INTERNET OF THINGS OBJECTIVES, BENEFITS, AND APPLICATIONS

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***ABSTRACT**: Nowadays information technology is developed to be as one part that covering different phases related to the spread of the Internet and the Web into the tangible infrastructure which called as the Internet of Things. The Internet of Things (IoT) is considered important knowledge that adapted the human to live in a smart and speed life, through enabling things to communicate with other objects, such as machines and as a whole everything altogether with peoples. IoT describes a system that contains many things that are exiting in the real world, along with sensors attached to them or embedded in these things, and connected to the Internet through a networked structure both as wireless or wired media to gain the target of it in development and evolutionary way. This paper focuses on definition, benefits and objectives, architectures, some applications of IoT. Furthermore, it addresses a case study for the application of the concept of "Internet Objects"(Eol) in California, USA with their effects in the Arab world.*

Keywords— Internet of things Application, automatically, Objectives, Benefits. Architecture, layers, Internet Objects

INTRODUCTION

Internet of things is not a new term that appeared in the space of technology since it was used by industry to track products and manufacture complex items. The Internet of Things (IOT) describes a situation where huge numbers of objects are interconnected using a network like the Internet. These objects have the ability to send and receive data.

The Internet of Things (IoT) is one of the well-known most familiar and boosting among other business and technologies recently.

It is expected to see 20 billion things that are Internet connected by 2020 which are not general-purpose devices, like ordinary smartphones and computers, but rather these objects assigned specific tasks, Such as vending machines, Air Finder, location tracking, connected vehicles and many numberless other examples.

By transforming many organizations into digital businesses, IoT is facilitating new business models, improving the efficiency of business and increasing engagement between employee and customer.

Not only, the means by which enterprises can make a reality of the benefits are will be different and, in sometimes hard, but also the great obstacle to the IoT is that ignorance of knowledge in most enterprises to the using of technology. Even if the enterprises have plans for the IoT, there is still a concern over who will drive these initiatives. Actually, this need is a chance for CIOs in enterprises to fill the position of IoT leadership.

The Internet of Things

Now the IOT is becoming more popular and entered the commercial domain, where small watching devices allow these objects or things, for instance, cars, doors, ovens, garage and even things used in the medical industry like the human heartbeat to be checked using a computing device. Examples of the goods use of the IoT are the wearable devices that measure gym activity and send information online. The driving engine for this IoT is the inexpensive, low-power sensors and transmitters, and the expansion of WIFI, Bluetooth and the INTERNET, which resulted in many objects that can communicate using these technologies [7].

The IoT is a network of uniquely identifiable "Things" that are connected to the internet where these things or objects have the ability to be programmed and can collect data as well as receiving instructions [2].

"THINGS" IN THE INTERNET OF THINGS

Everything, everything plainly is categorized under the Internet concept of things [7], such as furniture, clothes, house tools, body parts, roads, and even wildlife or pets. Anything that can be controlled by a processing unit and connected to the Internet is considered a thing in the Internet world of things. For example, many farms which deal with cow milking all over the world monitor the health and development of their cows through the usage of internet of things which gives the responsible personnel good and accurate data about the best time for milking the cows as well as decisions that is taken to develop the production times and quality process [13, 14].

Benefits of Internet Of Things

The Internet enables people beings to effectively control, facilitate, and govern objects near or far. For example, a man can start his car engine and control it from his Laptop or smartphone. A woman can start her washing machine and change its duties from her PC and remotely identify substances within the refrigerator by making use of the Internet connection. Nevertheless, these examples are the simple practice of Internet things. The advanced form Of IOT is things communicating with each other and understanding others through the use of IP.

An example of advanced usage of IOT is the refrigerator that can purchase goods from the shopping center through communication, all done directly without any personal interaction. Another mature example is the maintenance professional will understand the failure in the car using a computer with a remote connection with the car without human aid or the car visiting the maintenance shop. At a weather monitoring station, a water evaporator can be released according to the result of sensors that measure moisture and heat in the atmosphere. Many other examples can be thought of that affect our daily life and can be a reality through the use of the Internet of Things

Machine to machine communication can help save lives of patients of heart disease, diabetic, or asthma through the devices and sensors and a medical device connected to a smartphone app that can send collected data automatically to the physician who can read and give valuable advice in emergency situations. These devices can be used to measure blood pressure and can be used in pulse management and can be used also a hearing tool. And can be used in advanced medical devices such as pacemakers and hearing aids.

AS an example of wearable devices is Apple watch that has an IoT sensor which is built in the Watch Strap. The IoT monitors a patient's health through keeping track of

the heart data with the aid of a mobile app. If the application algorithm finds a possible heart attack, it alerts the user to record an EKG.

Objectives of the Internet Of Things

BY connecting all kinds of objects and systems, Internet stuff can offer new ways to research and learn. The Internet can also integrate university infrastructure - linking physical buildings and their contents, such as classrooms, learning spaces, and administrative areas with communications systems and service systems that support them - for example, through continuous regulation of heat and lighting [8, 15].

Internet Objects (IOT) also facilitates new types of tasks that explore the types of knowledge available from data when many things are associated with each other. Students can build inexpensive IOT devices that allow them to conduct research that may have been possible only in large laboratories in the past.

Enabling Technology

IOT ARCHITECTURE

The IOT should be able to interconnect billions or more of mixt objects through the Internet, and therefore it is an important need for a layered architecture. Many proposed architectures are proposed but not referenced as a model. There is some architecture based on the analysis of the needs according to researchers and business.

The first proposed was a basic model of 3-layer architecture that consists of Application, Network, and Perception Layers.

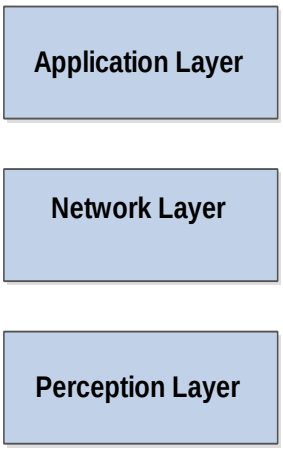

Figure (1): the 3-layer Architectures of IOT

The three-layer architecture describes the central idea of the Internet of Things, but it is not enough for research on IoT because it is general and research needs more details.

Second, Figure below illustrates some shared architectures of the 5-layer model of IOT which is the most applicable model for IoT applications, which is different from 5-layer of TCP/IP.

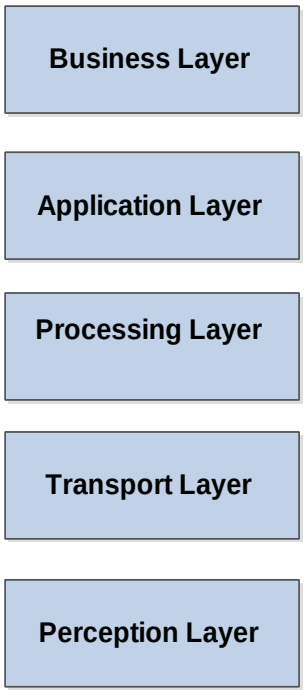

Figure (2): 5-layer Architecture of IOT

THE PERCEPTION LAYER

At the first layer, Objects or more specifically (devices) or perception layer, symbolizes the tangible sensors of the IOT which goal is to gather and manipulate information. Therefore, this layer contains sensors and mover that execute diverse functionalities like as asking for location, motion, temperature vibration, humidity, weight, etc. [11][16]

Uniform standards plug-and-play techniques are used in this layer to setup diverse mixed objects. The digitizing and transferring of data is done in the perception layer through secure channels. In the perception layer, the initializing of the big data is done.

OBJECT ABSTRACTION LAYER

After the data generated by the Objects in the perception layer, the Object Abstraction transfers this data to the Service Management layer using a secured path. In this layer there are many technologies are used such as such as UMTS, RFID, WiFi, GSM, 3G, Bluetooth Low, ZigBee, Energy, infrared, etc. Additionally, data management processes and cloud computing are controlled also in the abstraction layer. [13]

SERVICE MANAGEMENT LAYER

Service Management also called Middleware, it attaches a service with its caller according to the names and addresses. Service Management layer helps the IoT application programmers to handle varying and unrelated objects and work with them without paying attention to a specific hardware platform. In addition, this layer manipulates the input data to makes decisions and provides the needed services within a network wired protocols.

APPLICATION LAYER

The application layer is responsible for providing services that are requested by clients such as providing air temperature and humidity measurements for clients according to their request. The application layer is important to IoT due to its ability to provide authentic tools and services according to the client's needs. This layer covers innumerable. Vertical markets, for instance, smart building, transportation, smart home, and smart healthcare

BUSINESS LAYER

This layer manages the activities of IoT system and its services. The tasks and functions of this layer are to build a business model, flowcharts, graphs, etc. built on the data obtained from the previous layer. In addition, the business layer enables designing, analyzing, implementing, evaluating, monitoring, and developing IoT related system elements.

The Business Layer assists the making of a decision on the basis of Big Data analysis. Additionally, management and supervision of the primary four layers are accomplished at the business layer. TO improve the services and user's privacy, the business layer compares the expected output with the output from layers.

As a summary, the 5-layer model provides the user with an interface through Application Layer to communicate with devices and ask for needed data. Business Layer also provides analysis and reports that can be of great value to the business.

APPLICATIONS

Internet of things has changed many aspects of life through its applications [12] which can be divided into the following:

Personal and household applications

These applications depend on its core on the wireless Internet and control systems at home or that belongs to a person such as health applications where the doctor can monitor the condition of the home staying patient using sensors and home cameras without the need to be in the current location with the patient [6]. See figure 3

Figure (3): Personal applications for the Internet of Things

Applications for the community

Environment monitoring represents one of the greatest chief applications delivered by the Internet of things. The vendors of large companies who are professional in the field of environment can track the developments in the environment sector and its services, for example, the effect of the environment on citizen's health, road lighting, and pollution [14].

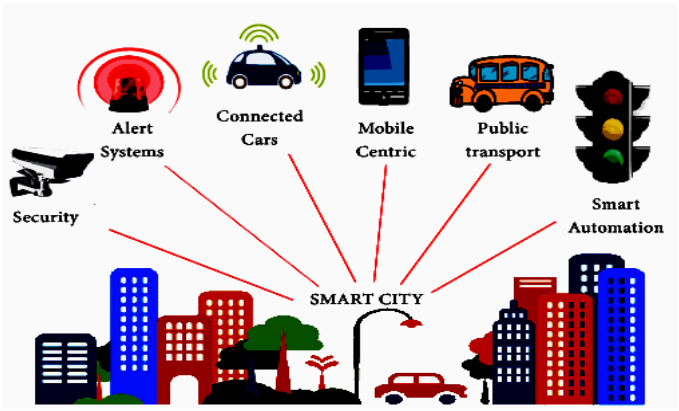

Figure (4): Smart City connected IOT

Service applications

This type of applications provides services on a large scale such as covering the country. The target of these applications aims to make a better quality of service submitted to the citizen other than displaying it and depends on the systems of communication via satellite and wireless Internet within these service applications. The improvement of the quality of drinking water is important and vital for it is important for keeping the life of people and other creatures on earth. In water monitoring applications, the examination of water quality is done in real time for supplying water to areas in need.

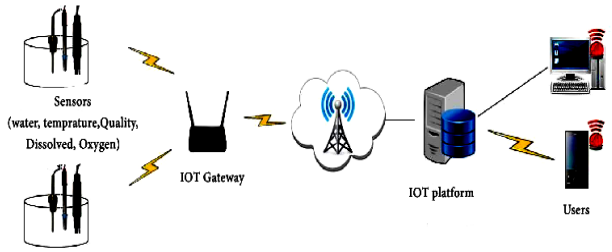

Figure (5): Personal applications for the Internet of Things

Mobile Phone Applications

The nature of different mobile phones is different from other electronic devices and other computers. Portability of phones that makes it moved from one place to another and from one country to another. The navigation applications in cars provide drivers with helpful information on the state of renewable energy according to the present location of the mobile phone.

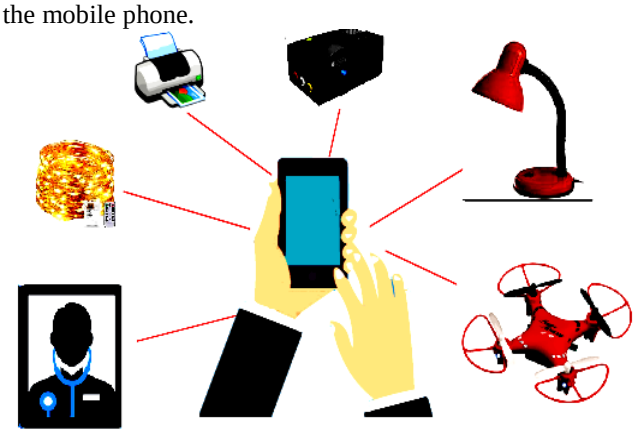

Figure (6): IoT Mobile applications]

Practical application

As a practical application to the use of internet objects for smart cities, a model of the smart city of Padua was developed in Italy. The model consists of a system for gathering environmental data in civic roads and supervising road lighting by means of wireless internet connection and a number of different sensors installed in various locations of the city. Through this application, important information was obtained on several environmental issues such as the level of carbon dioxide in the air, air temperature, humidity, noise ratio and supervision of road lighting.

Examples of data collected by the Padua smart city system include temperature and road lighting. Figure 2 shows the difference between the data collected by the system (the black line) and the actual data on the ground (the dots are red), and we notice when the lines converge, Application. In Figure 3, the actual temperatures and the temperature from the application are very close.

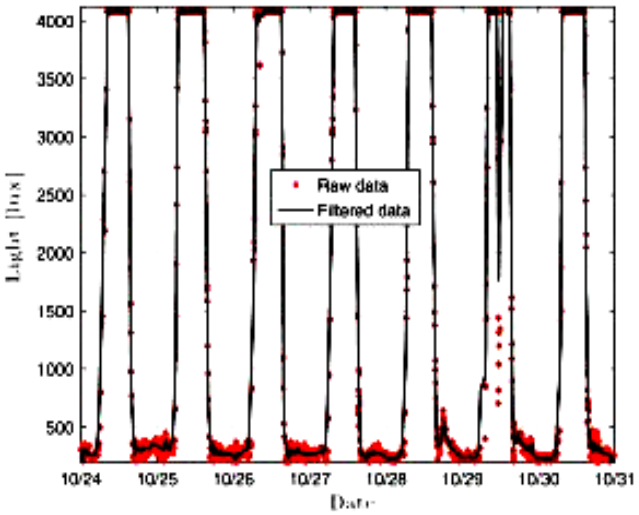

Figure (7) - Light data

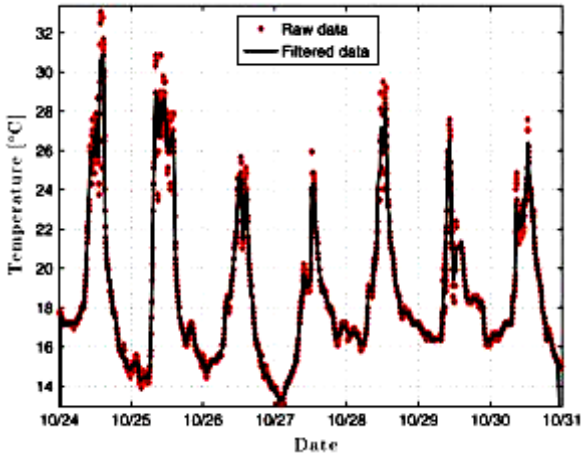

Figure (8) - Temperature data

Case Study: Application of the concept of "Internet Objects" (EoI) in California, USA

In 2014 Cisco Corporation (CISCO) released a report that provides an in-depth analysis of the economic benefits of implementing "Internet of Everything - IoE" initiatives in the government sector. The report found that a total of $ 4.6 trillion could be produced as an economic value from the adoption of "Internet Everything" in 40 areas in the government sector over the next ten years, including smart buildings, smart energy, and others [3]. As an example, San Mateo County, California, has collaborated.

Target

Providing technology and communications in all areas of San Mateo County, California is the main target.

The strategy

Partnership with state and city institutions and private sector companies.

Rely on small pilot projects to test different techniques and identify those that can be successfully applied on a large scale.

Keep citizens informed of the effects and costs.

Solutions

Free Wi-Fi is available in public areas in San Carlos.

The Countywide Smart Corridor Transport Project to address traffic issues.

Smart Parking in San Mateo and San Carlos

Router routers have been installed on street lights in rural Pescadero for Internet access.

RESULTS

The Internet service has improved wirelessly and wirelessly in the province, which has benefited the government, cities, citizens and business owners.

Smart Parking has many benefits: getting rid of traffic jams, reducing emissions, facilitating the creation of positions for consumers that benefit local businesses, as well as increasing potential revenue avi sales tax for the city and county.

Link roads supervised by the Ministry of Communications with local municipalities, thus improving the mobility, management, and updating of signs and traffic lights more effectively[1].

Internet Things in the Arab world

The usage of the Internet is not spread in our daily lives, especially in the majority of the Arab world, although its applications are increasing with the spread of smart mobile devices usage by people. The accessibility to stable Internet connectivity, retail selling techniques in malls, e-banking services, and usage of wearable smart sports watch, as well as safety and security systems, as well as other system related to energy-saving within laboratories and buildings, and fuel mobilization.

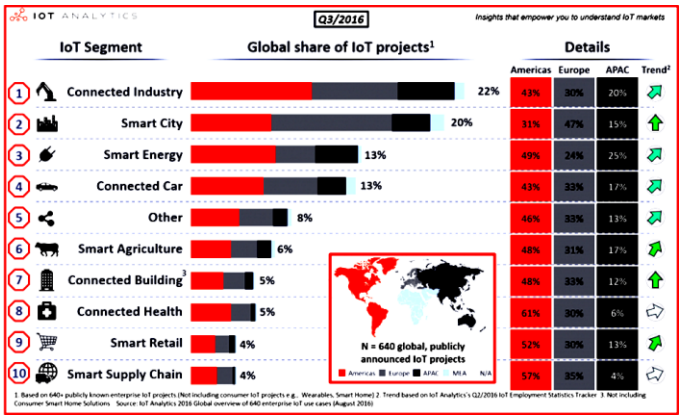

Figure (9)- IOT in the Arab world, from the IoT Analytics study.

Figure (6) shows a study conducted in 2016 by IoT Analytics it illustrates that if we exclude the use of smart home technologies and wearable devices, The most

investment in the Arab world and in Africa, is the usage is for smart cities, then by industry.

Clearly, the most nominal building blocks on the Internet. are mobile smartphones in the Arab world, Since, Android and iOS operating systems are standard, the Android and IOS application development is popular between developers, the introduction of Internet-connected smart devices, the manufacturing, program writing and linking them. The challenge for developers is to develop and implement systems that afford the quality of life for people in order to satisfy them and make benefit by buying these devices. The benefits cover an increase in productivity, providing an increase in income and reduce expenses and assure more effective use of resources when these systems maintenance is feasible.

A practical example of the Internet is the work of some institutions whose work requires the distribution of fuel, where appropriate sensors are used to collect information on the levels of fuel in reservoirs and the number of flows to control the distribution process and prevent waste and theft. Examples are also the optimal energy use systems in buildings and institutions To examine the consumption of energy and compare with the standard curves to identify the imbalance and take appropriate actions, and can be used Internet technologies to follow things to irrigate agricultural crops and gardens and the safety of plantations, Street lighting and solar systems as well as systems designed by banks, telecoms and point-of-sale companies, which work together to provide digital cash registers, connect the online shopping experience with shops, follow up the education process in schools, distribute and purchase food aid in associations As well as monitoring the quality of services such as waiting time in the role and work of employees in terms of permanence, productivity and customer satisfaction level. You will benefit from simple platforms for access to services, all with affordable and affordable technologies [4].

Future of Internet things

The increasing requests on devices that can communicate with other devices are increasing. The relay on sensors on IoT is making us believe that IoT is moving to be more technical in the future. IoT will play a great role in improving people's quality of life and increase enterprise productivity.

Internet of Things "is moving very quickly and with a startling development rate there are some factors that determine the future of the Internet of Things[5]:

Diffusion of sensors

integrated sensors are one of the core important elements of Internet Things. Corporations need millions or billions of sensors to help them with all the useful data from around the world and make better use of them to make better decisions, both product, and business.

The Internet market is expected to reach $ 27 billion by 2020, and the industry's growth is expected to continue to grow in the sensor market for its key role in harnessing the technology. With improvements in technology expected, Internet-connected devices will be able to collect more data with higher accuracy and lower cost, which will help to spread it further.

New regulatory environment

The biggest technological concerns are consumer privacy and market regulation. As increasing penetration rates and corporate data leakage pose a risk to individuals and users of technology, which has attracted much attention to data privacy and security protection.

Companies are expected to incur additional costs to develop infrastructure for IT security and to create a more robust business environment that shows us a positive future for data protection for both the average user and the company.

Relationship with automated learning

There is no doubt that automated learning that relies on the use of algorithms has been directly related to Internet technology things, but the relationship is still in its infancy. The uses of automated learning and Internet things still remain simple in simple products but it is certain that more complex products will show us in the future unpredictable.

Technology watcher knows that big companies such as Google and Microsoft spend a large part of their budget on research and development of artificial intelligence and computer learning for logical reasons. The technology is expected to be formed soon for companies wishing to master the best data analytics and automated learning capabilities as they will be required for most businesses in the future.

Safer products

Interest in consumer confidence and privacy will have a strong impact on long-term corporate reputation. The products are expected to be evaluated for their security level and life span rather than price and product availability. These developments will emerge after building the IT and information security infrastructure to show us stricter products in preventing hacking and data theft.

CONCLUSION

IoT is considered a collaborative approach of using the internet in the optimal way which will be related to the purpose of using and the financial issues. We surveyed the most aspects of IoT and the various application and architectures that are used based on the various domains such as donations and social work that are exceeded due to the quality of life of people through the efficient use of resources in addition to the quality of services. The last part of the paper also highlighted a case study in California/USA and comparing with using IoT in the Arab world. Furthermore, this paper guides the researchers on future research directions which are penetrated in IoT fields, such as diffusion of sensors, environment infrastructure with automated learning and safer products

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