INTERNET OF THINGS: APPLICATIONS, BARRIERS AND ITS STATUS

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***Abstract*-- Over a decade Internet has been playing major role in the process of digitalization and improving the standards of communication levels of the people. Internet is continuing to be more strong and persistent with the introduction of the wireless broad band connectivity. With the help of this internet, a new revolutionary technology called Internet of Things (IOT) is implemented where everything in this world is connected to internet. Although a lot of work has been done in the working implementation of IOT it is still facing many difficulties in the real world environment. This paper gives the information about employment opportunities generated by IOT and present trends of IOT business levels and role of government to implement it.**

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***Keywords*—Internet of Things (IOT), IOT Applications, Government Role, IOT Challenges**

A. INTRODUCTION

The Internet of Things (IOT) is and powerful and clever network which is capable of connecting all the things in the world to the internet in order to enable the information exchange and communication through the various devices with the set of various protocols. It has the capability to identifying the things intelligently and managing, monitoring them. It is one of the enhanced application of internet based network which has the capability of sharing information not between human-human but also human-things and things-things. It also enhances the interaction among the physical and virtual world. In IOT all the things are connected to one another using internet, Radio Frequency Identification Technology (RFID) and sensor technology. The IOT has various definitions which are given by different organizations are given below

Organizations	Definitions
CCSA	A network, which can collect information from the physical world or control the physical world objects through various deployed devices with capability of perception, computation, execution and communication, and support communications between human and things or between things by transmitting, classifying and processing information [2].
ITU-T	A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies [3].
EU FP7 CASAGRAS	A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities [4].
IETF	A world-wide network of interconnected objects uniquely addressable based on standard communication protocols [5].

Now a days the technology has been advanced as more devices which has more power of computing and storage came into play with low cost. The IOT mainly makes use of things which have higher computing capacity and efficient storage capability which has the ability to embed into other devices and systems. For the efficient functioning of IOT it should possess the following characteristics

1) *Secure Transmission Network*: Through the availability of various networks we can avail internet object information at any time. These networks should ensure the secure and reliable transmission of information. There includes two types of transmission technologies which are wired transmission and wireless transmission. IOT mainly uses wireless technology which is vulnerable to many attacks as it is having less

security. So it is necessary to have an reliable communication for the efficient performance.

2) *Intellectual Processing*: IOT includes the collection of data from various sources to the databases. IOT data can be processed by using various efficient processing techniques including cloud computing technique. The NSP has the ability to process more than millions of message at a time with the help of cloud computing, so for this reason the cloud technology acts as a big promoter of IOT.

3) *An Operations analysis* : IOT is combination of Big Data and advanced analytics in Exploration and Development activities, where managers and experts can perform strategic and operational decision-making. IOT should have the operation analysis capability to perform the operations.

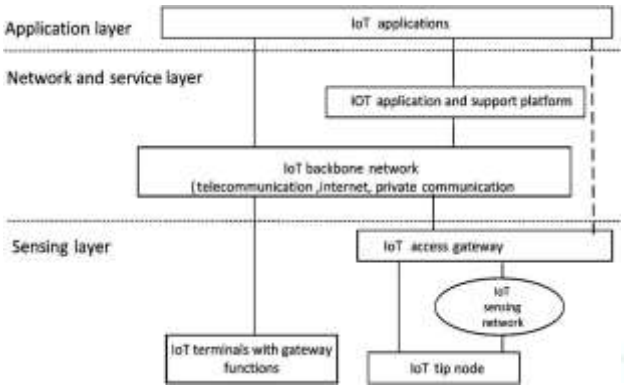
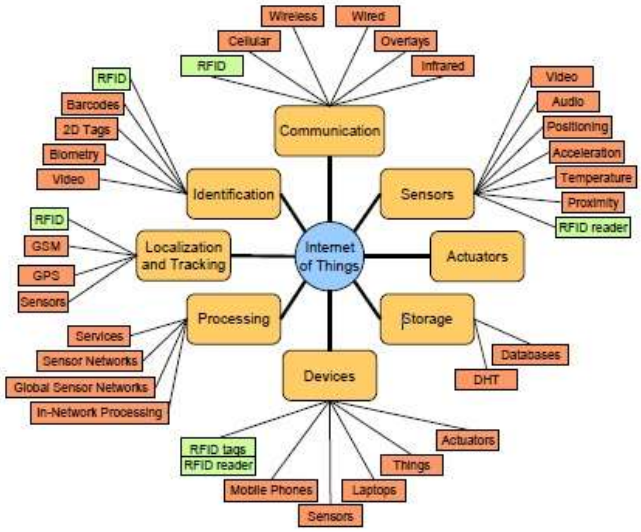


Fig. CCSA proposed IOT open architecture

B. STATUS OF IOT

The IOT can be considered as improvement in existing communication between people and the things. The IOT development is an very large scale technology innovation and computation process. It is presently growing in a large extent as that of vertical scale to polymorphic scale application. During the deployment of IOT applications, the domain specific application is the more important strategy. It is a control application which has its own manufacturing and industrial characteristics. It is also capable to provide various management activities in the enterprise sector so that the services can be joined with processing of business and industrial production.

The below figure shows the categorization of topics and technologies in Internet of Things



Categorization of topics and technologies in the Internet of Things

Polymeric applications are the another sort of applications which are mainly used in IOT and are called as cross industry applications which is able to serve service sector platforms of public information. This sort of applications are capable of serving both the home and industrial purposes. Everything which is from the physical or virtual world can be connected by IOT. For the efficient IOT technology intellectual learning, Fast deployment of applications, secure privacy protection, finding and preventing malicious attacks are essential requirements.

C. IOT APPLICATIONS CAPABILITY

In brief context, the IOT applications have the following capabilities

1) *Sensing of Location and sharing Location Information*: The IOT system gathers the location data of IOT nodes and terminals and then it starts providing the service based on the collected data. The location information also includes the relational or absolute positional information between the things. It is also useful in geo sensing networks.

2) *Temperature sensing*: IOT has the ability to process all the physical temperature conditions with the help of their terminals which are widely deployed at various locations. The environment sensing includes the collection of information about temperature, radiation, and percentage of various

gases in air, pollution information, and intensity of light, velocity of air.

3) *Traffic Information System*: This IOT application can get various information regarding traffic conditions such as traffic jams and on road traffic conditions by tracking the location information of vehicles. As this helps the end user to choose the efficient route.

4) *Ad Hoc Networking*: All IOT applications are capable of networking in an organized and efficient way and can interact with network layer to provide various services to the users upon their requirements

5) *Secure Communication*: The IOT applications are capable of establishing a secure channel of communication between service area and its terminals based on user requirements. This is the most important of IOT applications.

Fields	Typical applications
Industry	Production process control, industrial environmental monitoring, manufacturing supply chain tracking, product lifecycle monitoring (PLM), safety in manufacturing, and energy saving and pollution control.
Smart agriculture	Agricultural resources utilization, quantitative management in agricultural production process, production and cultivation of environmental monitoring, management of quality, safety and traceability of agricultural product.
Smart logistics	Inventory control, distribution management, traceability and other modern logistic system, public logistics service platform covering different zones and domains, with Smart e-commerce and smart logistics.
Intelligent transportation	Traffic state perception and notification, traffic guidance and Intelligent control, vehicle positioning and scheduling, remote vehicle monitoring and service, vehicle and road coordination, and integrated smart transportation platform.
Smart grid	Monitoring of power facilities, smart substation, automatic power dispatch, smart power, smart scheduling, Remote meter reading.
Smart environmental protection	Pollution source monitoring, water quality monitoring, air quality monitoring, environmental information collection network and its information platform.
Smart safety	Social security monitoring, monitoring of dangerous and chemicals cargo transportation, food safety monitoring, early warning and emergency response for infrastructures such as Important bridges, buildings, rail transit, public water supply/drainage, and the municipal pipe network.
Smart medical	Intelligent drug/medicine control, hospital management, collection and analysis of Human physiology and medicine parameters, and remote medical service for family and community.
Smart home	Home-area network, home security, smart control of household appliances, smart metering, energy saving and low carbon, and distance learning.

D. GOVERNMENT ROLE

The government should take major role in expanding the benefits of IOT to all people and concurrently should reduce the negative impacts.it is necessary for governments to work in collaboration with each other to achieve international standards.it should also focus on implementation of IOT systems and how it meets the accountability and openness of the citizens.it should focus on following key areas.

1) *Development strategies of economy*: The development of IOT in the various sectors depends on the various development strategies adopted by the government for economic development. These strategies helps in prompting business environments that encouraging the development of IOT in the fields of R&D, education system. Government should also concentrate on private sector implementations of IOT which helps in achieving goals based on sustainability of environment, effective transformation mechanism and public safety protection.

2) *Efficiency Mechanism and Delivery of Service*: The bodies which are present in the public sector provides many wide range of opportunities to create new services and also improving the previous services.at the city level, the applications include signal lighting, traffic management, water and waste management.at the national level, the application will include collection of taxes, board protection and protection of infrastructure.

3) Regulation Policies: Government should include in continuous policy making and control of regulations with respect to IOT. The policies need to be implemented for the resource management and allocation strategies and also to guarantee in efficient marketing strategies. Many of the devices becoming SMART by connecting to the internet network, government should ensure to provide safety as a part of policy.

E. IOT HIGH IMPACT FIELDS

1) Customer service: The IOT mostly deals with many devices which are latest fast, accurate. As these devices are new, most of the people are not at all familiar with them which invokes many doubts regarding the usage of devices. So a lot of customer service centers should start up to clear the doubts of the customers. In this way IOT provides a lot of opportunities in the customer service sector.

2) *Data base management analysis*: Implementation of IOT includes storage and processing of large volume of data. IOT uses massive data bases to store the data, for the effective implementation data base should be well managed and

maintained. So, this provides well opportunities for the persons who have the sound knowledge of data base analysis.

3) *Network security maintenance*: IOT not only deals with the information exchange between human-human, but also deals with the information exchange between the things-things which is popularly called as machine 2 machine (M2M) interaction. So, in order to enable secure transmission of information proper security system should be implemented. So, the people who are good at network security and maintenance has a lot of opportunities in the future if they are perfect with their subject.

4) Electronic arena: IOT purely uses the latest electronic gadgets which has high computation and processing power. As, everything to be connected to internet uses a electronic device the sales of electronic devices increases up to 100% with in the upcoming 10 years. Electronics sector is going to provide a lot of employment opportunities in future.

5) Development of sensors and embedded chips: IOT mainly uses the powerful sensors and embedded chips to detect the presence of the thing or the person. So, the manufacturers of high efficient and well developed chips and sensors are going to have huge profits in the future years.

F. OBSTACLES TO IOT

1) Lack of skill in the employee: As, IOT is an emerging technology, most of the employee does not know how to deal with such huge amounts of data and maintain the appropriate network security. So, the employees should increase their skill to deal with IOT data which in turn results in effective functioning of IOT.

2) *Immature standards of industry around IOT:* For effective implementation of IOT the industrial company should follow a lot of standards. Most of the companies are newly emerging companies and most of them were unable to follow the appropriate standards. So standards and levels of companies should be improved.

3) *High investment costs of IOT infrastructure:* IOT includes a lot of devices and high maintenance system for effective functioning. It requires huge infrastructure, in order to purchase such infrastructure huge investments should be involved. As this is an latest emerging technology most of the people are not at all having sound knowledge about the functioning of IOT, because of this reason investments are lagging in the field of IOT.

4) *Lack of guiding skill by senior management*: Most of the latest trending technologies lack guiding skill. As most of the employees were not perfectly aware of the trending technology, they cant perfectly guide the fresher's people who are entering into the global market. So perfect guidance is necessary for the effective implementation of IOT.

5) *Low level of consumer awareness about IOT*: Most of the consumers are not at all aware of the devices which they are using presently, as IOT includes very high edge cutting line technology devices users will not at all have knowledge of devices. If they have any small problem they do not even know how to rectify it.

6) *Inconsistency of network availability*: Presently we are using IPV6 to provide service to the end users, and present network has many loop holes, frequent dis connections and low uplink capacity.so all the network problems must be resolved for the effective functioning of IOT.

7) *More breach points and new threats*: As IOT deals with huge amount of data there is a chance to access that data in illegal manner and the security can be easily breaches, providing security to huge data is a tedious task and there is also a chance of new threats for the data.

G. CONCLUSION

Development strategies for the IOT is not different from that of other technologies. The IOT provides global opportunities in employment, only need is that, the employee should develop efficient skill and knowledge in that concerned field of implementation and government should also provide wide range of functionalities for the development of IOT in the public and private sectors. If these hurdles are overcomed there is no doubt that IOT will provide millions of job opportunities to many individuals and contribute to the economic development of country.

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