International Journal of Scientific Research in Computer Science, Engineering and Information Technology
ISSN : 2456-3307 (www.ijsrcseit.com)
doi : https://doi.org/10.32628/CSEIT206454

A Study Paper on Vision of IOT

Hima Mohan*1, Dr. L. C. Manikandan[2]
*1P G Scholar, Department of CSE, Musaliar College of Engineering & Technology, Pathanamthitta, Kerala, India
[2] Professor and Hod, Department of CSE, Musaliar College of Engineering & Technology, Pathanamthitta, Kerala, India

Article Info
Volume 6, Issue 4
Page Number: 328-335
Publication Issue :
July-August-2020

Article History
Accepted : 20 July 2020
Published : 27 July 2020

ABSTRACT

The Internet of things (IoT) refers to a type of network to connect anything with the Internet based on stipulated protocols through information sensing equipment's to conduct information exchange and communications in order to achieve smart recognitions, positioning, tracing, monitoring, and administration. In this paper we briefly discussed about what IOT is, how IOT enables different technologies, about its architecture, characteristics & applications. The purpose of this paper is to provide the basic information about IoT for young readers.

Keywords : Big data, Digital Twin, Cloud computing, BLE, GSM, GPRS, WIMAX

I. INTRODUCTION

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. In 1999, the IOT term was invented by a member of the development community of Radio Frequency Identification (RFID)tags [14,7],and sensor devices [12] has recently become more applicable to the practical world largely due to the growth of mobile devices, embedded and omnipresent connectivity, cloud computing and data analytics. IOT is a network of physical objects. The Internet is not only a computer network, it has also developed into a network of devices of all types and sizes, cars, smartphones, home appliances, toys, cameras, medical devices and industrial systems, animals, men, houses, all connected, all communicating and sharing. Knowledge based on protocols to achieve smart reorganizations, positioning, mapping, safe & track & even online personal real-time tracking, online updating, process control & management. The Internet of Things is a three-dimensional Internet: (1). Humans to humans, (2) Humans to machine things, (3) Things to machine or stuff.

Vision of IOT: IoT is a philosophy and framework that considers the omnipresence in the world of a number of things,objects that are able to interact with each other through wireless and wired links and specific addressing schemes and collaborate with otherthings, objects in order to create new application services and achieve common objectives.The research and development challenges of developing a smart environment in this sense are immense.The Internet of Things refers to the general idea of things, particularlyeveryday objects, which can be read, recognized, identified, addressed via information sensing devices and or managed via the Internet, regardless of the means of communication (whether via RFID, WLAN, WAN or other means).The Internet of Things ' goal is to be able to connect things anymoment, anyplace, with everything and everyone ideally using any path or network and any service. IOT is shown in Figure 1.

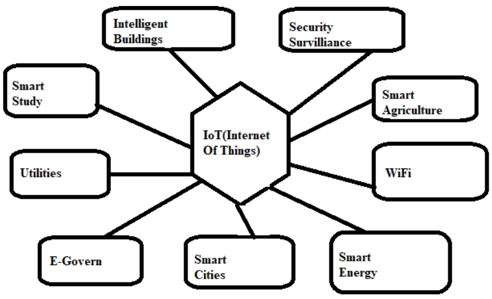

Figure 1: Internet of Things

II. CHARACTERISTICS

The basic characteristics of the IoT are:

A. Connectivity: With respect to IoT, the global information and communication network will interconnect everything.

B. Resources relating to matters: Within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things, the IoT is capable of providing service related to things. To deliver object-related services within the constraints of things, both the physical world technologies and the information world will be changing.

C. Heterogeneousness: The IoT systems are heterogeneous, as they are based on various hardware platforms and networks. They may communicate, across different networks, with other devices or service platforms.

D. Changes in Dynamics: Device status changes dynamically, e.g. sleeping and waking up, connecting and or disconnecting, as well as device context including location and velocity. What's more, the number of devices can dynamically change.

E. Enormous: At least an order of magnitude greater than the devices connected to the existing Internet will be the amount of devices that need to be handled and that communicate with each other. The management of the generated data and their interpretation for application purposes will be even more critical. It includes data semiconducting, as well as secure data handling.

F. Assurance: As we gain advantages from IoT, we mustn't forget safety. As both the IoT creators and recipients, we have to design for security. It requires the protection of our personal data and our physical wellbeing. Securing endpoints, networks, and data flowing through them all means creating a scale-up security model.

G. Connectedness: Connectedness allows accessibility and compatibility of the network. Accessibility becomes available on a network while compatibility offers the common ability to consume and produce data.

III. ARCHITECTURE OF IOT

IoT architecture is composed of various layers of IoT enabling technologies. It serves to illustrate how different technologies relate to each other and to communicate in different scenarios the scalability, modularity and configuration of IoT deployments.The general IoT system architecture are shown in Figure 2.

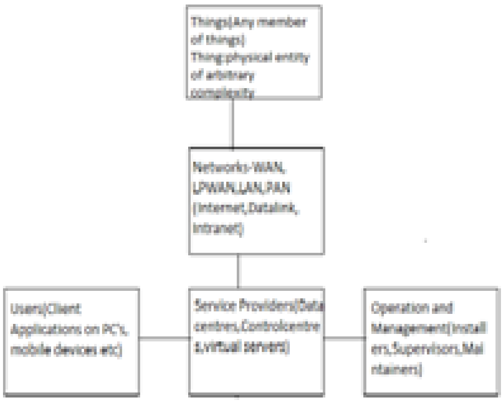

Figure 2: General IoT System Architecture

A. Smart app / sensor layer: The lowest layer consists of sensor-integrated smart objects. The sensors allow the physical and digital worlds to interconnect, allowing the collection and processing of real-time information. Different types of sensors exist for different purposes. The sensors have the ability to take measurements such as temperature, air quality, speed, humidity, friction, wind, movement and electricity etc.They may also have a degree of memory in some situations,enabling them to record a variety of measurements.A sensor can measure, and convert, the physical property into a signal that an instrument can understand. Sensors are grouped according to their unique purpose such as environmental sensors, body sensors, sensors for home appliances and telematics sensors for vehicles etc. Some sensors need access to gateways of the sensors. It can be in the form of a Local Area Network (LAN), such as Ethernet and Wi-Fi or Personal Area Network (PAN) such as ZigBee, Bluetooth and Ultra Wideband (UWB) connections.

B. Gateways and Networks: These tiny sensors will generate massive volumes of data and this requires a robust and high-performance wired or wireless network infrastructure as a means of transport. Current networks were used to support machine-to-machine (M2M)[13]networks and their applications, often tied to very differentprotocols.With demand needed to serve a wider range of IoT services and applications such as highspeed transactional services, contextaware applications, etc., multiple networks with different technologies and access protocols are needed to work in a heterogeneous configuration with each other.

C. ITService Layer: The IT service makes information processing possible through automation, security checks, and process modelling and device management.

D. Application Layer: The IoT software encompasses "smart" environments or spaces in such domains as: Transit, Building, City, Lifestyle, Retail, Agriculture, Emergency Healthcare, User Interaction, Culture and Tourism, Environment and Energy, Supply chain.

IV. TECHNOLOGIES ENABLING IN IoT

IoT-enabling technologies vary by domain and scenario. The Internet of Things enabling technologies are called in[10] and can be divided into three categories: (I) technologies enabling' things' to obtain contextual information, (II) Technologies enabling' things' to process contextual information, and (III)Protection and privacy protection technologies. The first two categories can be interpreted jointly as practical building blocks that allow the building of "information" into "stuff," which are indeed the features that differentiate the IoT from the ordinary Internet. The third category is not a practical requirement but rather a de facto requirement without which the IoT penetration would be severely reduced.[6]

A. Sensors: Sensors main purpose is to gather data from the surrounding environment. IoT machine sensors, or' things,' shape the front end. After the signal conversion and processing, these are connected directly or indirectly to IoT networks. But not all sensors are similar, and different IoT implementations require different sensor types. For example, digital sensors are straightforward and easy to connect with the Serial Peripheral Connect (SPI) bus using a microcontroller. But either analog-to-digital converter (ADC) or Sigma-Delta modulator is used for converting the data to SPI output for analog sensors. More precisely: "Technological improvements have produced microscopic scale sensors which have led to the use of technologies such as microelectromechanical systems (MEMS).

B. Communications: Wired and wireless communication technologies have also advanced with respect to the sending and receiving of data, so that almost any form of electronic equipment can provide data connectivity. This has allowed the ever-shrinking sensors embedded in smart objects to send and receive data for collection, storage and possible analysis over the cloud. The protocols used to enable IoT sensors [4] to relay data include wireless technologies such as RFID, NFC, Wi-Fi, Bluetooth, Bluetooth Low Energy (BLE), XBee[15], ZigBee, Z-Wave, Wireless M-Bus, SIGFOX [1] and NuelNET, as well as GSM, GPRS, 3G, LTE or WiMAX satellite connections and mobilenetworks.Wired protocols, which can be used with stationary smart objects, include Ethernet, Home Connect, Home PNA and Lon Works and traditional telephone lines.

C. Bigdata: Big data is an area that addresses ways of analysing, systematically extracting information from, or otherwise dealing with data sets that are too broad or complex for conventional application software for data processing to manage. Information with many cases (rows) provide greater statistical power, whereas information with higher complexity (more attributes or columns) can lead to a higher rate of false discovery [3].Big data challenges include data capture, data storage, data analysis, search, sharing, transferring, visualizing, querying, updating, privacy and source data. Big data originally involved three key concepts: volume, variety, and speed [2].

D. Cloud Computing: Cloud computing [9] – and its three service models Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) – are important for IoT because it is easy to connect with the Serial Peripheral Connect (SPI) bus using a microcontroller.It enables any user with a browser and an Internet connection to transform smart object data into actionable intelligence.In other words, cloud computing provides ' a virtual utility computing infrastructure that integrates applications, monitoring devices, storage devices, analytics tools, visualization platforms, and customer delivery ... [to] enable businesses and users to access applications on demand at anytime, anywhere and anywhere. [8]

E. Digital Twin: Another consequence of the growing and evolving IoT is the concept of a “digital twin,” introduced in 2003 by John Vickers, manager of NASA’s National Center for Advanced Manufacturing [11] The concept refers to a digital copy of a physical asset (i.e., a smart object within the IoT), which over the lifetime of the physical asset lives and evolves in a virtual environment. That is, since the sensors within the object collect data in real time, a set of models that form the digital twin is updated with all the same information

.

V. CLAINS IN IoT

Today there are key challenges and implications that need to be addressed before IoT can be mass-adopted.

A. Privacy and Security: While IoT is a core element of the Future Internet and the use of the Internet of Things for large-scale, partly mission-critical applications creates the need to properly tackle trust and security functions. Current Privacy, Trust and Reliability issues listed are:

- Providing confidence and information quality in shared information models to enable reuse across a wide range of applications.
- Providing safe exchange of information between IoT devices and consumers.
- Providing mechanisms for defense of vulnerable computers.

B. Price versus: IOT accessibility uses technology for connecting physical objects with the Internet. In order for IOT adoption to develop, in the coming years the cost of components needed to support technologies such as sensing, monitoring, and control mechanisms must be relatively inexpensive.

C. Interoperativeness: Interoperativeness is the central value of most basic; the first prerequisite of Internet communication is that "connected" devices should "speak the same language" of protocols and encoding. To help their applications, various companies today use different standards. With multiple data sources and heterogeneous tools, it becomes necessary to use standard interfaces between these various entities. This is particularly true for applications that endorse cross-organizational boundaries and different system boundaries. The IoT systems therefore need to handle high degree of inter operativeness.

D. Management of Data: Data management in the Internet of Things is a crucial aspect. When considering a world of interconnected objects and constantly sharing all kinds of information, the volume of the data generated and the processes involved in handling those data.

E. Energy problems at device level: Device Level Energy Issues One of the key challenges in IoT is how to interconnect "things" in an interoperable way while taking the energy constraints into account, knowing that communication is the most energy consuming task on device.

VI. ADVANTAGES OF IOT

The internet of things facilitates the various advantages of the business sector in everyday life.

- **Efficient use of resources:** Once we know the software and how each system operates we will certainly increase the efficient use of resources and track natural resources.
- **Reduce human effort:** As the devices of IoT interact and communicate with each other and do lot of task for us, then they minimize the human effort.
- **Save Duration:** This undoubtedly saves time as it eliminates human effort. Time is the primary factor that can be saved via IoT platform.
- **Safety Improvement:** Now if we have a system that interconnects all of these things then we can make the system safer and more efficient.

VII. DISADVANTAGES OF IOT

As the Internet of Things facilitates a set of benefits, a considerable set of challenges is also created. Some of the disadvantages concerning IoT are:

- **Security:** As networks interconnect the IoT systems and communicate. Given any security measures the system offers little power, and it can lead the different kinds of network attacks.
- **Privacy**: The IoT system provides significant personal data in the utmost detail even without the active participation on the customer.
- **Complexity:** It is quite complicated to plan, build, manage and allow the broad technology to IoT framework.

VIII. APPLICATION AREAS

Potential IoT implementations are numerous and complex, permeating almost all aspects of the daily life of people, businesses, and society as a whole. The

IoT technology encompasses "smart" environments / spaces in the following domains: Transit, Building, City, Lifestyle, Retail, Agriculture, Farm, Supply chain, Emergency, Healthcare, User Interaction, Culture and Tourism, Environment and Energy. Some of the IOT applications are:

A. Internet of smart living (IosL)

Remote Control Appliances: remotely turn on and off appliances to prevent accidents and save electricity, Weather: monitors outdoor weather conditions such as humidity, temperature, heat, wind speed and rain with the ability to transmit data over long distances, Smart Home Appliances: LCD screen refrigerators showing what's inside, food about to expire. Ingredients to purchase and all the details on the Smartphone App. Washing machines enable remote monitoring of the laundry, and. Kitchen interfaces with a Smartphone app that allow remote temperature control and monitoring of the self-cleaning function of the oven, Security Monitoring: cameras and home alarm systems that make people feel. Intrusion Detection Systems: Detection of window and door openings and intrusion prevention breaches, Energy and Water Use: monitoring of energy and water use to gain guidance on how to save costs and money.

B. Internet of smart health (IosH)

Patient Surveillance: monitoring of patient conditions inside hospitals and in the home of the elderly, Medical Fridges: control of conditions inside freezers that store vaccines, medicines and organic elements, Fall Detection: assistance to the elderly or the disabled living independently, Dental: Bluetooth paired toothbrush with Smartphone app analyses the uses of brushing and provides information on the smartphone's brushing habits for private information or reports to the dentist; Physical activity monitoring: wireless sensors mounted across the mattress to track small movements, such as breathing and heart rate and large motions triggered by tossing and turning during sleep, providing data on the mobile via an app.

C. Internet of smart energy (IosE)

Smart Grid: monitoring and management of energy consumption, wind turbines / power house: monitoring and analysis of energy flow from wind turbines & power house, and two-way communication with smart meters of consumers to analyse consumption patterns, Power Supply Controls: AC-DC power supply controls that assess energy requirements and increase energy efficiency with less energy waste for computer, telecommunications and consumer electronics applications power supplies, Photovoltaic installations: monitoring and performance optimisation in solar power plants.

D. Internet of smart agriculture (IosA)

Green Houses: monitor micro-climate conditions to improve fruit and vegetable production and quality, Compost: monitoring of alfalfa, grass, straw, etc. humidity and temperature levels to avoid fungus and other microbial pollutants, Animal Farming / Tracking: position and detection of animals grazing in open pastures or location in large stables, Analysis of air and ventilation in farms and identification of unhealthy gasses from excretion.

E. Internet of smart environment (IosE)

Air pollution monitoring: monitoring of CO2 emissions from factories, pollution from cars and toxic gasses from farms, Forest Fire Detection: monitoring of combustion gasses and preventive fire conditions to define alert zones, Weather monitoring: monitoring of weather conditions such as humidity, temperature, pressure, wind speed and rain, Early Detection of Earthquake, Water Quality: Survey of water suitability in rivers and sea for drinking eligibility, River Floods: monitoring water level fluctuations in rivers, dams and reservoirs during rainy days, Safety of wildlife: tracking collars using GPS / GSM [5]modules to locate and track wildlife and communicate their coordinates via SMS.

F. Internet of smart industry (IosI)

Explosive and dangerous gases: identification of gas and leakage levels in industrial settings, surroundings of chemical plants and indoor mines, control of toxic gas and oxygen levels in chemical plants to ensure the safety of employees and products, Monitoring of water, oil and gas levels in storage tanks and cisterns, maintenance and repair: Early warnings of system malfunctions and service repairs can be planned automatically prior to actual component failure by installing sensors inside the equipment to monitor and send reports.

G. Internet of smart cities (IosC)

Structural health: monitoring of vibrations and material conditions in houses, bridges and historic landmarks, Lightning: intelligent and weather-adaptive street lighting, safety: digital video surveillance, fire control, public announcement system, Transportation: Smart roads and Intelligent highways with warning signals and diversions according to climatic conditions and unexpected events such as accidents or traffic jams, Smart Parking: real-time tracking of the availability of parking spaces in the area, allowing citizens to locate and reserve the nearest spaces available; Waste management: Detection of rubbish levels in containers to optimize the routes for waste collection.

IX. CONCLUSION

In this paper IoT system architecture, technologies, claints and applications are discussed. It will be helpful for upcoming readers.

X. REFERENCES

[1] Sigfox - The Global Communications Service Provider for the Internet of Things (IoT), 2018, [online] Available: https://www.sigfox.com/en.

[2] Breur, Tom (July 2016). "Statistical Power Analysis and the contemporary "crisis" in social sciences", Journal of Marketing Analytics.

[3] Hilbert, Martin; Lopez, Priscila, "The World's Technological Capacity to Store, Communicate, and Compute Information", April 2016.

[4] Frederic Combaneyre, Understanding Data Streams in IoT, SAS White Paper, 2015.

[5] V. Mulge, G. Sathyaprabha, P.V. VaraPrasad Rao, "Anti-Theft Security System Using GSM GPS RFID Technology Based On Arm7", International Journal of Research in Information Technology(IJRIT), Vol. 2, No. 9, pp. 764-769, September 2014.

[6] Dr. Ovidiu Vermesan SINTEF, Norway, Dr. Peter FriessEU, Belgium, "Internet of Things– From Research and Innovation to Market Deployment", river publishers' series in communications, 2014.

[7] L. Wang, L. Xu, Z. Bi, and Y. Xu, (2014) "Data filtering for RFID and WSN integration," IEEE Trans. Ind. Informat.10 (1), pp.408–418.

[8] David Canellos, How the "Internet ill Feed Cloud Computing's Next Evolution, Cloud Security Alliance Blog, June 5, 2013.

[9] Dr. Ovidiu Vermesan SINTEF, Norway, Dr. Peter FriessEU, Belgium, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", river publishers' series in communications, 2013.

[10] Ewuzie, I., & Usoro, A. (2012, December). Exploration of cloud computing adoption for e-learning in higher education. In Network Cloud Computing and Applications (NCCA), 2012 Second Symposium on (pp. 151-154). IEEE.

[11] See Michael W. Grieves, Virtually Perfect: Driving Innovative and Lean Products through

Product Lifecycle Management (Space Coast Press, ISBN: 0982138008, 2011) at 133.
[12] J. Li, Z. Huang, and X. Wang. (2011) “Countermeasure Research about Developing Internet of Things Economy,” International Conference on E -Business and E -Government (ICEE).
[13] Y. Huang and G.Y. Huang and G. Li. (2010) “Descriptive Models for Internet of Things.” IEEE International Conference on Intelligent Control and Information Processing (ICICIP).
[14] Ashton, Kevin (2009), "That ‘internet of things’ thing." RFID journal 22(7), pp.97-114.
[15] Zheng Li, "ZigBee Development handbook", RIC TELECOM, February 22 2006.

AUTHOR PROFILE

HIMA MOHAN is doing M. Tech at Musaliar College of Engineering and Technology, Pathanamthitta, Kerala, India. She has received B Tech degree in Computer Science and Engineering from *Kerala University*, Thiruvananthapuram, Kerala, India. Her main research area of interest includes Internet of Things.

Dr.L.C.Manikandan is working as Professor at Musaliar College of Engineering and Technology, Pathanamthitta, Kerala, INDIA. He has received Ph.D. degree in Computer and Information Technology from Manonmaniam Sundaranar University, M.Tech. Degree in Computer and Information Technology from Manonmaniam Sundaranar University, M.Sc., Degree in Computer Science from Bharathidasan University and B.Sc. Degree in Computer Science from Manonmaniam Sundaranar University. His main research interest includes video surveillance, image compression and video coding in image processing.

Cite this article as :

Hima Mohan, Dr. L. C. Manikandan, "A Study Paper on Vision of IOT", International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), ISSN : 2456-3307, Volume 6 Issue 4, pp. 328-335, July-August 2020. Available at
doi : https://doi.org/10.32628/CSEIT206454
Journal URL : http://ijsrcseit.com/CSEIT206454