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A Review on Globalize Internet of Things (IoT) and Applications

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ABSTRACT: The Internet of Things(IoT) has a power to change the world by using smart applications. There are numbers of enabling technologies which can be integrated with IoT to change global scenario. It has a important fundamentals characteristics by using it can save power, cost, efforts and environment. We have to create efficient technology,software and applications for its implementation. Even though there are limitations, we have to overcome it because of its advantages and spread the globalize wave to make applications smart.

KEYWORDS: Globalize; Smart System ; Enabling Technologies; Applications.

I. INTRODUCTION

The Internet of Things(IoT) has a globalize wave which has a capacity to change the world. An IoT can be defined as "An Interrelated network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting according to the situations and changes in the surrounding." The Internet of Things brought a revolution in the field of IT . The phrase "Internet of Things" which is also shortly well-known as IoT is coined from the two words i.e. the first word is "Internet" and the second word is "Things". The Internet is a global system of interconnected computer networks that use the standard Internet protocol suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. Google ,Apple, Cisco etc. have taken the decision to position themselves in the IoT arena. These are the ICT players who connected internet and things together. Not only the assimilation of ICT concepts and their constituencies are pivotal but also integrating them in smart environments and ecosystems across specific application domains. The overall challenge is to extend the current Internet of Things into a dynamically configured web of platforms for connected devices, objects, smart environments, services and persons.

The evolution of the Internet of Things embedded in Smart Environments and Smart Platforms forming a smart web of everything as one of the next big concepts to support societal changes and economic growth, which will support the citizen in their professional and domestic or public life. By the end of the decade, dozens of connected devices per human being on the planet are conservatively anticipated, relating to a business whose yearly growth is estimated at 20%. In this context Europe needs to maintain its position through leadership in smart and embedded systems technologies with a strong potential in the evolving market of cyber-physical systems [1].

II. ENABLING TECHNOLOGIES

The Internet of Things is a technological revolution that represents the future of computing and communications, and its development depends on dynamic technical innovation in a number of important fields, from wireless sensors to nanotechnology .The first Internet appliance was a Coke machine at Carnegie Melon University in the early 1980s. Programmers working several floors above the vending machine wrote a server program that chased how long it had been since a storage column in the machine had been unfilled. The programmers could connect to the machine over the Internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them, should they decide to make the trip down to the machine. Though the buzzword "Internet of Things" evolution was set out a way back in 1980's with coffee vending machine, the original term is coined by Kevin Auston, the Executive

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Director of Auto-ID Labs in MIT in 1999. The concept of IoT first became very popular through the Auto-ID centre in 2003 and in related market analysts publications. Right from the beginning the Internet of Things evolution started, there were many things or objects connected to the internet for the different applications through diverse technologies depending on the type of object for the comfort ability of Human[2].There are some important areas as shown in below figure-1 where IoT can do best.

Figure-1 Internet of Things — Enabling Technologies

Enabling technologies for the Internet of Things considered in [3] can be grouped into three categories: i) technologies that enable “things” to acquire contextual information, ii) technologies that enable “things” to process contextual information, and iii) technologies to improve security and privacy. The first two categories can be jointly understood as functional building blocks required building “intelligence” into “things”, which are indeed the features that differentiate the IoT from the usual Internet. The third category is not a functional but rather a de facto requirement, without which the penetration of the IoT would be severely reduced. Internet of Things developments implies that the environments, cities, buildings, vehicles, clothing, portable devices and other objects have more and more information associated with them and/or the ability to sense, communicate, network and produce new information. In addition the network technologies have to cope with the new challenges such as very high data rates, dense crowds of users, low latency, low energy, low cost and a massive number of devices[4].

III. FUNDAMENTAL CHARACTERISTICS

The fundamental characteristics of the IoT are as follows [5]:

- Interconnectivity: With regard to the IoT, anything can be interconnected with the global information and communication infrastructure.
- Things-related services: The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. In order to provide thing-related services within the constraints of things, both the technologies in physical world and information world will change.
- Heterogeneity: The devices in the IoT are heterogeneous as based on different hardware platforms and networks. They can interact with other devices or service platforms through different networks.

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- Dynamic changes: The state of devices change dynamically, e.g., sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed. Moreover, the number of devices can change dynamically.
- Enormous scale: The number of devices that need to be managed and that communicate with each other will be at least an order of magnitude larger than the devices connected to the current Internet.

IV. FUTURE TRENDS AND RECOMMENDATIONS

In figure -1, different areas are indicated which has impact on economic growth. The Internet of Things (IoT) has a potential economic impact of $2.7 to $6.2T until 2025. The figure -2 Accessed from the URL dated on 08/11/2017 : https://blogsimages.forbes.com/louiscolumbus/files/2016/11/McKinsey.jpg

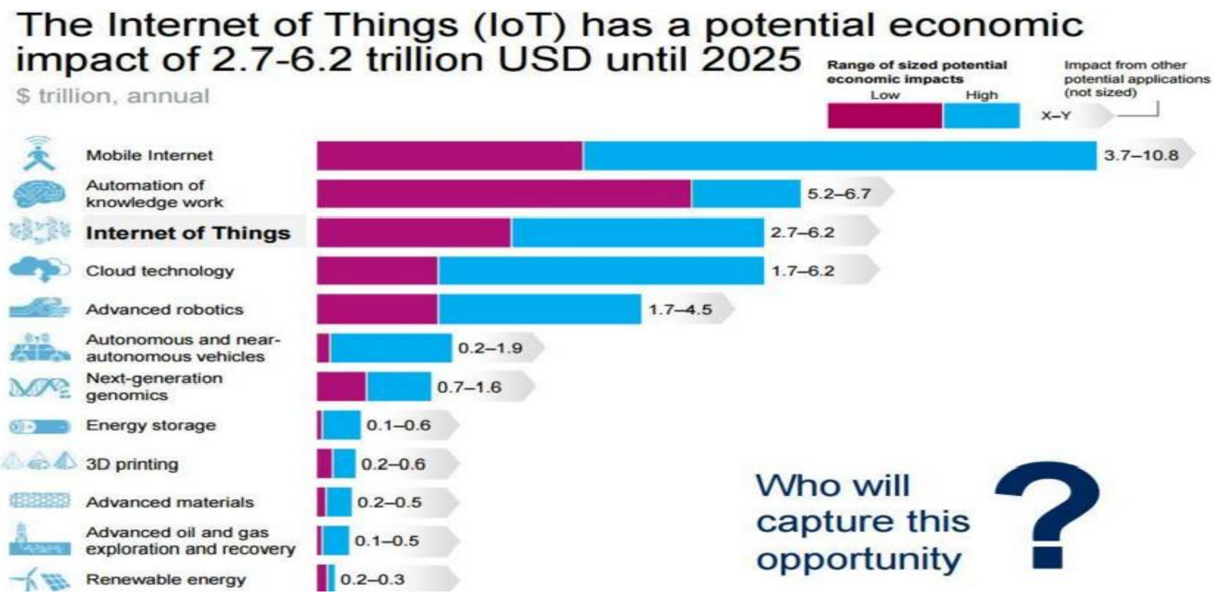

Figure-2 Economic impact of IoT until 2025.

In the future, the number and types of IoT devices will increase, therefore inter-operability between devices will be essential. More computation and yet less power and lower cost requirements will have to be met. Technology integration will be an enabler along with the development of even lower power technology and improvement of battery efficiency. The power consumption of computers over the last 60 years was analyzed in [6] and the authors concluded that electrical efficiency of computation has doubled roughly every year and a half. A similar trend can be expected for embedded computing using similar technology over the next 10 years. This would lead to a reduction by an order of 100 in power consumption at same level of computation.

The green products and services will be replaced by smart products and services. Smart products have a real business case, can typically provide energy and efficiency savings of up to 30 per cent, and generally deliver a two- to three-year return on investment. This trend will help the deployment of Internet of Things applications and the creation of smart environments and spaces. The Internet of Things (IoT) is based on the existence of billions of devices that are connected directly to the Internet and that make it possible to store and circulate all the information the machines collect and produce, without human intervention. That collection of data is becoming an essential harvest for farm production; according to a report by Machina Research, in 2014 there were only 13 million agricultural devices connected to the Internet, but by 2024 there are expected to be 225 million.

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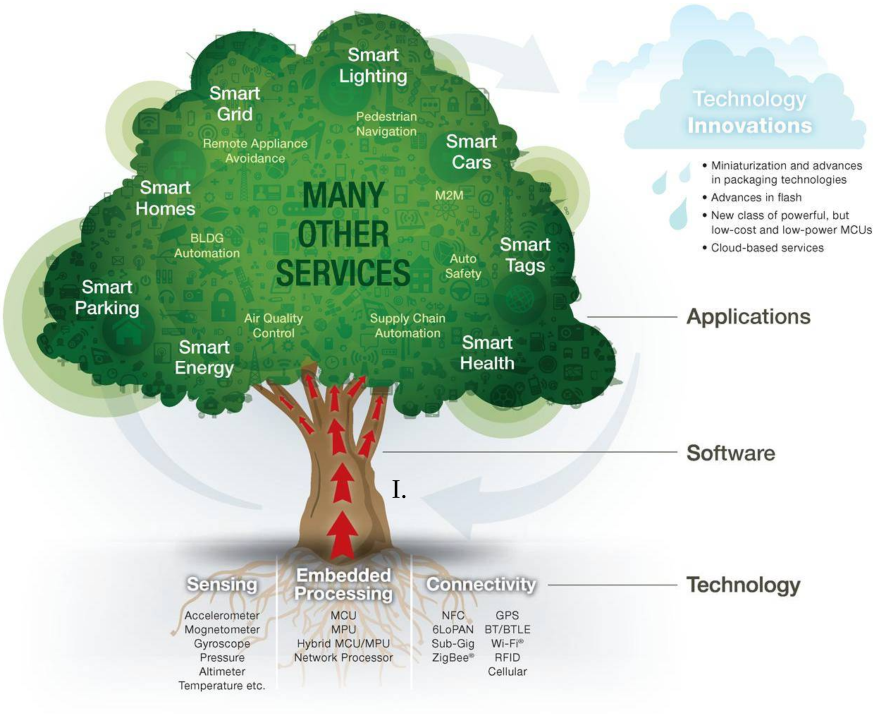

Figure- 3 IoT Pillars

V. CHALLENGES IN IOT

IoT is very useful concept but has important challenges like security,privacy and trust.An IoT applications and services is being used by multiple administrative domains and involve multiple ownership regimes, there is a need for a trust framework to enable the users of the system to have confidence that the information and services being exchanged can indeed be relied upon. The trust framework needs to be able to deal with humans and machines as users, i.e. it needs to convey trust to humans and needs to be robust enough to be used by machines without denial of service.

As the IoT is becoming a key element of the Future infrastructure, the need to provide adequate security for the IoT infrastructure becomes ever more important. IoT applications generally uses hardware such as sensors and actuators collectively to collect large volumes of data.

In case of hardware, maintaining energy consumption and avoid operational failures puts real impact on the environment. For example in the refrigerator industry, a refrigerator failing to maintain proper cooling temperatures could place high value medical or food inventory at risk. Having all of these devices connected, it is as well needed have the right data model. The data model is related with database The database read/write performance is critical, particularly with high data rate sensor data. The database must support high-speed read and writes, be continuously available (100% of the time) to gather this data at uniform intervals and be scalable in order to maintain accuracy.

Privacy is related with the personal data as much of the information in an IoT system may be personal data, there is a requirement to support anonymity and restrictive handling of personal information. Cryptography, Authentication and authorization,etc. provides the Privacy.

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VI. COMMUNICATION IN IOT

IoT uses combination of hardware and software. To develop software ,the programming languages such as C,JAVA,Python,PHP,Swift and other scripting languages. The IoT nodes use separate IoT gateways if there is needed protocol conversion, database storage, or decision making in order to supplement the low-intelligence node. If domains want to share information then there is need to exchange information. There are two important architecture for data exchange one is bus-based, and second is broker-based.

In the broker-based architecture, the broker controls the distribution of the information. For example, it stores, forwards, filters and prioritizes publish requests from the publisher (the source of the information) client to the subscriber (the consumer of the information) clients. Clients switch between publisher and subscriber roles depending on their objectives. Examples of broker –based protocols include Advanced Message Queuing Protocol (AMPQ), Constrained Applications Protocol (CoAP), Mes-sage Queue Telemetry Transport (MQTT) and Java Message Service API (JMS).

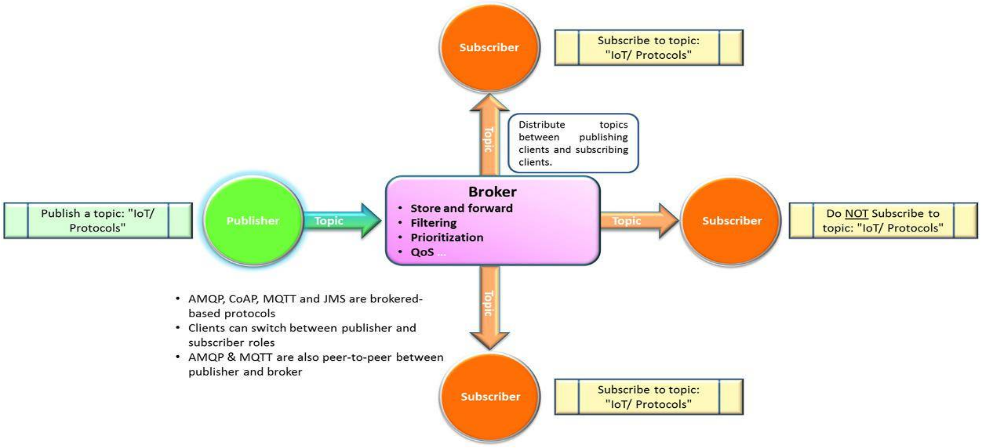

Figure 4 - Broker based architecture for data exchange

In the bus-based architecture, clients publish messages for a specific topic which are directly delivered to the subscribers of that topic. There is no centralized broker or broker-based services. Examples of bus-based protocols include Data Distribution Service (DDS), Representational State Transfer (REST) and Extensible Messaging and Presence Protocol (XMPP).

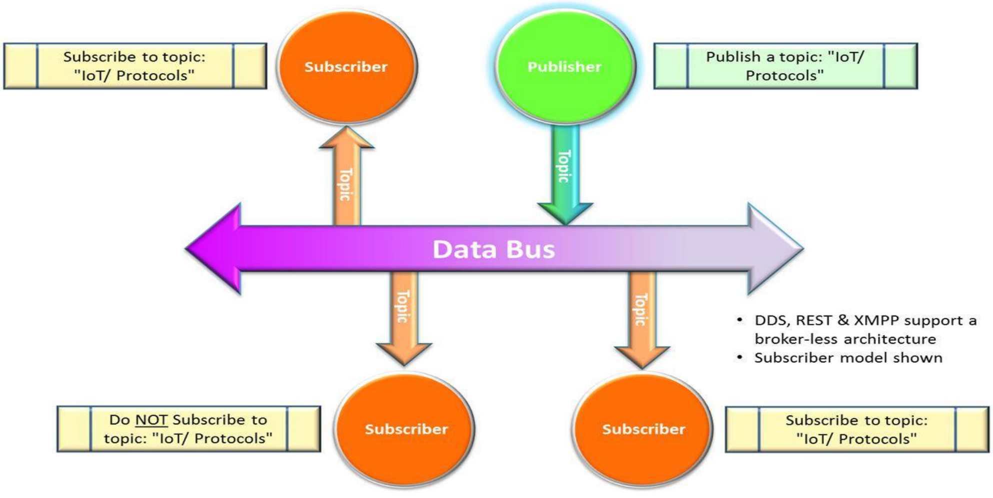

Figure 5– Bus based Architecture

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VII. APPLICATIONS

An IoT helps to various organizations according to their need like at Railway station, Bus stand and Air-port to display the information and notification. In mall it is also used to control the humidity and temperature of mall via central AC by using temperature sensor.

Smart cities:- To make the city as a smart city following points can be implemented

- Monitoring of parking areas availability in the city.
- Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.
- Detect Android devices, iPhone and in general any device which works with Bluetooth interfaces or WiFi .
- Measurement of the energy radiated by cell stations and Wi-Fi routers.
- Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.
- Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Medical field:-

- All Detection: Assistance for elderly or disabled people living independent.
- Medical Fridges: Monitoring and Control of conditions inside freezers storing medicines ,vaccines, and organic elements.
- Sportsmen Care: Vital signs monitoring in high performance centers and fields.
- Patients Surveillance: Monitoring of conditions of patients inside hospitals and in old people's home.
- Ultraviolet Radiation: Measurement of UV sun rays to warn people not to be exposed in certain hours.

Industrial Control:-

- Machine to Machine Applications: Machine auto-diagnosis the problem and control.
- Indoor Air Quality: Monitoring of oxygen levels and toxic gas inside chemical plants to ensure workers and goods safety.
- Temperature Monitoring: Monitor the temperature inside the industry
- . Ozone Presence: In food factories monitoring of ozone levels during the drying meat process.
- Vehicle Auto-diagnosis: Information collection from Can Bus to send real time alarms to emergencies or provide advice to drivers.

Security & Emergencies:-

- Perimeter Access Control: Detection and control of people in non authorized and restricted.
- Liquid Presence: Liquid detection in data centers, sensitive building grounds and warehouses to prevent breakdowns and corrosion.
- Radiation Levels: In nuclear power stations surroundings distributed measurement of radiation levels to generate leakage alerts.
- Explosive and Hazardous Gases: Detection of gas leakages and levels in industrial environments, surroundings of chemical factories and inside mines.

Domestic & Home Automation:- In home by using the iot system remotely monitor and manage our home appliances and cut down on your monthly bills and resource usage.

- Energy and Water Use: Energy and water supply consumption monitoring to obtain advice on how to save cost and resources.
- Remote Control Appliances: Switching on and off remotely appliances to avoid accidents and save energy.
- Intrusion Detection Systems:Detection of windows and doors openings and violations to prevent intruders.
- Art and Goods Preservation: Monitoring of conditions inside museums and art warehouses.

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Smart agriculture:-

- Wine Quality Enhancing: Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.
- Green Houses: Control micro-climate conditions to maximize the production of fruits and vegetables and its quality.
- Golf Courses: Selective irrigation in dry zones to reduce the water resources required in the green.
- Meteorological Station Network: Study of weather conditions in fields to forecast ice formation, rain, drought, snow or wind changes.
- Compost: Control of humidity and temperature levels in alfalfa, hay, straw, etc. to prevent fungus and other microbial contaminants.

VIII. CONCLUSION AND FUTURE WORK

In this paper we analyzed the globalize importance of IoT in present and future. We know about its characteristics, applications, how communication takes place in it and other things. There are number of challenges to implement it. Even though there are limitations, we have to overcome it because of its advantages and spread the globalize wave to make applications smart.

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