International Journal of Management, Sciences, Innovation, and Technology IJMSIT

Review Paper

Vol.2, Issue.6, pp.01-08, Nov (2021) **ISSN:** 0000-0000

The Internet of Things IOT and its Current and Future Applications

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Available online at: https://ijmsit.com/volume-2-issue-6/

Received: 11 Oct 2021 Revised: 17 Oct, 2021 Accepted: 30 Nov, 2021

***Abstract*—** The Internet of Things (IOT) describes the network of physical objects that are attached to sensors, programming and other technologies that are used for specific purposes such as interconnecting and exchanging data with other devices and systems on the Internet. Because of the multiple technical convergence, these things have crystallized according to current time analyzes in machine learning, common computing, commodity sensors, embedded systems and the traditional fields of embedded systems, wireless sensor networks, control systems and automation among them home and building automation and other contributions to enable the Internet of Things in the market. This technology is the most common synonym for products related to the concept of smart homes, including devices and equipment related to lighting fixtures, thermostats, cameras, home protection systems, and other home appliances that support one or the most common environmental systems, such as smart devices and smart speakers. It is also possible to use the Internet of Things in healthcare systems as well. There are many concerns about the risks of the growth of the Internet of Things, especially in the areas of security and confidentiality. Moreover, it has begun to address the governmental and industrial movements, which included the initiation of the development of international standards.

***Keywords*—** Internet of Things – IoT – High-tech – Technology – New Age

I. INTRODUCTION

At the beginning of 1982 the main concept of a smart device network for the Coca-Cola vending machine was discussed at Karnakley University in Colorado, which became the first device connected to the Advanced Research Projects Agency (ARPA) network, which was able to report on its stock whether recently bottled drinks were cold or no. Mark Weiser's 1991 newspaper wrote about ubiquitous computing as "the twenty-first century computer," as well as academic websites such as UbiComp and perComp about a contemporary vision of the Internet of Things. In 1994, Raza Raji described the IEEE concept as (transferring) small packets of data to a large set of nodes, in order to integrate

and automate everything from home appliances to entire factories. Between 1993 and 1997 many companies proposed solutions such as Microsoft or Novell. This gained steam for the field when Bill John thought machine-to-machine communication as part of his "Six Networks" work, which was presented at the World Economic Forum in Dagos in 1999. The concept of the Internet of Things and the term itself first appeared in a speech by Peter T. Lewis. On the fifteenth annual Legislative Weekend, the Black Congress Foundation in Washington, D.C. Which was published in September 1985. According to Lewis, the Internet of Things, or what is known as IOT, is the integration of people, processes, and technology with connectable devices and sensors, to enable remote monitoring, status, manipulation, and assessment of trends of these devices. The term Internet of Things was coined by Kevin Ashton, independently of Procter & Gamble, and later the Massachusetts Institute of Technology's Automatic Identification Center in 1999. Although he preferred the term Internet of Things, he saw it from his perspective at the time, that it was necessary to identify the radio frequencies of the Internet of Things that would allow computers to manage all individual things, which include short-range mobile transceivers in various devices and daily necessities, To enable new forms of communication between people and things and between the things themselves.

II. APPLICATIONS OF IOT

Smart Houses

IoT devices are part of a larger concept of home automation, which can include lighting, heating, air conditioning, media systems, security, and camera systems.

Long-term benefits can also include energy savings by ensuring that lights and electronics are automatically turned off, or by educating home residents about their proper use.

In addition, a smart home or automated home can rely on a platform or hubs that control smart appliances and devices. For example, with Apple's HomeKit, manufacturers can control their home products and accessories via an app in iOS devices such as an apple watch or iphone.

This could be a dedicated app or native iOS apps like Siri, and this can be illustrated in the case of Lenovo Smart Home Essentials, a group of smart home devices that are controlled through the Apple Home app or Siri without the need for a Wi-Fi bridge.

There are also dedicated smart home hubs that are offered as stand-alone platforms to connect various smart home products, these include Amazon Echo, Google Home, Apple's HomePod and Samsung's SmartThings Hub.

In addition to commercial systems, there are many open source, non-proprietary ecosystems, including Home Assistant, OpenHAB, and Domoticz.

Elderly care

One of the axes of the smart home application is to secure special assistance for people with special disabilities and the elderly.

These home systems use assistive technologies that accommodate the owner's disabilities.

Voice control can also help users with vision and movement restrictions, while alarm systems can be connected directly, which are cochlear implants worn by hearing impaired users.

In addition, it can provide users with additional safety features, including sensors, and emergency medical monitors for emergency situations. Such as: fainting, seizures.

Smart home technology has adopted this method to provide users with freedom and a better standard of life in their daily lives.

Enterprise IoT refers to devices used in business and corporate settings. By 2019, it is estimated that EIoT will represent 9.1 billion devices.

Medicine and health care

IoMT is an IoT application for medical and health purposes, data collection and analysis for research and monitoring.

IoMT has been referred to as "smart healthcare", as a technology to create a digital healthcare system, linking available medical resources and healthcare services.

IOT devices can also be used to enable remote health monitoring and emergency notification systems, and these devices can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as the Swarftbit electronic wrist pacemaker, or advanced earphones.

Some hospitals have begun to implement the so-called smart beds, which can adjust the patient’s position when trying to get up, in case the medical staff is busy, and it can also ensure the appropriate pressure level, in addition to providing medical support to the patient without the need for the actual presence of nurses.

In addition, specialized sensors can also be equipped within living quarters to monitor the health and general well-being of the elderly, while ensuring appropriate treatment and assistance.

They can also regain mobility that they previously lost through treatment as well.

These sensors have created an intelligent network of sensor devices that can collect, process, transmit, and analyze information available in various environments, such as connecting home monitors to a hospital and other consumer devices to encourage others to live healthy lives, such as scale systems and a wearable heart (a device for measuring heart rate).

IOT health monitoring platforms are also available for patients with chronic and prenatal conditions, helping to manage healthy vital organs and recurring medication requirements.

Advances in plastic and textile electronics manufacturing methods have also made low-cost IoMT sensors available for use. These sensors, along with the required RFID electronics, can be manufactured on paper or electronic textiles for disposable wireless sensors.

Applications for medical diagnostics have been created at the point of care, where portability and low system complexity are essential.

As of 2018, IoMT has not only been applied in the clinical laboratory, but also in the healthcare and health insurance industries. IoMT in healthcare now allows doctors, patients and other people, such as patients' parents, nurses, and families, to be part of the system where patient records are kept in a database.

Which allows doctors and the rest of the medical staff to access the patient information center, which involves flexibility in dealing with the medical conditions of the patient.

IoMT provides the insurance industry with access to better and new types of dynamic information, and includes sensor-based solutions such as biosensors, wearables, connected health devices, and mobile apps, to track customer behavior. It can also lead to more accurate warranty and new pricing models.

The implementation of IOT healthcare technology has played an essential role in chronic disease management, disease prevention, and control. Remote monitoring is made possible by delivering powerful wireless solutions.

Transport

The Internet of Things (IOT) can help with the integration of communication, control, and information processing across different transmission systems.

The application of IoT extends to all aspects of transportation systems (ie the vehicle, the infrastructure, the driver, or the user).

In addition, the dynamic interaction between these components of the transmission system allows communication between and within vehicles,

Intelligent traffic control, smart parking, electronic toll collection systems, logistic services, fleet management, vehicle control, safety and roadside assistance.

Manufacturing

The Internet of Things can connect many manufacturing devices equipped with sensing, processing, identification, communication, operation and network capabilities.

In addition, IOT allows network control, manufacturing equipment management, case management or process control, using industry applications, and smart manufacturing.

Also, intelligent IoT systems give us the opportunity to rapidly manufacture, improve new products, and respond quickly to product requests.

Digital control systems Automation process control, operator tools, and information service systems, to improve plant safety and security.

The IoT can also be applied in the industrial IoT domain through predictive maintenance, statistical evaluation, and industrial systems management. We can also integrate industrial management systems with smart grids, enabling energy optimization.

Automated measurements, controls, plant optimization, health and safety management, and other functions are provided by sensors connected to the network.

In addition to general manufacturing, IoT is also used in construction manufacturing processes.

Farming

There are huge numbers of IoT applications in the agricultural sector, such as: collecting data related to temperature, rainfall, humidity, wind speed, soil quality, as well as pest infestations. In addition, this data can be used to automate agricultural technologies. Make informed decisions to improve quality and quantity, reduce risk and waste, and reduce efforts required to manage crops. For example, farmers can now monitor soil temperature and moisture remotely, and they can even apply data gained from the Internet of Things to precision fertilization programs.

Moreover, the overall goal is that the data from the sensors, along with the farmer's knowledge and intuition about his farm, can help increase farm productivity and also help reduce cost. In August 2018, Toyota Tsush began to partner with Microsoft to build equipment for a fish farming project, using the appropriate Microsoft Azure application for IoT technology related to water management. The water-pumping mechanisms were developed in part by researchers from Kennedy University, and they use artificial intelligence to count the number of fish on a conveyor belt, analyze the number of fish, and infer the effectiveness of water flow from data provided by the fish. Currently, Microsoft Research's FarmBeats project, which uses TV white space to connect farms, is part of the Azure Marketplace.

Food

The use of the Internet of Things for basic applications has been significantly scrutinized in recent years. In order to improve the chain of activities related to the food supply. RFID technology, which has adopted the grocery supply chain, which has led to real-time stock visibility and movement, automatic delivery guide, increased efficiency in the logistics of products with short shelf life, in addition to environmental monitoring, livestock, cold chain, and effective tracking. Researchers at Loughborough University have developed an innovative Internet of Things (IoT) design, which was based on the design of an innovative digital food waste tracking system that supports the right decision in real time to combat and reduce the issue of food waste in food processing. On the other hand, they have also developed an integrated automated system, based on image processing, to track potato waste in the potato packing plant. The Internet of Things is now pervasive in food factories, to increase food security, improve logistics, enhance supply chain transparency and reduce waste.

Navy

IoT devices are used to monitor the systems and environments of boats and yachts. On summer days, many pleasure boats are left idle and unattended for days, and yachts for months. Therefore, such devices are equipped with early warning devices, which work when there is a flood in the boat, a fire, or a deep discharge of the battery. Using a global internet data network like sigfox, it combines long-lasting batteries, microelectronics that allow motor chambers, and the battery to be continuously monitored and reported via apps connected to Android or Apple systems.

Infrastructure applications

The process of controlling and monitoring sustainable rural and urban infrastructures such as bridges, railways, and offshore wind farms is one of the applications of the Internet of Things.

The Internet of Things (IoT) infrastructure can also be used to monitor any event or change in structural conditions that could jeopardize safety and increase risks.

In addition, the Internet of Things can benefit the construction industry, by saving costs, reducing time, improving the quality of daily work, paperless work flow, and increasing productivity. It can also help with quick decision making, saving money, and real-time data analysis.

It can also be used to schedule repair and maintenance activities in an efficient manner, by coordinating tasks between different service providers and users of these facilities.

IoT devices are also used to control critical infrastructure such as bridges to provide access to ships.

IoT devices are likely to be used for the process of infrastructure monitoring, which has led to improved incident management and emergency response coordination, quality of service, and time and cost savings, in all areas related to the infrastructure operation.

Even in the areas of waste management, the Internet of Things can be beneficial and optimized for use.

Spread across major cities

There are many large-scale implementations underway or planned for the Internet of Things, to enable better management of cities and systems.

For example, [Songdo International Business District] South Korea, the first of its kind fully wired smart city, is being built gradually, with nearly 70 percent of the business districts completed {as of June 2018}. It is planned that a large part of the city will be wired and automated, with little or no human intervention. [33][34] Another application is currently under a project in Santander, Spain.

For this diffusion, two approaches have been adopted. This city of 180,000 residents saw 18,000 downloads of its smartphone app.

This application connects 10,000 sensors that are enabled for services such as, parking search, environment monitors, digital city calendar, and more. . .

City context information is used in this deployment to benefit merchants through the Spark Deals mechanism, which is based on city behavior aimed at maximizing the impact of each notification.

Other examples of ongoing large-scale deployments include sino Air Improvement City, Knowledge City Improvement in Guangzhou, Singapore to improve air and water quality, reduce noise pollution, increase transportation efficiency in San Jose, California, and traffic management Smart Traffic in Western Singapore.

Tech in Western Singapore, San Diego is based on Ingenu which has built a nationwide public network.

A group of wireless executives aims to build a nationwide network of the Internet of Things.

To transmit low-bandwidth data using the same unlicensed 2.4 GHz spectrum as Wi-Fi. Ingenu's "Machine Network"

covers more than a third of the US population in 35 major cities, including San Diego and Dallas.

The French company Sigafox began building a very narrow bandwidth wireless data network in the San Francisco bay area in 2014, the first work to achieve such a deployment in the United States.

It will then set up a group of 4,000 base stations to cover a total of 30 cities in the US by the end of 2016, making it the largest IoT coverage provider in the country to date and Cisco has also been involved in smart city projects. As Cisco begins to deploy technologies for smart Wi-Fi, smart safety and security, smart lighting, smart parking, smart transportation, smart bus stops, smart kiosks, remote expert for government services (REGS), and smart education in a five-kilometre area. In the city of Vijaywada.

In addition to another example of the great spread, is the one completed by New York Waterways in New York City to connect all of the city's boats and the ability to monitor them 24 hours a day, 7 days a week.

The network is also designed and engineered by Fluidmesh Networks, a Chicago-based company that develops wireless networks for critical applications.

The NYWW Network currently covers the Hudson River, East River, and Upper New York Bay. With the wireless network in place, NY Waterway can control its fleet and passengers in a way that was never possible before.

It could include new applications such as security, energy, fleet management, digital signage, public Wi-Fi, paperless ticket booking, etc.

Energy Management

A large number of energy-consuming appliances (lights, appliances, motors, pumps, etc...) are already integrated with an internet connection, which can allow them to communicate with utilities not only to balance power generation, but also help to Optimizing energy consumption as a whole. These devices also allow remote control by users, or centralized management through a cloud-based interface, enabling functions such as scheduling (power control, turning on or off heat systems, controlling ovens, changing lighting modes, etc. A smart grid is a utility-side Internet of Things application that aggregates systems to run on energy and energy and energy-related information to improve the efficiency of electricity production and distribution. Using Advanced Metering Infrastructure (AMI) devices connected to the internet, electrical utilities not only collect data from end users but also manage distribution automation devices such as switches.

Environment Monitoring

Environmental monitoring applications from the Internet of Things typically use sensors to help protect the environment, by monitoring air or water quality, and can even include areas such as the atmosphere or soil conditions. In addition to monitoring the movements of wildlife and their natural environment. The development of devices with limited resources connected to the Internet also means that other applications, such as earthquake and tsunami early warning systems, can also be used by emergency services to provide more effective aid. IoT devices in these applications usually span large geographic areas, and can also be mobile

devices. This has been argued and suggested that the standardization that IoT devices bring to wireless sensing will revolutionize the field.

Live Lab

Another example of IoT integration is the Neighborhood Lab which integrates research and innovation process, and is established within a public-private collaboration.

There are currently about 320 live labs, which use the Internet of Things to collaborate and share knowledge, and science among experts to co-create innovative and technological products. In order for companies to implement and develop IoT services for smart cities, they need incentives and motives. Governments play a major role in smart city projects, where changes in city policies will help implement the Internet of Things that provides effectiveness, efficiency and accuracy of the resources being used. For example, the government provides tax incentives, nominal rents, improved public transportation, and provides an environment where start-ups, creative industries, and multinational corporations can participate in and participate in the creation of infrastructure, common labor markets and take advantage of locally embedded technologies, production process and costs.

In addition, the relationship between technology developers and the governments that manage city aid is fundamental to providing open access to resources to users in an efficient manner.

Military applications

The Military Internet of Things (IOMt) is the application of IoT technologies in the military field for reconnaissance, surveillance, and other combat-related objectives. It is also greatly influenced by the future prospects of warfare in the urban environment, and includes the use of sensors, munitions, vehicles, robots, wearable human biometrics, and other smart technologies related to battlefields. The Internet of Things meets the military and the battlefield, to deliver biometric hardware and wearables for IoMT and IoBT.

III. CONCLUSION

Many IoT devices have the potential to take a portion of the stock exchange. In addition, Jean-Louis Gacy (the initial Apple alumni team, and co-founder of BeOS) addressed this topic in an article published on Monday Note, where he predicts that the most likely problem is what he calls a "basket of remotes" problem, in which we will be You have hundreds of applications to interact with hundreds of devices that do not share protocols to talk to each other. To improve user interaction, some technology leaders are uniting to create standards for inter-device communication to solve this problem. Others turn to the concept of predictive device interaction, "where collected data is used to predict and animate actions on specific devices" while making them work together.

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