

revolutionize computing and communications.

- **SMART METERS** :- The first power meters to communicate remotely with the grid were installed in the early 2000s.
- **DIGITAL LOCKS** :- Smartphones can be used to lock and unlock doors remotely, and business owners can change key codes rapidly to grant or restrict access to employees and guests.
- **SMART HEALTHCARE** :- Devices connect to hospitals, doctors and relatives to alert them of medical emergencies and take preventive measures.
- **SMART VEHICLES** :- Vehicles self-diagnose themselves and alert owners about system failures.
- **SMART CITIES** :- City-wide infrastructure communicating amongst themselves for unified and synchronized operations and information dissemination.
- **SMART DUST** :- Computers smaller than a grain of sand can be sprayed or injected almost anywhere to measure chemicals in the soil or to diagnose problems in the human body.

EVOLUTION OF CONNECTED DEVICES



Source: Intel

Modern day IOT Applications are :-

Smart Parking, Structural health, Noise Urban Maps, Smartphone Detection, Traffic Congestion, Smart Lighting, Waste Management, Smart Roads, River Floods, Smart Grid, Tank level, Photovoltaic Installations, Water Flow, Silos Stock Calculation, Perimeter Access Control, Liquid Presence, Forest fire detection, Air Pollution, Snow Level Monitoring, Landslide and Avalanche Prevention, Earthquake Early Detection, Water Leakages, Radiation Levels, Explosive and Hazardous Gases, Supply Chain Control, NFC Payment, Intelligent Shopping Applications, Smart Product Management.

IOT components are Device(thing), Local Network, Internet, Backend services and Applications.

Functional Components of IOT are Component for interaction and communication with other IoT devices, for processing and analysis of operations, for Internet interaction, for handling Web services of applications, to integrate application services and User interface to access IoT.

IOT Categories :-

1. **Industrial IoT**

IoT device connects to an IP network and the global Internet.Communication between the nodes done using regular as well as industry specific technologies.

2. **Consumer IoT**

IoT device communicates within the locally networked devices. Local communication is done mainly via Bluetooth, Zigbee or WiFi. Generally limited to local communication by a Gateway Communication between the IoT device(s) and the outside world dictates the network architecture. Choice of communication technology dictates the IoT device hardware requirements and costs. Due to the presence of numerous applications of IoT enabled devices, a single networking paradigm not sufficient to address all the needs of the consumer or the IoT device.

Some of the Key technologies for IOT are :-

Security privacy, Future internet, knowledge Aggregation, standards, sensor networks, communication, cloud computing, discovery services, nanoelectronics, embedded systems, software and system Integration.

Some areas identified as IoT enabler are RFID, Nanotechnology, Sensors, Smart Networks

Connectivity Technologies :-

1) RFID

RFID is an acronym for "radio-frequency identification"Data digitally encoded in RFID tags, which can be read by areader.Somewhat similar to barcodes.Data read from tags are stored in a database by the reader.As compared to traditional barcodes and QR codes, RFID tagdata can be read outside the line-of-sight.

Features :

- RFID tag consists of an integrated circuit and an antenna.
- The tag is covered by a protective material which also acts asa shield against various environmental effects.
- Tags may be passive or active.
- Passive RFID tags are the most widely used.
- Passive tags have to be powered by a reader inductively
- before they can transmit information, whereas active tagshave their own power supply.

Working Principle :-

- Derived from Automatic Identification and Data Capture (AIDC)technology.
- AIDC performs object identification, object data collection andmapping of the collected data to computer systems with little or nohuman intervention.
- AIDC uses wired communication.RFID uses radio waves to perform AIDC functions.

2) 6LoWPAN

- Low-power Wireless Personal Area Networks over Ipv6.
- Allows for the smallest devices with limited processing abilityto transmit information wirelessly using an Internet protocol.
- Allows low-power devices to connect to the Internet.
- Created by the Internet Engineering Task Force (IETF) - RFC5933 and RFC 4919.

Features :

- Allows IEEE 802.15.4 radios to carry 128-bit addresses of
- Internet Protocol version 6 (IPv6).Header compression and address translation techniques allowthe IEEE 802.15.4 radios to access the Internet.
- IPv6 packets compressed and reformatted to fit the IEEE802.15.4 packet format.
- Uses include IoT, Smart grid, and M2M applications.

Case study of IoT on HealthCare

- Advances in sensor and connectivity.
- Collect patient data over time.
- Enable preventive care Understanding of effects of therapy on a patient.
- Ability of devices to collect data on their own.
- Automatically obtain data when and where needed by doctors.
- Automation reduces risk of error.
- Lower error implies increased efficiency and reduced cost.

CONCLUSION

The future of IoT is unlimited and the possibility to reach many people in other areas in the society is rapidly increasing. The creativity of this new era of IOT is boundless with amazing potential to improve our lives. Internet has connected the people and machine not just on the land but also at sea and in the air. Although IoT globally might have been a little concern as far as security and cyber crimes if taken into consideration. IoT has lead to infrastructure communicating amongst themselves for unified and synchronized operations. The demand for IoT is never ending and its future prospects are highly increasing. Iot has made humans work effective and productive. In the near future it will be more glorious than we can think.

SCOPE FOR FURTHER RESEARCH

This research was undertaken with the primary objective on the rise of the demand on Internet of Things in the recent years. It would be interesting to conduct another study within the same area of research, with the incorporation of more industries and the more departments, which will give more integrated result to the topic and better utility to the consumer and government. Future of IOT is easily predictable but as per the present scenario. There are some essential factors which will contribute to the boom of the IOT in India which includes excellent internet connection for data retrieval and up gradation. Smaller, less expensive sensors which makes them easily accessible.Distributed control of assembly line, automated monitoring, control and maintenance.

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