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Internet of Things (IOT): An Overview and Applications of the Wireless Environment

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ABSTRACT: We are entering in a beginning of a new of computing technology i.e. Internet of Things (IOT). IOT is a sort of "universal global neural network" in the cloud which connects various devices. The IOT is an intelligently connected devices and systems which be made up of smart machines interacting and communicating with other machines, environments, objects and infrastructures and the Radio Frequency Identification (RFID) and sensor network technologies will go up to meet this new challenge. As a result, a very large in size data are being generated, stored, and that data is being processed into useful actions that can "command and control" the things or devices to make our lives much easier and safe and to reduce our influence on the environment. This paper gives an overview of Internet of Things (IOT) and brief information about IOT applications and challenges in various fields. We are also studying about wireless technologies like Wireless Fidelity and also the need for Wi-Fi including the problems that are associated with wireless fidelity. The Internet of Things (IoT) is a new technology paradigm envisioned as a global network of machines and devices capable of interacting with each other, it represents diverse applications and advanced technology. The number of devices connected to the Internet is increasing rapidly. Everything in the home that uses electricity can be connected to the home WiFi network and upload the processed data at your command. With increasing deployments of insecure WiFi-connected devices in the home, an attacker can illegitimately gather data about clients or remotely control the IoT devices; Therefore, security has been a significant issue in smart home applications.

KEYWORDS: IOT application, Wi-Fi, Sensors, RFID, Wireless Network Security,

I. INTRODUCTION

The phrase "Internet of Things" was invent by Kevin Ashton in 1999. He made at his place of employment, Proctor & Gamble. During his time there, Ashton came up with the idea of putting a RFID tag on each lipstick and having them communicate with a radio receiver. He put forward as fact that such data collection can be used to solve lots of problems in the real world. At the moment, a lot of connected devices can talk to internet and to our smart phones, and maybe even some similar products, but most of them can't talk to one another because of branded hardware and software with differing standards, languages and communication protocols. For most of the current smart household items, you'll need to use a different app or website to interface with the device. Unless they were especially designed by the manufacturer to work together. K. Rose in 2015 gave reasons that why IOT is possible. He said it is possible due to following reasons: Ubiquitous Connectivity, widespread adoption of IP– based networking, computing economics, advances in Data Analytics, rise of Cloud Computing so, the IOT is the conjunction of a variety of computing and connectivity trends that have been evolving for many decades. Technology and it is gradually emerging. Everything in the world is considered as a smart object according to the IOT paradigm. These smart objects communicate with each other through the internet and they allow connection to be established between people and things any time any place in any path or network. We all expect new devices every day to simplify our lives in our day to day life. Therefore, every researcher and innovator is at a constant urge to subsequently discover and invent new things in order to satisfy the people needs and this process of inventing new things would eventually continue till infinity as long as innovation persists. By 1990's we saw the proliferation of internet connectivity in markets and consumer enterprises. However the usage of the internet in the nineties was limited mainly because of its speed and due to the lack of its innovation and low performance of the interconnecting network. Gradually by 2000s the connectivity

of the internet became very usual among all the enterprises in industrial and consumer sectors in order to provide information.

The direct communication between devices was referred by M2M using communication channels, wireless and wired communication. The communication between M2M includes the industrial instrumentation which enables a sensor or meter to communicate the information which records as application software such as temperature, levels of inventory and so on. For example an industrial process can be adjustable based on temperature or refill the orders to inventory. By remote network of machines these communications was originally accomplished to send back the information for analysis to a central hub, which then routes the same information back to personal computer. There are changes in the M2M communication of networks which transfers the data to personal appliances.

Recent research has confirmed the promise of machine learning for anomaly detection. In 2017, Meidan applied random forest algorithm to features extracted from network traffic data and enforced perfect detection of unauthorized IoT devices [6]. Moreover, Doshi, Apthorpe, and Feamster achieved high accuracy distributed denial of service (DDoS) detection in traffic between WiFi devices with a variety of machine learning algorithms [6]. They developed a machine learning pipeline that performs data collection, feature selection and classification for IoT DDoS detection using different types of classifiers including random forest, K-nearest neighbors, SVM, decision trees and neural networks. Their results showed that random forest, K-nearest neighbors and neural net classifiers were very effective and successfully identified attack traffic with an accuracy higher than 0.999.

The lOT (Internet of Things) is a network of Internetenabled objects, together with web services that interact with these objects. Underlying the Internet of Things are technologies such as RPID (radio frequency identification), sensors, and smart phones. The basic idea of the lOT is that virtually every physical thing in this world can also become a computer that is connected to the Internet. To be more accurate, things do not tum into computers, but they can feature tiny computers. When they do so, they are often called smart things, because they can act smarter than things that have not been taggeds. Of course, one could question whether things would really have to feature computers to become smart. For instance, a consumer good could be considered to be already smart, when tagged with a visual code such as a bar code or equipped with a time-temperature indicator that, say, a mobile phone can use to derive and communicate the product's state of quality, dynamic carbon footprint, effect on diabetics, or origin. Certainly the boundary between smart things, which autonomously can derive and transform to different states and communicate these states seamlessly with their surroundings, and not so smart things, which only have a single status and are not very active in communicating it, is blurring. For pragmatic reasons, however, I will focus in this paper on smart things that are smart because they feature tiny low-end computers.

II. OVERVIEW OF IOT

IOT or the internet of things influences the internet and communication technologies. It connects living and non-living things with the help of internet. These devices that use the internet can be roughly considered as the primary things on the internet. However these devices require more human interaction and application monitoring. Internet of things generally excludes personal computers tablets and smart phones and it is expected to increase almost 30 fold times from 0.9 million to around 26 billion units by 2020.

The main challenge in the internet of things is regarding the vulnerability of IOT devices to malevolent program. [6]The gadgets of IOT senses the information and passes the question to interpersonal organization. by taking into consideration correspondence people searching for information given by objects which is known as human object communication with the help of RFID we can associate self-sufficient route as indicated according to the guidelines of proprietor. Internet of things is commonly referred to as “smart object networking” according to the internet engineering force .Smart objects are actually devices which have significant constraints. These limitations or constraints could be of much type.

They can be commonly classified as constraints related to limitation of power, memory and processing resources and bandwidth. According to the concept of the Internet of things, new things are often connected to serve many applications. There is also a fairly heterogeneous mix of communication technologies for addressing the needs of the various applications related to the internet of things. Internet of things provide extensive interconnectivity.

It means that with the help of the internet of things we can connect devices to access global information and communication infrastructure. In addition to that the internet of things is known to provide services that ensures consistency semantically between the virtual and the physical things. These things are often heterogeneous based i.e. they run on different hardware platforms and networks.

There are many technologies used in internet of things are:

1. Radio Frequency Identification
2. Near Field Communication
3. Machine-to-Machine Communication
4. Vehicle-to-Vehicle Communication

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. III. OVERVIEW OF WIFI

Wi-Fi which stands for wireless fidelity is one of the most widely used recently developed wireless technologies. Wireless fidelity offers excellent speed and range over most other existing wireless networks. With the widespread usage of wireless devices over these past few decades the demand for accessing wireless networks have also increased to a great extent. Wireless fidelity is extremely flexible and mobile. Over these years the access points for accessing wireless connections through wireless fidelity has increased to a great extent because of its efficiency and convenience. Wireless fidelity can be roughly divided into various standards namely IEEE 802.11b, IEEE 802.11a, IEEE 802.11g and IEEE802.11n. IEEE802.11b and IEEE802.11g [11]. Among all these standards IEEE802.11b is the oldest wireless network criterion. In addition to that it is also the most widely used Wi-Fi standard.

The maximum bandwidth of IEEE 802.11b is 11Mbps. For weaker signals, the bandwidth is adjusted to 5.5Mbps, 2Mbps and 1Mbps. Wireless fidelity features:

1. Wireless fidelity offers transmission of data over long distance as much as 1000m
2. Wireless fidelity communication provides compatibility with other devices.
3. Transmission of Data through wireless fidelity is fast. Speeds up to 600 Mbps can be achieved for meeting various requirements.
4. Wireless fidelity is comparatively secured for use.

Integration of wireless fidelity has become very common in various markets. One such example is concept of digital products. Nowadays various gadgets like television, DVD players, projectors and digital sound box have also adopted Wi-Fi Technology. These gadgets can further be connected with servers running at the background via Wireless Fidelity Network.

However there are few problems which still exist in the Wireless Fidelity Technology. They are:

1. Wireless fidelity connection is done with the help of a variety of access points. Therefore when people move in local area network the terminals need to be switched among these access points. Therefore wireless fidelity has problems of Roaming Switch.
2. Since wireless fidelity networks are easily disturbed by various signals around them, wireless fidelity networks demands stability in order to avoid unsteadiness of Wireless Fidelity.

IV. PROPOSED SOLUTION

First of all, we set up an experimental consumer IoT network and collect only benign IoT devices traffic to find the normal behavior. The sensors in the IoT system records the source MAC address, IP address, source port, client IP address and other necessary information sent from WiFi connected devices, and then send it to a central server. Given a set of authorized devices and a set of traffic data, the server creates a fingerprint for each device which contains the unique distinguishable information. Based on domain knowledge of IoT devices behavior, we extract discriminative features from the information elements in our traffic data collection. A model of the normal behavior of the device can be created by the unsupervised deep learning algorithm (autoencoder) on the server. By anomaly detection techniques, we identify patterns that do not conform to expected normal behavior in the test data. After several iterations, we can get the best performing model with the highest accuracy.

Fig.1: A high-level overview of the solution

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V. APPLICATION OF IOT IN DIFFERENT FIELDS

A. IOT in industry:

Indoor Air Quality: Monitoring of oxygen levels and toxic gas inside chemical plants to ensure workers and goods safety. Monitor the temperature inside the industry. In food factories monitoring of ozone levels during the drying meat process. Information collection from Can Bus to send real time alarms to emergencies or provide advice to drivers.

B. IOT for Smart Home:

IOT that turns the automated home into the smart home. With a combination of sensors, smart systems, IOT connects everyday objects to a network, enabling those objects to complete tasks and communicate with each other, with no human input. This in turn the home automation, connected devices and IOT you get a Smart Home. And a modern smart home can be easily controlled through a smart phone, tablet or computer.

C. IOT for Agricultural Production:

Implementing IOT in agricultural field for developing the supply and growth of the crop by collecting the information from the environment sensor. The need of agricultural products could be predicted measurably, but due to the slight difference in condition of harvest and weather change, disease and insect damage etc. could not be predicted, so that the supply and need of agricultural products has not been controlled properly. To overcome it, the IOTbased monitoring system to analyze crop environment and the method to improve the efficiency of decision making by analyzing harvest statistics.

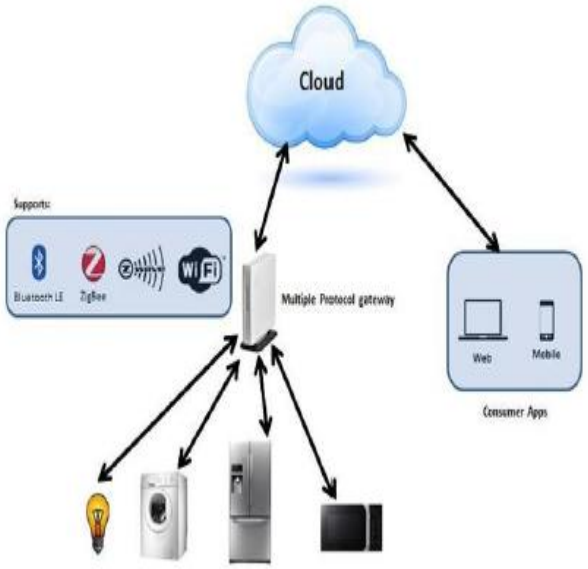

Fig 2: IOT for smart home

D. IOT for Health Care:

IOT in the healthcare application is used to observe and check the progress the health condition of patient in one end from other end of the spectrum; especially it is more useful for patient in the remote location. IOT Healthcare solutions can remotely monitor patients be affected from various disorders like diabetes, dementia, Alzheimer etc., These applications will not only improve the access to care while increasing the quality of care but also reduce the cost of care.

E. IOT in Transportation:

IOT less in amount traffic congestion in the city. GPS and time information from city buses is displaying a city-wide view of the public transport system, with the action of predicting something of bus arrivals, transit times and route congestion on a digital map of the city. Based on this information, the city can take designed to correct the action to reduce traffic congestion and keep city buses running smoothly.

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VI. CONCLUSIONS

Internet of things is a new internet application which leads to an era of smart technology where there exists thing-thing communication rather than human-human communication. Through IOT, each and every object in this world can be identified, connected and take decisions independently. In the near future the Internet and wireless technologies will connect different sources of information such as sensors, mobile phones and cars in an ever tighter manner. The number of devices which connect to the Internet is – seemingly exponentially – increasing. Internet of things is the present trending technology around the world which is the combination of information technology and real world things. IOT is the technology which makes human activities become better and comfortable. The experimental result shows that the model is able to detect anomaly flooding traffic in Wi-Fi networks based on characteristic patterns that separate normal traffic from malicious activity. However, a high false positive rate requires further research. Based on this work the following direction of the research should be considered. Firstly, to test the proposed algorithm on a dataset containing real bonnet traffic. Secondly, to assemble a sensor and investigate the capability of the model to detect abnormal behavior in a real environment.

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