ISSN- 2394-5125 VOL 08, ISSUE 02, 2021

Internet Of Things: Application and Challenges

Preety Sharma
Assistant Professor, Chandigarh School of Business
Chandigarh Group of Colleges, Jhanjeri, Mohali
Email ID: preetysbrn12@gmail.com
Naveen Bansal
Assistant Professor, Chandigarh School of Business
Chandigarh Group of Colleges, Jhanjeri, Mohali
Email ID: cbs.naveenbansal@gmail.com

Abstract

It is critical to recognise the different possible IoT domains as well as the research issues related to these applications since the Internet of Things (IoT) is gradually developing as the next phase of internet emergence. IoT is predicted to permeate practically every facet of everyday life, from smart cities to health care, smart agriculture, transportation, and retail, to even smarter and smarter living environments. Despite recent significant advancements in IoT technology, there are still a number of issues that require addressed. There will be additional research hurdles when the Internet of Things (IoT) idea arises from heterogeneous technologies. Since IoT is so pervasive and has a significant impact on practically every aspect of our lives, it is a crucial topic for academic study in a number of related subjects, including computer science and information technology. IoT is crucial to today's many research sectors in order to provide the desired outcomes. In this article, current developments in IoT are described, followed by an analysis of the difficulties encountered in this sector and an examination of the many applications while taking a long-term perspective.

Keywords

Smart cities, heterogeneous technology, embedded components, web enabled system, Research cluster.

Introduction

IoT has grown into a marketing practice and a regular newsletter. Without exaggeration, IoT has proven to be a powerful tool for many domains. IoT has the origins of many previous methods: networks with sensors, integrated systems and full information. Numerous IoT gadgets are integrated for particular applications in a worldwide organization, they are seldom utilized as community gadgets.

IoT node is a sensor that contains part of the hardware that transmits the information you hear to users and any other devices over the Internet. IoT notes are embedded in industrial equipment, mobile and medical devices, wireless sensors, and more. Top examples of IoTs are linked to smart city, smart industry, smart transport, smart buildings, smart power, smart production, environmental monitoring, smart life, smart health, smart food and water monitoring. Figure 1.1 shows the IoT network architecture. This structure has many IoT sensors for sensory purposes such as temperature, humidity, pressure etc. After hearing, this data is transferred to the cloud server via the IoT port. Additionally, users can access this data through mobile applications and more.

Due to the low cost of access and smart devices, the IoT network refers to a smart system. IoT devices operate independently with their hearing and transmission capabilities. In addition, IoT distribution offers many benefits but also offers potential threats. A factor that has been neglected so far is the increase in energy costs. IoT nodes are expected to remain accessible to other nodes.

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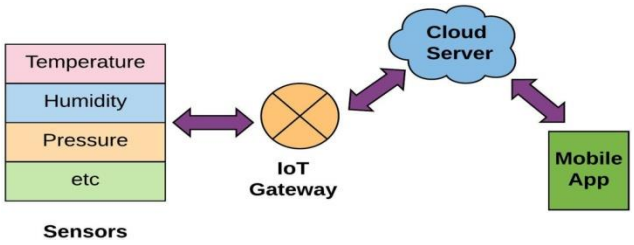

Fig 1.1 Architecture of IOT Network

IoT workflow

The Internet of Things (IoT) site combines intelligent web-enabled devices that analyze, transport, and store environmental data using embedded components such processors, sensors, and communication devices. IoT devices exchange sensory data that has been gathered via an IoT gateway or other end-to-end device that sends data away from the cloud for processing. These IoT items occasionally communicate with other similar gadgets and process the information they exchange. IoT devices can stop, educate themselves, learn new things, and do most tasks without human input thanks to artificial intelligence and machine learning.

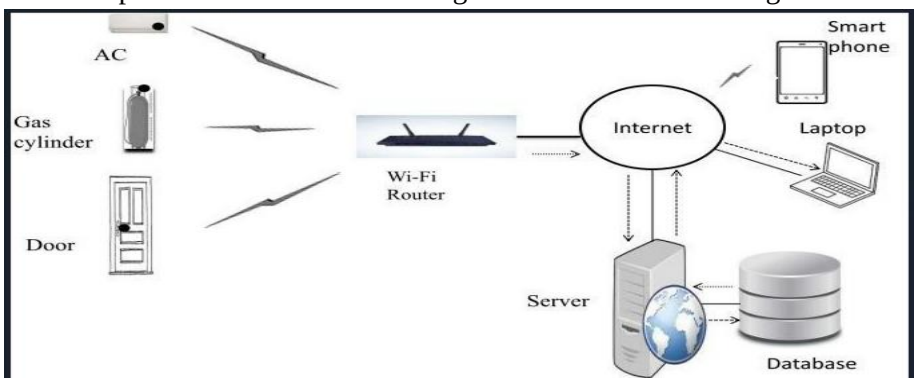

Fig 1.2 Functioning Of IOT

Benefits of IOT

Customers should be able to trace nodes and find them quickly using tracking and tracking skills.

• Universal information exchange: In the Internet of Things, information is sent between nodes that are linked to the Internet. Intelligent means ubiquitous. As a result, intelligence sensors gather data and send it using a defined input.

• Improved power solution: Users should be able to locate even the most powerful place and receive the best outcome possible.

• Data management and intelligence: When a node delivers intelligence and information in advance, IoT does not necessarily need to provide instructions on the tool; it may begin to work, make judgments, and create Intelligent-based solutions.

• Measuring: IoT should be standardized since every node in a network with more than a few IoT nodes must be unique.

IOT Consequences

While IoT presents a promising array of advantages, it also presents a significant number of difficulties. A list of some of its primary issues is shown in Figure:

• Security: IoT creates a network environment programme for nodes and networks that are regularly linked.

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In addition, despite safety regulations, the programme provides insufficient control. It shields users against different kinds of hackers.

• Confidentiality: Without the cooperation of consumers, IoT technology exposes private information to all information.

• Flexibility: Consumers are worried about the IoT system's adaptability for simple integration. Anxiety arises from having too many protected or incompatible source codes.

• Compliance: IoT must adhere to the regulations just like all other commercially available technology.

Its complexity creates a seemingly insurmountable problema daunting challenge when many think that standard software compatibility is a battle.

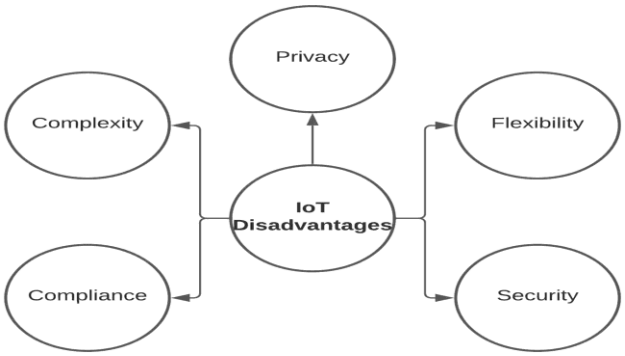

Fig 1.3 IOT Disadvantages

Applications of IOT

The IoT European Research Cluster (IERC) has identified IoT application areas based on expert feedback, publications, and research. Smart city, smart industry, smart transportation, smart buildings, smart energy, smart manufacturing, smart environment monitoring, smart living, smart health, smart food, and smart water monitoring are top examples of IoT applications.

Due to the short manufacturing life cycle and the requirement for short-term marketing in many sectors, industrial automation and production are under stress. The next generation of production systems will be flexible and modified, with this being a key objective. The updated list of IoT devices shown below includes examples of IoT applications in several fields, demonstrating why IoT is one of the anticipated technological trends during the next five years.

1. Smart Cities

IoT is essential for creating conventional infrastructure and urban intelligence. Smart building, waste management, traffic congestion, smart lighting, smart parking, and urban mapping are a few of the IoT applications that may be used to create smart cities. This might involve a variety of tasks, such as keeping an eye on parking spaces in the city, checking the state of bridges and buildings for vibrations and freight, setting up noise monitoring equipment in strategic locations around cities, and keeping an eye on pedestrian and vehicle quality. In smart cities, traffic congestion may be monitored, managed, and reduced using IoT-enabled Artificial Intelligence (AI). Additionally, IoT takes into account the installation of clever traffic and weather lighting as well as access to trash holders and waste compartments by recording tabs for waste collection plans. Additionally, smart roads provide important information and cautionary signals, such as permission for detours based on weather conditions or unanticipated events like accidents and bottlenecks.

Radio frequency and sensory detection may be necessary for the IoT to be used for smart cities. There aren't many IoT solutions that involve home automation and smart functions. A few significant urban areas in the United

ISSN- 2394-5125 VOL 08, ISSUE 02, 2021

States, like as Boston, are planning to integrate the Internet of Things into their many systems, including their sewerage, stopping metres, streetlights, shower, and other systems that are designed to connect to the internet continuously. Such requirements will be a crucial aid in resource conservation and energy use.

2. Healthcare

Many nations' health care systems are inefficient, cumbersome, and frequently unavoidable. As the healthcare sector relies on several processes and gadgets that may be automated and utilise cutting-edge technology, this is readily changeable. The healthcare sector might be significantly transformed by the addition of new technologies that can carry out a range of functions, including information exchange with people and locations, record keeping, and medication delivery.

The tracking of patients, personnel, and goods, identification and authentication of persons, automatic data gathering, and listening are just a few of the many advantages given by IoT systems in the healthcare industry. If the flow of patients is closely watched, work efficiency at the hospital can be significantly increased. Additionally, authenticity and identity lessen record-keeping requirements, possibly harmful patient occurrences, and a few instances of newborn deformities. In addition, automation, faster form processing, automated process assessment, and medical asset management all depend on automated data gathering and data transfer. Sensory equipment makes it possible for patient-centered operations, in particular, to detect problems and provide current data on patient health indicators.

Applications in this area include the capacity to track a patient's adherence to instructions, telemedicine services, and patient safety alerts. Thus, Bluetooth dental gadgets and toothbrushes that can give post-operative information and patient monitoring can be employed in both outpatient and inpatient settings. In this role, other IoT components include RFID, Bluetooth, and Wi-Fi, among others. As a result, methods for measuring and keeping track of crucial bodily processes including blood pressure, temperature, heart rate, blood sugar, cholesterol levels, and much more will be significantly improved.

With the development of Internet of Things Nano-things (IoNT), the usage of Internet of Things (IoT) and Internet of Things (IoE) is also increased.

As the name suggests, IoNT vision is created by integrating Nano sensors into different things (objects) via Nano networks. One area where IONT use is most concentrated is in medicine. When IoNT is used within the human body for therapeutic reasons, it makes it easier to get data from in-body components that have previously been accessible from or through those medical devices paired with big sensory size. IoNT will therefore make it possible to gather new medical data, which will lead to discoveries and improved diagnosis.

3. Water management and intelligent agriculture

By measuring soil moisture and, in the case of grapes, stem width, IoT has the potential to enhance and expand the agricultural industry. With the help of IoT, you can manage the amount of vitamins present in agricultural goods and adjust microclimate conditions to maximise the quantity and quality of vegetables and fruits. Studying the weather also provides information on rain, snow, drought, climate change, and how to control temperature and humidity to avoid contaminants like fungi.

When it comes to cattle, the Internet of Things (IoT) may assist in identifying animals grazing in open areas, detecting dangerous gases in farm animals, controlling kid growth circumstances to promote health and livelihood chances, among other things. Additionally, the entire agricultural industry may benefit from effective monitoring and management techniques thanks to the application of IoT in agriculture. Additionally, it improves the management of water and power. As stated, the role of IoT in water management includes researching whether seawater and rivers are suitable for use as drinking water and for agricultural purposes, detecting changes in pipeline pressure, the presence of liquid outside tanks, and monitoring the levels of water diversity in dams, rivers, and dams. These Internet of Things apps rely on wireless networks. SiSviA, GBROOS, and SEMAT are a

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few examples of IoT applications that are already in use in this sector.

4. Logistics and Retail

There are several advantages to using IoT in supply chain or retail management. Some examples include tracking products to allow tracking capabilities, monitoring storage conditions throughout the supply chain, processing payments based on theme parks, gyms, and other locations where public transportation is used, and more. IoT can be used in retail properties for a number of purposes, including store-based tracking, quick payment methods like auto-checking with biometric assistance, the identification of potentially incompatible products, and the management of product fluctuations on shelves and in warehouses to automate stock recovery procedures.

Wireless sensor networks and radio frequency identification are the IoT characteristics that are most frequently employed in this environment. In retail, SAP (System Applications and Products) is now used, and there are numerous instances in transportation, including quality load conditions, item placement, identification of issues with inconsistent storage, and vehicle tracking, among others. IoT is essential to the industry because it helps detect gas and leakage levels in both the workplace and the environment, monitors levels of oxygen and toxic gases in chemical plant areas to protect workers and the public, and checks the levels of water, oil, and gas in storage tanks and other tanks. The usage of IoT also helps with maintenance and repair since systems may be configured to foresee equipment problems while also routinely configuring repair services in advance of any hardware breakdowns. In order to do this, sensors can be placed inside of machinery or machines to track their performance and occasionally give information.

5. Wise Living

IoT may be applied in this area to remote control devices that enable one to turn on and off remote equipment, reducing accidents and conserving energy. Refrigerators with LCD panels, which show what is inside, what is left over, what is outside, and what has to be replaced, are another example of smart household equipment. This data may also be connected to a smartphone app, enabling access from outside the house and the eventual purchase of the required hardware. Additionally, washing machines offer the capability of remote monitoring of garments. A smartphone may link to a wide range of kitchen equipment, making it simple to change the temperature, such as in the oven. Some self-cleaning ovens are also simple to keep an eye on. IoT may be utilised for home security with alarm systems and cameras to monitor and detect openings in windows or doors, deterring trespassers.

All living things, including humans, animals, birds, and plants, depend on nature, and all are impacted by a sick environment. There have been several attempts to establish a healthy environment in terms of minimising resource losses and eradicating pollution, but the existence of industry, as well as transportation waste linked to carelessness and dangerous human activities, are prevalent and continue to affect the ecosystem. As a result, waste management and monitoring are important for the environment and give useful information that compels governments to implement green policies.

Intelligent natural methods should be developed in conjunction with IoT technology to find, monitor, and assess natural resources that might be used for establishing sustainable livelihoods and a greener world. IoT technology provides spatial contexts to improve traffic control systems in big cities and enables the viewing and management of air quality through data collecting from distant sensors in all cities. IoT technology may also be used to assess water contamination levels and, as a result, inform choices regarding water consumption. IoT may also be utilised in the management of garbage, which includes a variety of waste kinds such chemicals and pollutants that are harmful to the environment as well as to people, animals, and plants. This may be accomplished by protecting the environment by reducing industrial pollution using quick monitoring and management systems that are integrated with monitoring over decision-making networks. Waste is decreased as a result.

By exchanging information and data, the IoT may be leveraged to give notable accuracy and high-quality weather monitoring in weather forecasting. IoT technology allows weather systems to wirelessly transfer data to weather

ISSN- 2394-5125 VOL 08, ISSUE 02, 2021

stations while also collecting data from moving cars, including barometric pressure, humidity, temperature, light, and other variables. Sensors are installed in vehicles and even buildings to collect the data, which is then analysed and saved to help in weather predictions. The environment, the health of people and animals, and agricultural productivity are all negatively impacted by radiation. IoT sensor networks can regulate radiation by continuously tracking its concentrations, particularly close to nuclear reactors to find leaks and stop them.

Future Obstacles

Before IoT can be widely used, there are significant difficulties and effects that must be solved.

Security and Privacy

Other criteria will be more important on the network of things as security and safety characteristics on the Internet such as communications secrecy, friend authenticity and confidence in message exchanges, and message integrity, increase. Other donations might need to be approved, and discussing other IOT and business-related topics that might need to be revealed to the rival might be prohibited.

Expense vs. usability

IoT connects physical items to the internet by using technology. The cost of the components needed to enable abilities like hearing, tracking, and control techniques need to match in the upcoming years for IoT usage to expand.

Interoperability

Each kind of intelligent online item possesses unique processing, conversational, and number skills. Different criteria, such as those relating to power supply and network bandwidth needs, will apply to various smart devices. There are no mandatory standards needed to support the communication and interaction of these devices.

Management of Data

It can be necessary to comprehend the current context as correctly as possible using sensors in order to assist users of intelligent gadgets. It is desirable to be able to infer a few simple inferences from interpreted sensory information so that service providers can use a range of facts practically.

Issues with Device Level Energy

Because things have a tendency to move and are not powered by electricity, they require a suitable energy source to activate their intelligence. Even when RFID transponders are inactive and no longer need to be powered, their usefulness and range of communication are hampered. Future low power CPUs and networking hardware have opportunities for very low power embedded systems. For hardware and system architecture as well as software applications, such as the construction of protocol stacks, where each switching byte will justify its existence, saving power is a relatively straightforward matter.

CONCLUSION

This paper's main focus was on highlighting significant applications and IoT issues. One future vision is that the Internet of Things (IoT) develops into a system that can hear, perform, communicate, control, and generate information from massive volumes of data. A different quality of life than what exists now will result from this. All the material in our environment is transformed by IoT into an ecosystem of information that improves our lives. IoT introduces a lot of things every day, from refrigerators to parking lots to residences, which will make IoT a multibillion-dollar market soon. IoT is expanding daily. Many IoT initiatives are now in the planning stage, while others are in the implementation stage. Experts face a wide range of difficulties. IoT will soon be a reality.

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References

[1] M. H. Miraz, M. Ali, P. S. Excell, and R. Picking, "A Review on Internet of Things (IoT), Internet of Everything(IoE) and Internet of Nano Things (IoNT)", in 2015 Internet Technologies and Applications (ITA), pp. 219– 224,Sep.2015, DOI:10.1109/ITechA.2015.7317398.

[2] K.Ashton,"That'InternetofThings',"22June2009.[Online].Available:http://www.rfidjournal.com/articles/view?4986.

[3] http://www.nxp.com/assets/documents/data/en/white-papers/INTOTHNGSWP.pdf

[4] ITUInternetReports,theInternetofThings,November2005.

[5] Internet3.0:TheInternetofThings.AnalysysMasonLimited2010.

[6] ManveerJoshi,Dr. Bikram Pal Kaur, "Internet of Things: A Review",International journal of Science Technology&Management(IJSTM), 26-27thMarch2015, ISSN: 2229-6646.

[7] Dr. Ovidiu Vermesan ,Dr. Peter Friess ,Internet of Things: Converging Technologies for Smart Environments andIntegrated Ecosystems, RiverPublishers.

[8] ZHIBOPANG,TechnologiesandArchitecturesoftheInternet-of-Things(IoT)forHealthandWell-being,Doctoral Thesis in Electronic and Computer Systems KTH – Royal Institute of Technology Stockholm, Sweden,January2013.

[9] Eiman Al Nuaimi1 et al., Applications of big data to smart cities. Journal of Internet Services and Applications2015.

[10] http://www.7wdata.be/article-general/how-big-data-and-internet-of-things-builds-smartcities/[12]A.Murray,M.Minevich,and A.Abdoullaev.Beingsmartaboutsmartcities. KMWorld, October 2011.

[11] Farheen Fatima, at el., Internet of things: A Survey on Architecture, Applications, Security, Enabling Technologies,Advantages&Disadvantages.InternationalJournalofAdvancedResearchinComputerandCommunication EngineeringVol. 4, Issue 12, December2015.

[12] http://www.connected-living.org/content/4-information/4-downloads/4-studien/20mind-commerce-smart-homes-companies-and-solutions-2014/mind-commerce_smarthomes-companies-and-solutions-2014_glo_12-2014.pdf

[13] http://www.gsma.com/connectedliving/wpcontent/uploads/2012/03/vision20of20smart20home20report.pdf

[14] JukkaSuhonen.ExperiencesandFuturePlansforWSN-enabledServiceDevelopmentinHomeEnvironment. Realinwhitepaper2013

[15] AmritaSajja, D.K. Kharde, Chandana Pandey.ASurveyon efficientwayto Live:SmartHome-It"sanInternet ofThings.ISAR-InternationalJournal ofElectronicsand CommunicationEthics, Volume1.Issue1, 2016.

[16] GabrieleLobaccaro,SalvatoreCarlucciandEricaLöfström(2016).AReviewofSystemsandTechnologiesforSmartHomes andSmartGrids.www.mdpi.com/journal/energies

[17] TiagoD.P.Mendesetal.,SmartHomeCommunicationTechnologiesandApplications:WirelessProtocolAssessmentfor HomeArea Network Resources. Energies2015.

[18] http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/DOE_SG_Book_Single_Pages(1).pdf