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Original Article

Internet of Things (IoT) Security Issues and Challenges

Anita Patrot

Department of Computer Science, Maharani Lakshmi Ammanni College for Women, Autonomous, Bangalore, Karnataka, India.

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Abstract *- The computer period is increasing daily, where individuals can connect various devices to the internet. The internet of connected things plays a major part in the globe in that every object (thing) relates to internet-connected to perform the task. IoT connects the devices and systems intelligently through the internet, where devices can interact and communicate with other objects through Radio Frequency Identification and sensor networks. This leads to a challenging task and an issue of the internet of things that every individual face the insecurity, which is having an open research problem to the researcher in this domain to concentrate on the user security issues and challenges to identify and give the proper solution for that. A huge amount of data is generated through sensor devices and stored in clouds. Again it's a big data challenge in the cloud computing era. The retrieving of data is also taken from the cloud with the help of intermediator brokers. It's a challenging task to get the connection as well as data transfer for the cloud. The main objective of the research paper is to view various issues occurring on the internet of things for security reasons. The overall coherence of the technologies used in the IoT research projects is the issues and security, which is a major concern in identifying the insecurity reasons for results.*

Keywords *- Broker, Cloud Storage, Internet of Things, Security.*

1. Introduction

The internet [1] increases day-to-day life through the internet growing tremendously in everyone's life. The growing technologies with many connected objects to the internet are also increasing, and vice versa in that most devices are connected. The technologies are completely dependent on the global internet. The connected devices communicate with the cloud through the various intermediators. The communication between the client and the cloud through intermediators like brokers helps them provide client services. IoT is defined as technology connected with different types of sensors and actuators to communicate with the cloud with a wireless network for storing and retrieving data; for this ZIGBEE network is used for the connection.

The first term, "Internet of things (IoT) "[2], was coined by Computer Scientist Kevin Ashton in the year 1999. The Internet of Everything (IOE) relates to RFID technology. In upcoming years, IoT technology will change the world of the Internet through IoT devices, which also provides the path for hackers to misuse private data over the network. The connected devices have three processes: pre-processing, collection, and monitoring data. Things can be mobile, iPhone, sensors, and interfaces in various applications of the internet of things (IoT). Cisco is estimating that the "Internet of Everything" they connect 50 billion devices to the cloud by 2020.

Everything is connected to wireless communication, as shown in figure 1.

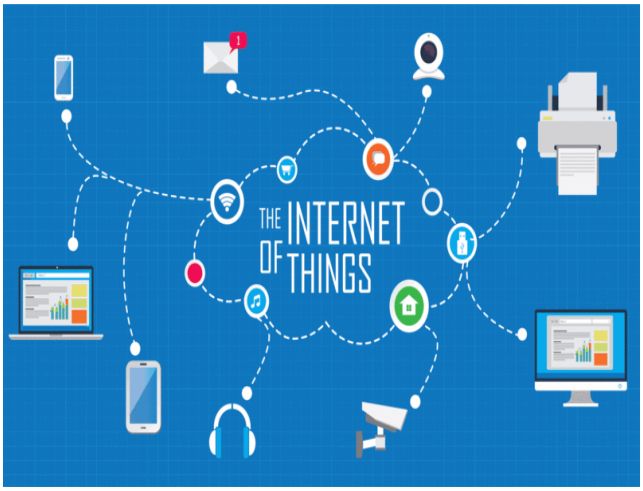

Fig. 1 Internet of Things (IoT)

2. Related Work

The associated work is illustrated in the following sub-sections, where the IoT revolution and history related to the internet of things are as follows. The reference of this research work done by the various author's papers is taken for discussion and identification of research gaps in such IoT research works [3]. The edge cloud collaborative for intelligent systems is used for the applications of smart, intelligent systems used in various fields.

The machine learning concept of artificial intelligence worked on the deep learning layers for resource interfaces used in wearable devices [4]. Mobile device applications are also used most in the internet of things, especially for big data analytics by using deep learning techniques for mobile applications [5].

The research opens opportunities for researcher one who works on IoT projects for more reliable and security-based systems [6]. The edge-based cloud data processing is a challenging task in big data analytics using wireless sensor networks [7].

2.1. Internet of Things Revolution

The Internet of Things is state of the art in the information technology area where each object relates to another through the internet. The term internet of things is also written as IoT. In this thing are nothing but the objects and devices connected in the network and transforming information to the cloud. The global system as we know it is interconnected with many computer networks that use Transfer Protocol (TCP) and Internet Protocol (IP) to give services all over the world connected through wireless sensor networks [8-10]. Every object in the globe may be a device, or an individual object has its unique identifier. [13] The report was given by the green technology used in things on the internet.

The global market for the internet of things is increasing, as shown in figure 2. The figure explains the health care (16%), marketing, manufacturing (16%), Government (7%), Transformation (6%), Retail and wholesale (8%), banking and securities (11%), insurance (12%), computing services (8%), utilities (5%), Real Estate (4%), Agriculture (4%) and others (3%). The internet of things global market is used in all the fields shown in the diagram.

Fig. 2 Global Market in the Internet of Things (IoT)

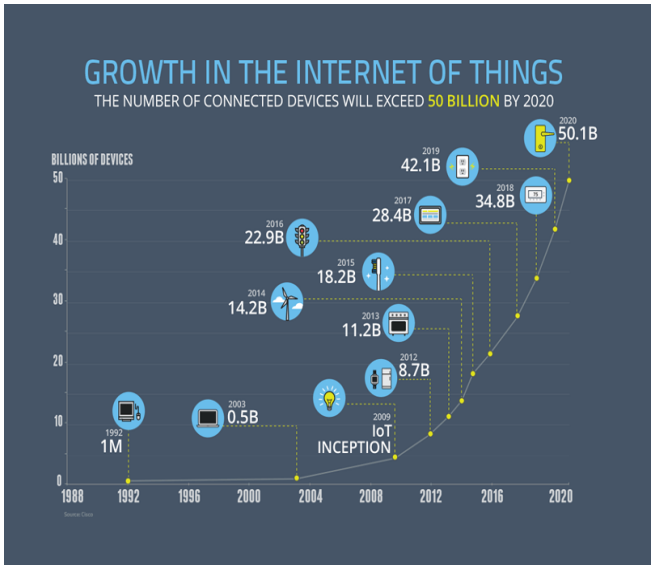

Fig. 3 Growth of Internet of Things (IoT) by 2020

The growth of the internet of things is gradually expanding the open research problem to researchers to concentrate on the challenges we face while computing new technologies to the connected objects for communication and processing data and storing it in the clouds.

Managing and monitoring data are challenging tasks for the designers who create a platform for the internet of things devices, software, and system. We can observe tremendous growth today by increasing the internet connection between objects. Figure 3. This shows that even by 2020, the connected objects are more globally.

2.2. Time Series of IoT

The time series of an IoT build in various fields like the industrial internet of things and the data that indicates changes over time on physical devices such as hardware and software. The applications are processed based on the data stored in the cloud. The issues challenge data maintenance and operations performed on the data.

The figure4. Shows the connected objects increasing yearly from the year 2012 to 2020. Th x-axis shows the connected objects through the world, and the y-axis shows the year-wise increasing objects connected for both penetration in %. Gradually changes in the 8.7 from 2012 to 50.1 billion objects in 2020.

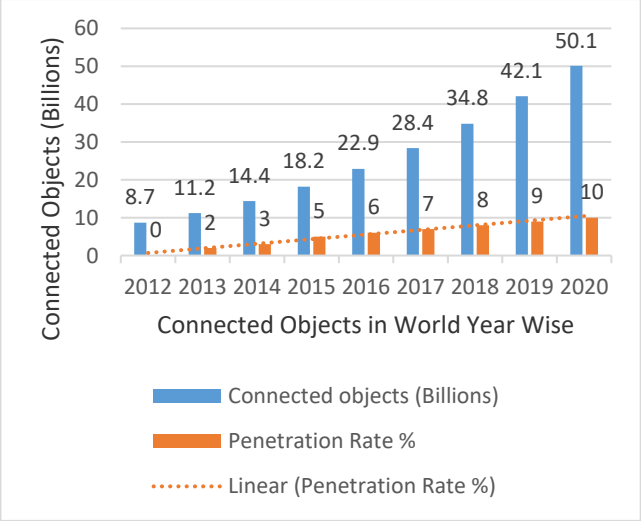

Fig. 4 Connected objects in IoT p

3. Applications in Various Fields

The internet of things-based applications is used in various fields, including government and education domains. The IoT has lots of applications in all the fields of information technology. The applications are as follows. The different fields include the industry, real-world objects, home automation, smart cities, environment, and energy to retail department. Industry Applications include digitization, monitoring, and management of inventory. It also includes the security concern, quality of product control, and packaging quality matters.

Real-world applications include actions such as trackers of fitness, health monitoring machines, and modern agriculture smart irrigation. Home automation is a most used application of IoT, which includes Smart appliances for the home like TVs, refrigerators, music systems, dryers, etc. Each appliance has its own set of rules for the operating task. Also, it includes smart lighting. Smoke detector, intrusion detection.

Smart cities can be implemented by using the idea of using IoT for smart parking, and people get confused during space rush hours during parking in busy areas. The parking issue can be maintained smartly by observing the space for parking. Smart roads and smart lighting for roads and, most importantly, surveillance ensures people's security.

When we talk about environmental applications, environmental application through IoT should be the weather monitoring system. Air pollution systems, noise pollution, forest fire, and floods detection. Energy is also one of the applications of IoT, and nature provides the renewable energies that can be used for the energy system, prognostics like grids smartly, wind, and power plants. The retail management includes the inventory monitoring system and smart payments like debit/credit or online transactions.

4. Security Issues and Challenges

The internet allows hackers to access users' private data online. These are the security issues and challenges when everything is connected to the internet. The following are the major issues considered in the overview of the research papers on the Internet of Things. In this paper, some of the issues are identified while accessing data from the cloud and connecting through various WIFI internets. Cloud attacks through the internet have huge data stored in the cloud. This information is warehoused in the cloud supplier's standard objective.

The biggest safety experiment to see is the creation [14-15] of these attacks that service less than purchaser devices from the attack through immensely synchronized for abuse by hackers. Security issues are also one of the major issues of IoT. Malware [16-20] is a virus code built by programs based on computerized susceptibility discovery and data analysis. The millions of linked devices make a wide attack external for hackers through the botnet attacks, who will continue to review the connections between low-power, somewhat dumb devices and critical infrastructure.

The user or client faces a lack of confidence in data security online. Artificial Intelligence Automation is also a tool for the many applications used for the combination of different technologies for better security. Artificial Intelligence (AI) is used in many applications in robotics by combining AI and the internet of things with the internet in robotics. The security challenges of an IoT are insecurity of data, hardware updating, Internet connection, and various government domains' security.

5. Conclusion

The overview of the internet of things connected devices through the internet and access to the cloud for storing data and retrieving data from the various fields are facing some issues and challenges this technology. The objectives of this paper are to identify the issues and challenges of an IoT.

The specific applications of an IoT are not limited to a few fields. It is globally used in various applications such as industrial and real-world applications. IoT is not restricted to any field; it is globally used in all information technology fields. When technologies increase tremendously, the issues also gain from the approaches and challenges for designers of smart product engineers.

This is an open research problem where the researcher can work on data security and privacy in the cloud. The overall issues and challenges are a lack of confidence while using internet things in many applications. Security is one of the major concerns for storing and retrieving data from the cloud.

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