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The Internet of Things Applications for Challenges and Related Future Technologies & Development

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Abstract: *The Internet of things refers to the type of network to connect anything with the Internet-based in specific protocols through information sensing equipment to conduct information exchange and communications in order to achieve smart recognition, positioning, tracking, monitoring, and administration. This paper we briefly discuss on what Internet of Things is, how the Internet of Things enables different challenge in technologies, and its applications in Future Technologies, & characteristics, Internet of Things functional view & what the future challenges are for the Internet of Things. The Internet of Things sensors can use various types of connections like Wi-Fi, Zig-Bee, and Bluetooth, in the addition to allowing large-scale area connectivity used many technologies such as 3G, GSM, GPRS, and LTE etc.*

Keywords: The IoT Applications, Future Technologies, Smart Cities of IoT, Smart Environment of IoT, Smart Energy Grid and internet of things, Wi-Fi, Zig-Bee, & Bluetooth.

1 INTRODUCTION:

The Internet of things has the impact on education, business, communication, science and technology, humanity, government, etc. Clearly, the Internet is one of the most important part and powerful creations in all of human history and with the concept of the internet of things. The internet becomes more favorable to have a smart life in everyone elevation. Internet of Things is a new technology of the Internet access. By the internet on the Internet of Things, objects recognize themselves and obtain intelligence behavior by making or enabling related decisions thanks to the fact that they can communicate information about themselves. These objects can access information that has been aggregated by other things, or they can add to other services. Figure 1 shows that with the internet of things, anything's we will able to communicate to the internet at any time from any place to provide any services by any network to anyone.

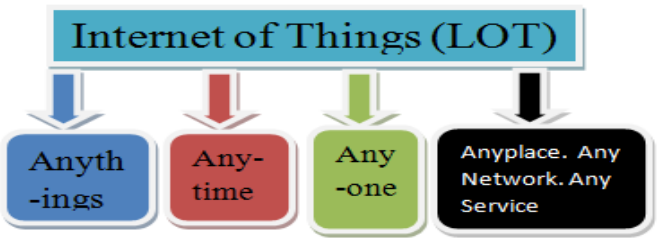

Fig.1 Internet of Things Concepts

All concept will create new types of applications can involve such as smart home and the smart cities, too many services provide such as notifications, security privacy, energy saving, communication, computers, and entertainment. The aim of this paper published the internet of things Applications, Related Future Technologies, and challenges. The remainder of this paper is structured as follows: segment 2 provides a vision and internet of things scope characteristics. In segment 3 the application of internet of thing will be discussed. Segment 4 will provide Internet of Things and the challenges that facing the Internet of Things will be reviewed in segment 5 will provide Internet of Things and Related Future Technologies and finally the chapter will end by a conclusion of the overall sections.

2 INTERNETS OF THINGS APPLICATION & CHARACTERISTICS

Internet of things promises many applications in human life, making life easier, safe and smart. There are many applications such as smart cities, homes, transportation, energy and smart environment.

The fundamental characteristics of the IoT are as follows:

2.1 CHARACTERISTICS

***Interconnectivity:**

Using the IoT, Globally anything can be interconnected with the information and communication infrastructure. Things-related services: The IoT is capable of producing thing-related services within the limitations of things, such as privacy protection and semantic coherence between physical things and their associated virtual things. In the system to provide thing-related services within the limitations of things, both the technologies in physical world and information world will change.

Heterogeneity:

The devices in the IoT are independent as based on different hardware platforms and channels. They can interact with other devices or service platforms through different networks or channels.

Dynamic changes:

The state of devices change dynamically for, e.g., sleeping and waking up, connected and disconnected as well as the

context of devices including location and speed. Moreover, the number of devices can change dynamically in order to maintain the user instructions.

Enormous scale:

The number of devices that require being maintained and that interact with each other will be at least an order of magnitude larger than the devices connected to the current Internet. Even more significant will be the management of the data generated and their interpretation for application purposes and its link to the semantics of data, as well as efficient data handling.

Safety:

As we get benefits from the IoT, we can't forget about safety. As both the producers and beneficiaries of the IoT, we must design for safety. This involves the safety of our personal data and the safety of our physical well-being. Securing the endpoints, the networks, and the data moving across all of it means creating a security standard that will scale.

Connectivity:

Connectivity enables network accessibility and compatibility to one end to another end. Accessibility is accepting on a network while compatibility provides the common ability to produce and consume data.

2.2 APPLICATIONS

Smart Cities

Many major cities were supported by smart projects, like Seoul, Tokyo, Shanghai, New York, Amsterdam, Singapore, and Dubai. Smart cities may still be viewed as a city of the future and smart life, and by the shift rate of building smart cities today's, it will become very feasible to open the IoT technology in cities development. Smart cities needs require careful planning at every stage, with the comfort of agreement from governments, citizens to implement the internet of things technology in every aspect of development. By the IoT, towns can be developed in many levels, by improving infrastructure, intensifying public transportation decreasing traffic blockage, and keeping citizens safe, healthy and more involved in the community. By connection, all systems in the cities such as healthcare system, transportation system weather monitoring systems and etc., in addition, to help people by the internet in every place to accessing the database of railways, airports, transportation tracking operating under designated protocols, cities will become smarter by the internet of things.

Smart Home and Buildings

Wi-Fi's technologies in-house self-regulation have been used essentially due to the network nature of used electronics where electronic devices such as mobile devices, TVs etc are usually supported by Wi-Fi. Wi-Fi have started becoming part of the home IP network and due to the growing rate of adoption of mobile computing devices like smartphones, tablets, etc. For example, a networking to providing network or online streaming services at homes to control of the device functionality over the network. At the same time, mobile devices assure that consumers have access to a portable 'controller' for the electronics connected to the network. Both types of tools can be used as gateways for IoT uses. Many companies are thinking to develop platforms that integrate the building mechanization with entertainment, energy monitoring, healthcare monitoring, and wireless sensor monitoring in the home and building environments. By the concept of the internet of things, homes and buildings can operate many devices and objects smartly, of the most interesting application of IoT in smart homes and buildings are smart lighting, smart environmental and media, air control and central heating, energy management and security. Wireless sensor networks (WSNs) with integration to the internet of things technology will provide an intelligent energy management in buildings, in addition to the obvious economic and environmental gains. Internet together with power management systems also offers a chance to access a buildings' power information and control systems from a laptop or a Smartphone placed anywhere in the world. The future Internet of Things will contribute an intelligent building management system which can be deemed as a part of a much larger information system used by facilities managers in buildings to manage electricity use and power procurement and to secure buildings systems.

Smart Energy and the Smart Grid

A smart grid is linked to the information and control and developed to have a smart energy management. A smart grid that integrates the data and information technologies (ICTs) to the power network will enable a real-time, two-way interaction between suppliers and consumers, creating more dynamic interaction on energy flow, which will help deliver power more efficiently and sustainably. The Key elements of information and communications technologies will combine sensing and monitoring technologies for power flows; digital communications infrastructure to send data across the grid; smart meters with the in-home display to notify energy usage; coordination, control and automation systems to aggregate and process various data, and to create highly interactive, responsive electricity. Many applications can be handled due to the internet of things for smart grids, such as industrial, solar power, nuclear power, and vehicles, hospitals and cities power control, enabled by the internet of things essentially in smart grid aspect

Smart Health

A close attention that required to hospitalized patients whose physiological status should be monitored continuously can be constantly done by using IoT monitoring technologies. For smart health, sensors are being used to get comprehensive physiological data and use gateways and the cloud to examine and collect the information and then transfer the analyzed data wirelessly to caregivers for

additional analysis and review. It substitutes the process of having a health professional come by at frequent intervals to check the patient's vital signs, rather than giving a continuous automated flow of information. In this way, it together improves the quality of care through regular attention and lowers the cost of care by reduces the cost of conventional ways of care in addition to data collection and analysis. Many people around the worlds are suffering from the poor health because they don't have immediate access to effective health monitoring and may be an assumed to be as critical situation patients.

With small, powerful wireless resolutions joined or cone through the IoT is immediately making possible for monitoring to get to these patients. These solutions can be utilized to securely obtain patient health data from a quality of sensors, apply complex algorithms to analyze the data and then share it by wireless connectivity with medical professionals who can make proper health recommendations

3. INTERNET OF THINGS CHALLENGES:

The fact that Internet of things applications and scenarios outlined above are very interesting which provides technologies for smart everything, but there are some challenges to the application of the Internet of Things concept in the cost of implementation. The expectations that the technology must, Be available at low cost with large numbers of objects. IoT is also faced with many other challenges such as:

3.1 Scalability:

Internet of Things has a big concept than the conventional Internet of computers, because of things are cooperated within an open environment. Basic functionality such as communication and service discovery, therefore, need to function equally efficiently in both small-scale and large-scale environments. The IoT requires new functions and methods in order to gain an efficient operation for scalability.

3.2 Self-Organizing:

Smart things should not be managed as computers that require their users to configure and adapt them to particular situations. Mobile things, which are often only sporadically used, need to establish connections spontaneously, and able to organize and configure themselves to suit their particular environment.

3.3 Data volumes:

Some application scenarios of the internet of things will involve to infrequent communication, and gather information's form sensor networks, or form logistics and large-scale networks will collect huge volumes of data on central network nodes or servers. The term represents this phenomenon is big data which require many operational mechanisms in addition to new technologies for storing, processing and management.

3.4 Data interpretation:

To support the users of smart things, there is a need to interpret the local context determined by sensors as accurately as possible. For service providers to profit from the disparate data that will be generated, needs to be able to draw some generalize able conclusions from the interpreted sensor data.

3.5 Interoperability:

Each type of smart objects on the Internet of Things has different information, processing and communication capabilities. Different smart objects would also be subjected to different conditions such as the energy availability and the communications bandwidth requirements. To facilitate communication and cooperation of these objects, common standards are required

3.6. Automatic Discovery:

In dynamic environments, suitable services for things must be automatically identified, which requires appropriate semantic means of describing their functionality.

3.7. Software complexity:

A more extensive software infrastructure will be needed on the network and on background servers in order to manage the smart objects and provide services to support them. That because the software systems in smart objects will have to function with minimal resources, as in conventional embedded systems.

3.8. Security and privacy:

In addition to the security and protection aspects of the Internet such in communications confidentiality, the authenticity and trustworthiness of communication partners, and message integrity, other requirements would also be important in an Internet of Things. There is a need to access certain services or prevent from communicating with other things in IoT and also business transactions involving smart objects would need to be protected from competitors' prying eyes.

3.9. Wireless communications:

From an energy point of view, established wireless technologies such as GSM, UMTS, Wi-Fi, and Bluetooth are far less suitable; more recent WPAN standards such as ZigBee and others still under development may have a narrower bandwidth, but they do use significantly less power.

4. INTERNET OF THINGS AND RELATED FUTURE TECHNOLOGIES & DEVELOPMENT.

Many new technologies are related to IoT to prove the integration of wired as well as wireless control, communication and IT technologies together which are responsible for connecting several subsystems and things which operate under a unified platform controlled and managed smartly.

4.1 Cloud Computing

The two worlds of Cloud and IoT have seen a rapid and independent evolution. These worlds are very different from each other, but their characteristics are often complementary in general, in which IoT can benefit from the virtually unlimited capabilities and resources of the cloud to compensate its technological constraints for example storage, processing, and communication. Cloud can offer an effective solution for IoT service management and composition as well as for implementing applications and services that exploit the things or the data produced by them.On the other hand, the cloud can benefit from IoT by extending its scope to deal with real-world things in a more distributed and dynamic manner, and for delivering new services in a large number of real-life scenarios. In many instances, Cloud can provide the common layer between the things and the applications, protecting all the complexity and functionalities required to implement the latter. This will affect future application development, where information collection, processing, and synchromesh will generate new challenges, particularly in multi-cloud conditions or in a fog cloud. Cloud aids for IoT application to allowing data collection and data processing, in expanding to rapid setup and integration of new things, while sustaining low costs for deployment and for complicated data processing. Cloud is the most suitable and cost-effective solution to deal with data produced by IoT and, in this regard, it generates new opportunities for data gathering, integration, and sharing with third parties. Once into Cloud, data can be treated as homogenous through robust-defined APIs, can be guarded by applying top level security, and can be immediately accessed and visualized from any place.

4.2. Shared Computing:

Shared computing uses groups of networked computers for the identical computational goal; shared Computing has several common issues with concurrent and parallel computing, as all these three falls in the scientific computing field. Nowadays, a large volume of shared computing technologies coupled with hardware virtualization, service-oriented architecture, and autonomic and utility computing have started to cloud computing. Internet of Things with shared computing represents a vision in which the Internet extends into the real world embracing everyday objects. Physical things are no longer disconnected from the virtual environment, but can be remotely managed and can act as physical access points to Internet services.

4.3. Fog Computing

Fog computing is similar to the edge computing in the cloud. In opposition to the cloud, fog platforms have been defined as compact computational architectures at the network's edge. Features of such platforms reportedly include low latency, location awareness and control of wireless access. While edge computing or edge analytics may especially refer to performing analytics at things that are on, or close to, the network's point, a fog computing structure would deliver analytics on anything from the network core to the edge. IoT may considerably likely be presented by fog computing in which computing, storage, control and networking power may remain anywhere along the architecture, either in data stations, the cloud, edge devices such as gateways or routers, edge devices itself such as a computer, or in sensors.

4.4. Wireless Fidelity (Wi-Fi)

Wireless Fidelity (Wi-Fi) is a networking technology that allows computers and other devices to communicate over a wireless signal. Vic Hayes has been named as the father of Wireless Fidelity. The precursor to Wi-Fi was invented in 1991 by NCR Corporation in Nieuwe in the Netherland. The first wireless products were brought on the market under the name Wave LAN with speeds of 1 Mbps to 2 Mbps. Today, there is nearly pervasive Wi-Fi that delivers the high-speed Wireless Local Area Network (WLAN) connectivity to millions of offices, homes, and public locations such as hotels, cafes, and airports. The integration of Wi-Fi into notebooks, handhelds, and Consumer Electronics (CE) devices has accelerated the adoption of Wi-Fi to the point where it is nearly a default in these devices. Technology contains any type of WLAN product support any of the IEEE 802.11 together with dual-band, 802.11a, 802.11b, 802.11g, and 802.11n. Nowadays whole cities are shifting Wi-Fi corridors through wireless APs.

4.5. Bluetooth

Bluetooth wireless technology is an inexpensive, short-range radio technology that eliminates the need for proprietary cabling between devices such as notebook PCs, handheld PCs, PDAs, cameras, and printers and effective Range of 10 - 100 meters. And generally communicate at less than 1 Mbps and Bluetooth uses specification Of IEEE 802.15.1 standard. At first in 1994 Ericson Mobile Communication company started a project named "Bluetooth". It is used for the creation of Personal Area Networks (PAN). A set of Bluetooth devices liking a common channel for communication is called Piconet. This Piconet is basically capable of 2 - 8 devices at a point for data sharing, and that data may be text, video, picture, and sound. The Bluetooth Special Interest Group comprises more than 1000 companies with Intel, Cisco, HP, Aruba, Intel, Ericson, IBM, Motorola, and Toshiba.

4.6. ZigBee

ZigBee is one of the protocols developed for enhancing the features of wireless sensor networks. ZigBee technology is

created by the ZigBee Alliance which is founded in the year 2001. Characteristics of ZigBee are low cost, low data rate, relatively short transmission range, scalability, reliability, flexible protocol design. It is a low power wireless network protocol based on the IEEE 802.15.4 standard. ZigBee has a range of around 100 meters and a bandwidth of 250 kbps and the topologies that it works are a star, cluster tree, and mesh. It is extensively used in home automation, industrial controls. The digital agriculture, medical monitoring & power systems.

Table 1: Future development & research needs

TECHNOLOGY	FUTURE DEVELOPMENT	RESEARCH NEEDS
Hardware Devices	•Nanotechnology •Miniaturization of chipsets •Ultra low power circuits	•Low-cost modular devices •Ultra low power EPROM/FRAM •Autonomous circuits
SENSOR	•Smart sensors (biochemical) •More sensors (tiny sensors) •Low power sensors •Wireless sensor network for sensor connectivity	•Self-powering sensors • Intelligence of sensors
Communication Technology	•On-chip antennas •Wide spectrum and spectrum aware protocols •Unified protocol over wide Spectrum •Multi-functional reconfigurable chips	•Protocols for interoperability •Multi-protocol chips •Gateway convergence •On-chip networks •Longer range (higher frequencies – tenths of GHz) •5G developments
Network Technology	•Self-aware and self-organizing networks •Self-learning, self-repairing networks •IPv6- enabled scalability •Ubiquitous IPv6-based IoT deployment	•Grid/Cloud network •Software-defined networks •Service based network •Need based network
Software and algorithms	•Goal oriented software •Distributed intelligence, problem-solving •User-oriented software	•Context-aware software, •Evolving software , •Self-reusable software, •Autonomous things, •Self- configurable, • Self-healing, •Self- management etc.
Data and Signal Processing Technology	•Context-aware data processing and data responses •Cognitive processing and optimization •IoT complex data analysis •IoT intelligent data visualization •Energy, frequency spectrum aware data processing	•Common sensor ontology •Distributed energy-efficient data processing •Autonomous computing
Discovery and Search Engine Technologies	•Automatic route tagging and identification management centers •On demand service discovery/integration	•Scalable Discovery services for connecting things with services
Security & Privacy Technologies	•User centric context-aware privacy and privacy policies •Privacy aware data processing •Security and privacy profiles selection based on security and privacy need	•Low cost, secure and high performance identification or authentication devices •Decentralized approaches to privacy by information localization

5. CONCLUSIONS

The Internet of Things (IoT) my report and studies, we can say that this sector is now in the first steps of evolution or development and have a lot of possible development. It looks like a bias to have one of these products and that is pretty good for the future of the Internet of Things. As we can understand it in my report, the prognostications of a lot of people are very useful for this sector, using this type of product support a lot of gains, production, and time also so on. The attraction is huge for a lot of companies to shift them self into the utilization of those products. As we saw it in my report, people who are utilizing those type of products cut the costs. It is sure that those products are probably pricey but they offer a good return on investment. Internet of things is a new technology which presents many applications to connect the things to things and human to things over the internet. Each object in the world can be identified, connected to each other through internet taking decisions independently. All networks and technologies of communication are managed in building the concept of the internet of things such technologies are RFID, mobile computing, wireless sensors networks, and embedded systems, in addition to many algorithms and methodologies to get management processes, storing data, and security issues. Internet of Things requires standardized approach for architectures, protocols, identification schemes, and frequencies will happen parallels, each one targeted for a particular and specific use. by the internet of things many smart applications becomes real in our life, which enables us to reach and contact with everything in addition to facilities many important aspects for human life such as smart healthcare, smart homes, smart energy, smart cities and smart environments,

This paper surveyed some of the most important applications of the Internet of Things with a particular focus on what is being actually done in addition to the challenges that faced the implementation the internet of things concept, and the other future technologies make the concept of the Internet of Things feasible.

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