iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** III **Month of publication:** March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3390

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

The Technology, Tools and Simulators of Internet of Things

G. Kalpana[1]
[1] *Asst. Professor, CBIT, Hyderabad*

Abstract: Internet of Things (IoT) is used to describe an environment where billions of objects, constrained in terms of resources ("things"), are connected to the Internet and interacting autonomously. This paper includes basic information about IOT, the IOT relation with Internet. The technology behind the IOT and it also includes the challenges and research areas of IOT. It also includes the Applications of IOT, tools and simulators which are available to develop IOT applications.
Keywords: Internet, IOT, Protocol, service, application

I. INTRODUCTION

The Internet of Things (IOT) is a system of interrelated computing devices, physical objects that are accessible through internet. The 'thing' in IOT could be a person or an automobile with built-in-sensors, i.e. objects or people that are provided with unique identifiers and the ability to transfer data over a network without manual assistance. When devices/objects can represent themselves digitally, they can be controlled from anywhere. In traditional internet content can be written by human where as in IOT content creation can be done by machine. In traditional Internet, content is consumed by request where as in Iot content can be consumed by pushing information and triggering action. In Traditional internet content is combined using explicitly defined links where as in IoT through explicitly defined operators. The main value of internet is to give answers to a specific question where as the value of IOT is providing timely information.[1]

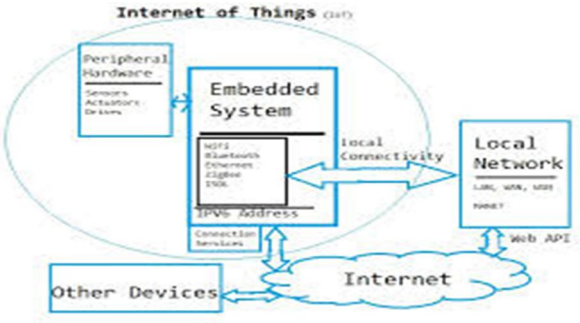


Fig1: Internet Of Things

II. TECHNOLOGY AND PROTOCOLS

IoT primarily exploits standard protocols and networking technologies. However, the major enabling technologies and protocols of IoT are RFID, NFC, low-energy Bluetooth, low-energy wireless, low-energy radio protocols, LTE-A, and WiFi-Direct. These technologies support the specific networking functionality needed in an IoT system in contrast to a standard uniform network of common systems.

A. NFC and RFID

NFC (near-field communication) and RFID (radio-frequency identification) provide versatile, simple and low energy options for identity and access tokens, connection bootstrapping, and payments.

1) NFC protocol consists of communication for electronic devices, typically a mobile device and a standard device
2) RFID technology employs 2-way radio transmitter-receivers to track and identify tags associated with objects.

B. LTE-A

LTE-A delivers an important upgrade to LTE technology by reducing its latency and raising its throughput and increasing its coverage. It gives a tremendous power to IOT through expanding its range, with its most significant applications being vehicle, UAV, and similar communication.

C. WiFi-Direct

With the Wi-Fi Direct we can establish a direct Wi-Fi connection between two devices without requiring a WiFi router .It eliminates the need for an access point. It allows peer-to-peer connections with the speed of WiFi and with lower latency.

D. Low-Energy Bluetooth

Bluetooth Low Energy is a wireless personal area network technology which is designed and marketed by the Bluetooth Special Interest Group (SIG) Bluetooth Low Energy is intended to provide considerably reduced power consumption and cost while maintaining a similar communication range.

E. Low-Energy Wireless

Low energy wireless technology replaces the most power hungry aspect of an IoT system. Though sensors and other elements can power down over long period of time, wireless communication links must remain in listening mode. Low-energy wireless reduces consumption and also extends the life of the device through less use.

F. Radio Protocols

Radio protocols like ZigBee, Z-Wave, and Thread are used for creating low-rate private area networks. These technologies are low-power and they offer high throughput. This increases the power of small local device networks with less cost.[2]
The protocols used in IOT are broken into the following layers:

1) Infrastructure (IPv4/IPv6)
2) Identification (IPv6, URIs)
3) Trans port (ex: Wifi, Bluetooth,)
4) Discovery (ex: Physical Web, DNS-SD)
5) Data Protocols (ex: MQTT, CoAP,)
6) Semantic (ex: JSON-LD, Web Thing Model)
7) Multi-layer Frameworks (ex: Homekit)[3]

III. APPLICATIONS OF IOT

Consumers can get more personal products or service offers, based on what they actually do or where they are. Businesses can discover needs for new products or services, by studying how customers can behave. Governments and public authorities can also get benefit from the IoT. For example, health and long-term care costs can be reduced with better remote support for the elderly in their own homes. As governments work to deliver quality services in increasingly complex environments, devices that have already introduced to make our life easier and more efficient for companies and consumers can also help create greater public value.[4]

A. Smart Home

Any device in home that uses electricity can be put on home network and at user command. Whether user can give that command by voice, tablet or smartphone and with remote control then that home reacts. Smart home applications are home security, home theater and entertainment, lighting and thermostat regulation.[5]

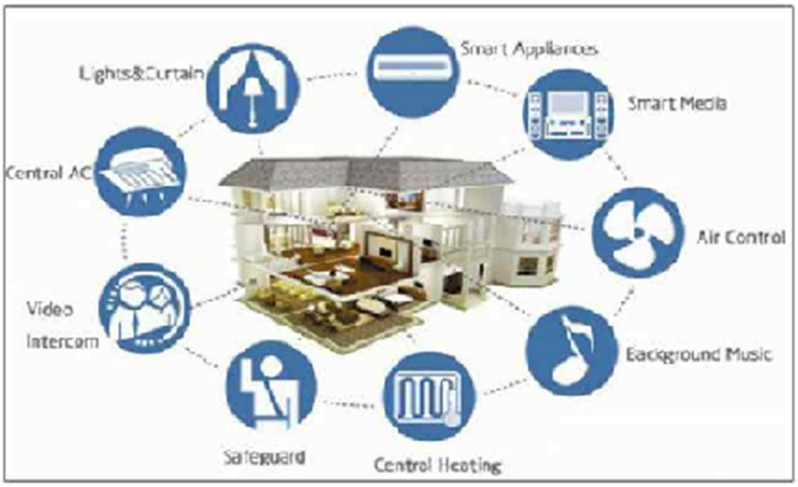


Fig:2: IOT Applications

B. Wearables

These days Wearables are very popular which are like smart watch, the Myo gesture control, or LookSee bracelet, Sony Smart B Trainer. Of all the IoT startups, wearables maker Jawbone is probably the one with the biggest funding to date. It stands at more than half a billion dollars!

C. Smart City

Its popularity is fueled by the fact that many Smart City solutions promise to alleviate real pains of people who living in cities . IoT solutions in the area of Smart City solve the traffic congestion problems and help make cities safer. Smart city spans a wide variety of use cases, from traffic management to water distribution, to waste management, urban security and environmental monitoring and also reduce noise and pollution.

D. Smart Grids

A smart grid is an electrical grid which includes many operational and energy measures including smart appliances, smart meters, energy efficient resources and renewable energy resources. Distribution of electricity, Electronic power conditioning and control of the production are important aspects of the smart grid. Smart grid can also improve the efficiency, reliability and economics of electricity.

E. Industrial Internet

The industrial internet is also one of the Internets of Things applications. While many market researches such as Gartner see the industrial internet as the IoT concept with the highest potential, its popularity doesn't reach the masses like smart home or wearable's. The industrial internet has a lot going for it.

F. Connected Car

A car is connected if it is equipped with wireless local area network and internet access and .This facility allows the car to share internet access with other devices both inside and outside of the vehicle. These days many large auto makers and some start-ups are working on connected car solutions. Software companies like Google, Microsoft, and Apple have all may announced connected car platforms ,if automobile companies are not introduced such type of cars .This car also have some special technologies ie not only with internet or wireless LAN but also provide additional benefits for the driver safety.

G. Connected Health (Digital health/Telehealth/Telemedicine)

Digital healthcare provide the services at patient location with the help of internet facility without moving to physical location ie hospitals. which also provide sports, fitness, and wellness solutions that empower patients. digital health care will reduce the cost and burden to the patient .The discipline refers to the use of information and communication technologies to address the health problems and challenges faced by patients.

H. Smart Retail

Smart retail enables moving towards into an interactive point of sale from conventional physical store. Smart Retail incorporates Powers helf, Battery Free Digital Price Tags, and Low Energy Bluetooth Beacons into a revolutionary technology solution for the retail market.

I. Smart Supply Chain

These days supply chain is becoming more efficient and effective with help of digital technologies. We achieve this by creating an integrated supply chain with suppliers, customers and partners and exchanging data with them, which increase the transparency of the entire supply chain.

J. Smart Farming

Unlike a traditional physical paper form a Smart Form is an electronic form with capabilities electronic completion, database calls and electronic submission, dynamic sections. The Australian government established a unit called the Smart Forms Developer Center which is used to encourage and assist Government Agencies to transform their current paper forms to Smart Forms. The aim is to improve their own internal processing and the service they are providing to their constituents. The remoteness of farming operations and the large number of livestock that could be monitored the IOT could revolutionize the way of farmers work. [6]

IV. TOOLS FOR DEVELOPING IOT APPLICATIONS

A. Device Hive

Device Hive is a device. Its is one of the leading development platforms for IoT applications and it is a free open source machine to machine communication (M2M) framework it was launched in year 2012 . Regardless of network configuration its cloud-based API can be controlled remotely. similarly it can also controlled management portal, protocols, and open-source libraries. Among its potential applications are smart home technology, remote sensors, security and automation. Everything you need for DeviceHive, including components, can be found on their website.

B. Kaa

Kaa is a open source kit it can be interface with just about any desired hardware including sensors, devices and gateways.it is a middleware platform for building end-to-end IoT solutions, products and connected applications. Kaa is backed by Cyber vision and its main purpose is to provide end-to-end support for connected devices across a large cloud. We can set up Kaa easily and it offers many features which can be easily plugged into the platform.

C. Arduino

Arduino is one of the better known platforms ,it refers to an open-source electronics platform and the software used to program it. Arduino is designed to make electronics more accessible to designers, artists, hobbyists and any one interested in creating interactive objects or environments. It offers both hardware and software. The IDE allows users to write code in the Arduino language. The cloud system consists of MQTT broker which enables the developers to send messages from one board to another.

D. Home Assistant

Home Assistant is is a open source home automation platform, as the name suggests, it operates on a Python based coding system that can be controlled with both mobile and desktop browsers. this is very easy to setup and has been noted for its security and privacy capabilities. The systems is updated regularly for every two weeks, and currently supports almost 250 smart devices. The software can run on anything that can also run on Python 3, including desktops and Raspberry pi.There is no hub for the Home Assistant network, there's also no cloud component but the creators believe that this lack of functionality is a sacrifice worth making because even when the internet goes down, the home stays active and your private data stays private.

E. Devicehub.net

Device Hub is an integrated solution for IoT project development. scalable IoT platform for service automation, creation, integration and connecting manufacturers and industry to iot device hub. net. It combines cloud integration with business intelligence to integrate both hardware and web technologies. It offers cloud logic, data gathering, triggers, real time remote control and analytics in a friendly user interface. It mainly offers a PaaS (Platform as a Service) through which the hardware/mobile developers can connect , remotely manage various devices. The primary objective of PaaS offering is modular and built to scale with security and performance.

F. Site Where

SiteWhere is an open source platform which is used to help companies to build scalable Internet of Things (IoT) applications and also to speed up their time-to-market with new products and services. Site where integrates with HBase, MongoDB, Horton works,, Apache Solr , Clouder and Twilio, and it supports deployment on any cloud computing platform. The platform has been tested with many different vendors, including Cloudera and Horton works. Big selling point for Site Where is the ability to deploy your own private cloud, you can safely and securely store your own data with the need to leverage the use of a third party's cloud service.

G. Zetta

Zetta is an open soure platform which is used to create IOT applications. APIs, WebSockets and reactive programming combined into a platform that is well suited for assembling various devices into data-intensive, real-time sensor networks or other Web-connected IoT applications.Zetta servers can run in the cloud unlike other iot platforms , on PCs, or on many other different types of embedded hardware platforms and single-board computers such as a Beagle Bone or Raspberry Pi. With Zetta we can link these

devices together with each other and with cloud platforms such as Heroku, to create geo-distributed networks with an architecture that is optimised for data-intensive, real-time Big Data and streaming applications.[7]

H. Particle

Particle, the open source IoT development platform formerly known as Spark, is a development platform that will allow you to securely and reliably connect your internet of things devices to the actual internet. IoT projects are delayed by a significant amount of time due to their over complexity, something which is inevitably leads to going over budget. But with particle without previous IoT experience, can ship a product in months.

I. Open Remote

Open Remote is open source IoT development platform for smart home solutions and home automation. This platform gives developers a large choice in devices and network specs and the cloud based design tools for UI.It is a convenient tool for beginners that will ensure you'll be developing IoT solutions for your smart home in no time.

J. *MOcana* is a new full stack IOT platform.it is having device to cloud security model. This platform aims to provides the security to Industrial IOT devices and industrial clouds..it provides high performance.[13]

V. CHALLENGES OF IOT

A. Security

increasing the number of connected devices increases the opportunity to exploit security vulnerabilities. poorly designed devices can be put at risk.

B. Privacy

Integrating traceable, voice recognition or vision featured devices into our environments without us consciously using them leads data protection and privacy law.

C. Standards

poorly configured devices can have negative consequences for the networking resources which are connected to the broader Internet. Configuring larger numbers of IoT devices, the need for thoughtful design and standardization of configuration tools ,interfaces and methods coupled with the adoption of IPv6, will be essential in the future.

D. Regulation

Conflicts between law enforcement surveillance and civil rights, cross border data flow, data retention and destruction policies and security breaches or privacy lapses, legal liability for unauthorized uses are few legal issues with IoT.

E. Development

To take advantage of the IoT potential,less-developed regions will need to address market readiness, policy requirements, and technical skill requirements.[8]

VI. SIMULATORS

The design of complex IoT setups requires the support of the usage of scalable simulators.

A. Iotify

Iotify is a very powerful IoT simulator that allows you to quickly develop IoT solutions in the cloud. This tool allows to simulate large scale IoT installations in your own virtual IoT lab. It also used to generate customizable traffic from thousands of virtual endpoints and also for providing security and reliability in order to identify and fix issues .

B. Matlab

MATLAB features an interesting IoT module that allows to develop and test smart devices, collect and analyze IoT data in the cloud. Iot platforms collect data from smart devices, aggregate it in the cloud and then analyze it in real time. Patterns and

algorithms are then extracted and engineers can then use this information to create prototype algorithms and execute them in the cloud. MATLAB can be used to prototype and to build IoT systems. More specifically, we can develop algorithms in Simulink and then deploy them on embedded hardware.

C. Netsim

Fig3.:Netsim simulator

Net Sim is network simulator tha can be used to simulate IoT systems. we can also use it to test the performance of real applications over a virtual network. NetSim can be used to predict how the respective network will perform for building a new IoT network from the ground or expand an existing one. This simulator supports many sources and destination and can be scaled to hundreds of nodes. simulating a wide variety of situations with the help of the' What-if' scenarios and test metrics such as delay, loss, error, quality of service, and many more.

D. Bevy Wise IoT Simulator

Bevy Wise IoT is a Simulator , which is a complex and easy to use. This tool allows to simulate tens of thousands of IoT devices. IoT Simulator allows to test your cloud and on premise MQTT Application for functional and load testing. The clean and powerful UI allows to create and add the necessary devices in no time. one can configure the simulated IoT devices so as to publish messages at a very precise time. IoT Simulator can store simulation data in FLAT files or MySQL and SQLite databases. The tool supports tens of thousands of IoT devices on Windows 7 and later.

E. Ansys Iot Simulator

This Ansis IoT simulator can be used to develop and test the IoT devices and networks of tomorrow. Ansys collaborated with the best IoT leaders in the world, across industries, to build comprehensive framework for IoT engineering simulation. we can also use this tool in a variety of fields like drones, connected cars, wearables and medical devices, industrial equipment, and many more. Ansys' IoT simulation solutions helps to build more affordable and profitable devices..

F. IBM Bluemix

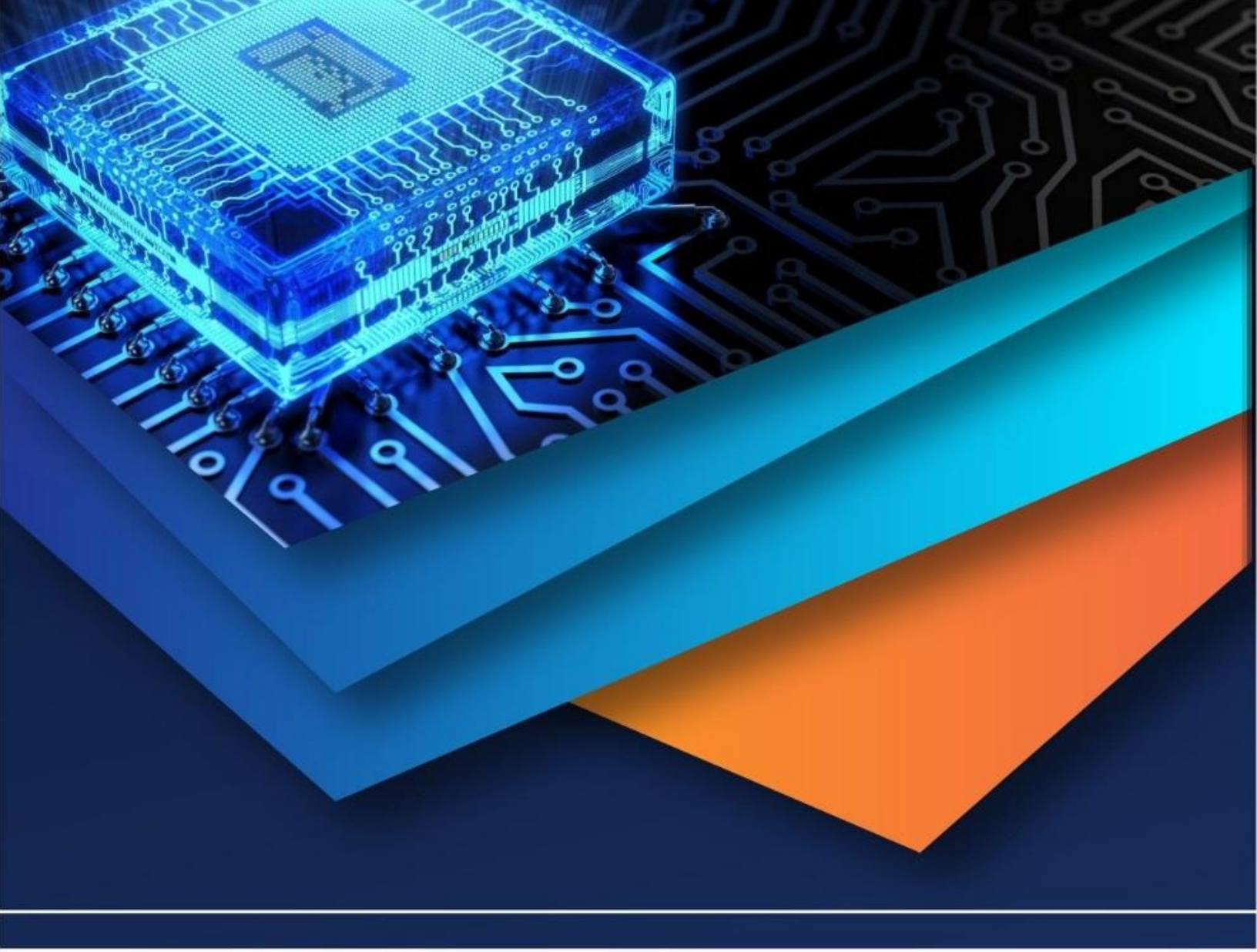
This simulator is high quality cloud platform that allows to reduce risk, to sample the company's Internet of Things Platform even if you don't have a physical device using simulated data. The built-in web console dashboards lets you monitor and analyze your simulated IoT data and then use it to build and optimize your own applications. This tool supports a wide variety of functions for manipulating data, storing it and even for interfacing with social media. Many independent developers use to implement, prototype, deploy, and iterate applications based on shifting business priorities. Bluemix runs and integrates open source projects, offering them in a single platform across public, dedicated, and on-prem.[9]

VII. CONCLUSION

IOT is the network of some physical objects, devices, vehicles, buildings , software, and other items embedded with electronics, sensors, and network connectivity-that enables these objects to collect as well as exchange data.[10,11] There are many challenges to face related to the deployment, growth, implementation and use of this technology. Lot of research is carried out in this area. But there is still a need for further research in this field because of the ever increasing demands of users. [12]

REFERENCES

[1] Dr. Opher Etzion ,May 27, 2015, "difference between Iot and traditional Internet" and it is retrived from the link https://www.rtinsights.com/differences-between-the-iot-and-traditional-internet/
[2] technology and protocols" retrieved from the link https://www.tutorialspoint.com/internet_of_things/internet_of_things_technology_and_protocols.htm
[3] Suraj Choudhari1 , Tejas Rasal2 , Shubham Suryawanshi3 , Mayur Mane4 , Prof. Satish Yedge5 titled"Survey Paper on Internet of Things: IoT "in IJESE vol7
[4] Ms. Yogita Pundir1, Ms. Nancy Sharma2, Dr. Yaduvir Singh3 titled " Internet of Things (IoT) : Challenges and Future Directions" Vol. 5, Issue 3, March 2016 Copyright to IJARCCE
[5] Molly Edmonds & Nathan Chandler,"how smart home works" retrieved from the link https://home.howstuffworks.com/smart-home.htm
[6] Knud Lasse Lueth "IOT analysis " retrieved from the link .https://iot-analytics.com/10-internet-of-things-applications
[7] david berlind https://www.programmableweb.com/api/devicehive,] and IOT tools retrieved from the link http://www.cbronline.com/news/internet-of-things/10-open-source-software-tools- developing- iot-applications/,]
[8] [Robbie Mitchell on 20 Oct 2015"clallenges of the internet of things" retrieved from the link "https://blog.apnic.net/2015/10/20/5-challenges-of-the-internet-of-things/
[9] Madeleine Dean, August 27, 2017 C:\Users\Lenovo\Dropbox\1. IJRASET\03. Final-March 18\,
[10] Anupama Kaushik paper titled on "IOT-An Overview" International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 3, March 2016
[11] Jaehak Byun1, Sooyeop Kim2, Jaehun Sa3, Sangphil Kim4, Yong-Tae Shin5 and Jong-Bae Kim6* ,"Smart City Implementation Models Based on IoT Technology " Advanced Science and Technology Letter
[12] Hafsa Tahir1, Ayesha Kanwer2 And M. Junaid3 A Paper Titled " Internet Of Things (Iot): An Overview Of Applications And Security Issues Regarding Implementation" International Journal Of Multidisciplinary Sciences And Engineering, Vol. 7, No. 1, January 2016
[13] BySantosh Singh-March 8, 2016 vhttps://internetofthingswiki.com/top-20-iot-platforms/634/]



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY