An Exploratory Survey on Applications of Internet of Things (IoT Network)

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***Abstract*- We are entering a new era of computing technology known as the Internet of Things (IoT). The IoT is a form of a "universal global neural network" in the cloud that connects various devices. This network comprises intelligently connected systems and smart machines that interact and communicate with other machines, environments, objects, and infrastructures. Technologies like Radio Frequency Identification (RFID) and sensor networks will rise to meet these new challenges. As a result, an enormous amount of data is being generated, stored, and processed into useful actions that can "command and control" these devices to make our lives easier, safer, and reduce our environmental impact. Organizations such as companies and civil institutions need up-to-date information about people. Most establishments use websites, emails, or notice boards for communication. However, in many countries, internet access is widely available on both systems and mobile devices, making the transfer of information much easier and less costly through the internet.**

***Index Terms*— Information dissemination; Embedded System, Web server formatting.smart system .**

I. INTRODUCTION

The term Internet of Things (IoT) represents the concept of network devices sensing and collecting data from around the world, and then sharing that data across the Internet for processing and utilization for various purposes. The IoT consists of smart machines interacting and communicating with other machines, objects, environments, and infrastructures. Nowadays, people are connected with each other through various communication methods, with the Internet being the most popular. In other words, the Internet serves as the primary means of connecting people.

The essential idea of the Internet of Things (IoT) has been around for nearly two decades, attracting many researchers and industries due to its significant potential for improving

our daily lives and society. When household appliances are

connected to a network, they can cooperate to provide an integrated service rather than functioning as independent devices. This is beneficial for numerous real-world applications and services, such as creating a smart home where windows automatically close when the air conditioner is turned on or open for ventilation when the gas oven is in use. IoT is particularly valuable for individuals with disabilities, as IoT technologies can support human activities on a larger scale, like in buildings or communities, by enabling devices to work together as a cohesive system.

Communication capability and remote manual control lead to the next step: how to automate things based on settings and sophisticated cloud-based processing to make things happen without intervention. This is the ultimate goal of some IoT applications. For these applications to connect with and leverage the Internet, they must become "smart" (incorporate an MCU/embedded processor with a unique ID), then connected, and finally controlled. These capabilities can enable new services that make life easier for users. The term Internet of Things was first coined by Kevin Ashton in 1999 in the context of supply chain management. Over the past decade, the definition has expanded to cover a wide range of applications like healthcare, utilities, and transport. Although the definition of "Things" has evolved with technology, the primary goal of making a computer sense information without human intervention remains the same. This represents a radical evolution of the current Internet into a network of interconnected objects.

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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 open wireless technologies such as Bluetooth, RFID, Wi-Fi, telephonic data services, and embedded sensor and actuator nodes, IoT is transitioning from its infancy to transforming the static Internet into a fully integrated Future Internet. The Internet revolution connected people at an unprecedented scale, and the next revolution will interconnect objects to create a smart environment. In 2011, the number of interconnected devices surpassed the number of people, with current estimates at 9 billion devices expected to reach 24 billion by 2020. Nowadays, places like railway stations, shopping malls, and colleges require information desks to provide immediate updates on schedules, promotions, and notices. However, these desks need dedicated staff with up-to-date information, and people must visit these desks for assistance. A technological solution involves using cell phones, which are widely available and internet-connected, to provide updated information. If online information is unavailable, customer service calls are needed. Some authors propose devices with stored information to assist users on demand. In educational institutions, students may miss important updates like class rescheduling as they might not regularly check notice boards, highlighting the need for timely information dissemination across the campus. The Internet revolution connected people at an unprecedented scale, and the next revolution will interconnect objects to create a smart environment. In 2011, the number of interconnected devices surpassed the number of people, with current estimates at 9 billion devices expected to reach 24 billion by 2020. Nowadays, places like railway stations, shopping malls, and colleges require information desks to provide immediate updates on schedules, promotions, and notices

Enabling technologies for the IoT include three primary types:

Near-field communication (NFC) and Radio Frequency Identification (RFID): RFID was the leading technology in the 2000s. NFC, which became more prevalent in the early 2010s, is now commonly found in smartphones for purposes such as reading NFC tags or accessing public transportation.

Quick Response (QR) codes and Optical tags: These are used for various purposes, including linking to digital content and tracking products.

Wireless Sensor Networks (WSNs): These networks consist of spatially distributed sensors that monitor physical or environmental conditions and cooperatively pass their data through the network to a main location.low cost tagging. Phone cameras decodes QR code using image-processing techniques. In reality QR advertisement campaigns gives less aurnout as users need to have another application to read QR codes.

i. Bluetooth and low energy - This is one of the latest technique. All newly releasing smartphones have BLE hardware in them. Tags based on BLE can signal their presence at a power budget that enables them to operate for up to one year on a lithium coin cell battery.

II. LITERATURE REVIEW

Every organization typically maintains an information desk to provide updates, advertisement messages, and notifications to customers and staff. This requires dedicated staff with current information about offers and organizational details. The Internet of Things (IoT) introduces numerous smart devices, leading many to believe that cities and the world will evolve into smart environments, with sensors and actuators embedded in everyday objects. According to literature [10], IoT involves intelligently connected devices and systems that gather data from embedded sensors, actuators, and other physical objects. IoT is expected to rapidly expand, offering new services that enhance consumers' quality of life and enterprise productivity, thus unlocking significant opportunities. Mobile networks already provide connectivity to a wide range of devices, facilitating the development of new services and applications beyond tablets and laptops, extending to connected cars, buildings, smart meters, and traffic control, leading to a "Connected Life" as described by GSMA.

In [11], the authors explore sensor networks enabled by advancements in microelectro-mechanical systems technology and wireless communications. They review sensor network applications, design factors, and outline algorithms and protocols for each layer and the communication architecture. Additionally, the authors in [1] developed an Electronic Information Desk System using an SMS-based approach that operates independently without human intervention. When information is needed, users send an SMS to the system, which responds with the required details. Various technical communities are actively researching topics related to IoT, contributing to its ongoing development.

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In [12] the purpose of research is to understand the feasibility of IoT in bus transportation system in Singapore. The Singapore, which is technically very advanced but still has scop of advancement in their transportation system.themade a system by the using the IOT for the consumer to understand and evaluate different bus options in an efficient manner. Secondary research was used to predict arrival timings of buses as well as the crowd inside each bus.

The literature [13] presents a three layered network construction of Internet of Things (IOT) communication method for high-voltage transmission line which involves the wireless self-organized sensor network (WSN), optical fiber composite overhead ground wire (OPGW), general packet radio service (GPRS) and the Beidou (COMPASS) navigation satellite system (CNSS). The function of each layer of network, application deployment and management of energy consumption are studied. The method can meetthe needs of interconnection between the monitoring center and terminals, reduce the terminals" GPRS and CNSS configuration and OPGW optical access points, and ensure the on-line monitoring data transmission real-time andreliable under the situation of remote region, extreme weather and other environmental conditions.

[3] Many technical communities are vigorously pursuing research topics that contribute to the IoT. Today, as sensing, communication, and control become ever more sophisticatedand ubiquitous, there is significant overlap in these communities, sometimes from slightly different perspectives. More cooperation between the communities is encouraged. To provide the basis for discussing open research problems in IOT, a vision for how IOT could change the world in the distant future. Now in this era the iot may be used in various research field in this literature those may classified as: massive scaling, creating knowledge and big data, architecture and dependencies, , robustness, openness, security, privacy, and human-in-the-loop.

Advantages:

•Students or employee easily get important notice or information by message any time 24x7.

•Within a seconds organization can change notice or information by sending SMS only.

•Admin can change the display message or notice from any place or anywhere.

Disadvantage:

•If anybody wants information they have to do message and for every new information they have to send message again and again to the system.

The authors in [6] developed Digital electronic display board is fast gaining acceptance and application in different spheres of life which include educational institutions, public utility places and in advertisement due to the problem associated with construction of signposts and manually placement of papers on walls, buildings, and edifies which makes the environment look untidy. These authors [6] presents the design and development of a microcontrollerbased electronic strolling message display board, which will be used to display messages and information in real-time viaSMS This microcontroller based electronic strolling message display board offers the flexibility to a user to control the message or information displayed without recourse to geographical location of the user, provided there is GSM (Global System for Mobile Communication) mobile network. It therefore eliminates the inconveniences of physically going to the display board to manually input informationusing a computer system. The paper also incorporates a feedback mechanism from the remote display board to ascertain that the message sent by the user has been displayed.

Advantages:

•Within a seconds organization can change notice or information by sending SMS only.

•User can change the display message or notice from any place or anywhere and anytime.

Disadvantages:

•For SMS we have to pay or we have to give extra charges to organization.

•Security and network issue may occur sometimes..

The authors in [7] deal with an innovative rather an interesting manner of intimating the message to the people using a wireless electronic display board which is synchronized using the GSM technology. This will help us in passing any message almost immediately without any delay just by sending a SMS which is better and more reliable than the old traditional way of pasting the message on notice board. This proposed technology can be used in many public places, malls or big buildings to enhance the security system and also make awareness of the emergency situations and avoid many dangers. Using various AT commands is used to display the message onto the display board. GSM technology is used to control the display board and for conveying the information through a message sent from authenticated user. The authors in [4] the term Internet of Things was first coined by Kevin Ashton in 1999 in the context of supply chain management. However, in the past decade, the definition has been more specified covering a wide range of applications like healthcare, utilities, transport, etc. Although the definition of „Things" has changed as

technology evolved, the main goal of making a computer sense information without the aid of human effort remains the same. A radical evolution of the current Internet system into a Network of interconnected the objects that not only gathering the information from the environment (sensing) and interacts with the physical world, but also uses existing Internet standards to provide services for information transfer, analytics, applications and communications.

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III. APPLICATIONS

This system is designed for a shopping complex mall but it can be also used in various organizations like educational Notice board system or at Railway station, Bus stand and Air-port to display the information and notification. In mallit is also used to control the humidity and temperature of mall via central AC by using temperature sensor. In Industrial organization it can be also used. E-display system may be used to display Emergency message in Hospitals. Some areas where IoT frequently used

i. Smart cities:-

To make the city as a smart city to engage with the data exhaust produced from your city and neighborhood.

- Monitoring of parking areas availability in the city.
- Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
- Detect Android devices, iPhone and in general any device which works with Bluetooth interfaces or WiFi .
- Measurement of the energy radiated by cell stations and and Wi-Fi routers.
- Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.
- Detection of rubbish levels in containers to optimize the trash collection routes.
- Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

ii. Security & Emergencies:-

- Perimeter Access Control: Detection and control of people in non authorized and restricted.
- Liquid Presence: Liquid detection in data centers, sensitive building grounds and warehouses to prevent breakdowns and corrosion.
- Radiation Levels: In nuclear power stations surroundings distributed measurement of radiation levels togenerate leakage alerts.
- Explosive and Hazardous Gases: Detection of gas leakages and levels in industrial environments, surroundingsof chemical factories and inside mines.

iii. Smart agriculture:-

- Wine Quality Enhancing: Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar ingrapes and grapevine health.
- Green Houses: Control micro-climate conditions to maximize the production of fruits and vegetables and its quality.
- Golf Courses: Selective irrigation in dry zones to reduce the water resources required in the green.
- Meteorological Station Network: Study of weather conditions in fields to forecast ice formation, rain, drought, snow or wind changes.
- Compost: Control of humidity and temperature levels in alfalfa, hay, straw, etc. to prevent fungus and other microbial contaminants.

iv. Domestic & Home Automation:-

In home by using the iot system remotely monitor and manage our home appliences and cut down on your monthly bills and resource usage.

- Energy and Water Use: Energy and water supply consumption monitoring to obtain advice on how to save cost and resources.

- Remote Control Appliances: Switching on and off remotely appliances to avoid accidents and save energy.
- Intrusion Detection Systems:Detection of windows and doors openings and violations to prevent intruders.
- Art and Goods Preservation: Monitoring of conditions inside museums and art warehouses.

v. Medical field:-

- All Detection: Assistance for elderly or disabled people living independent.
- Medical Fridges: Monitoring and Control of conditions inside freezers storing medicines ,vaccines,

and organic elements.

• Sportsmen Care: Vital signs monitoring in high performance centers and fields.

• Patients Surveillance: Monitoring of conditions of patients inside hospitals and in old people's home.

• Ultraviolet Radiation: Measurement of UV sun rays to warn people not to be exposed in certain hours.

vi. Industrial Control:-

• Machine to Machine Applications: Machine auto-diagnosis the problem and control.

• Indoor Air Quality: Monitoring of oxygen levels and toxic gas inside chemical plants to ensure workers and goods safety.

• Temperature Monitoring: Monitor the temperature inside the industry.

• Ozone Presence: In food factories monitoring of ozone levels during the drying meat process.

• Vehicle Auto-diagnosis: Information collection from Can Bus to send real time alarms to emergencies or provide advice to drivers.

IV. CONCLUSION

The Internet of Things (IoT) promises to significantly enhance individuals' quality of life and enterprises' productivity through a widely distributed, locally intelligent network of smart devices. IoT can improve fundamental services in transportation, logistics, security, utilities, education, healthcare, and other areas while fostering a new ecosystem for application development. A concerted effort is necessary to move the industry beyond its early market development stages towards maturity, driven by a common understanding of the distinct opportunities IoT presents. This market is characterized by unique aspects in service distribution, business and charging models, the capabilities required to deliver IoT services, and the varying demands these services place on mobile networks.

Connecting smart devices (nodes) to the web has begun, albeit slowly. The technology components are coming together faster than expected, similar to the rapid spread of the Internet phenomenon. The IoT is anticipated to impact every aspect of our lives within a decade.

This work presents a model of an IoT-based E-Advertisement system for shopping malls and other organizations. The proposed model aims to replace advertisement systems in large shopping complexes like Big Bazaar and Reliance Fresh. It also has the capability to maintain humidity levels in large shopping malls without human intervention. Additionally, this prototype system can be applied in educational organizations or railway stations. The prototype model will be implemented using virtual components in Proteus 7.1 software..

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