ISSN:2231-5063.

REVIEW OF INTERNET OF THINGS AND IT'S APPLICATIONS

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Abstract: In general, the IoT promotes a enhanced level of awareness about our world, and a platform from which to monitor the reactions to the changing conditions that said awareness exposes us to. The government has adopted the field of "Internet of Things" as a national strategic project, announcing the Internet of Things master plan to achieve a leading country of hyper-connected digital revolution. Internet of Things(IoT) faces challenges in providing the end-to-end-performance, security, and energy effciency needed for the Smart Systems . These future smart systems will include smart cities, smart transportation systems, and smart manufacturing. Internet of Things allow massive number of uniquely addressable ``things'' to communicate with each other and transfer data over existing internet or compatible network protocols.

Keywords: IoT

I. INTRODUCTION

The term "Internet of Things" (IoT) was first used in 1999 by British technology pioneer Kevin Ashton to describe a system in which objects in the physical world could be connected to the internet by sensors. Today, the Internet of Things has become a popular term for describing scenarios in which Internet connectivity and computing capability extend to a variety of objects, devices, sensors, and everyday items.
While the term "Internet of Things" is relatively new, the concept of combining computers and networks to monitor and control devices has been around for decades. By the late 1970s, for example, systems for remotely monitoring meters on the electrical grid via telephone lines were already in commercial use. In the 1990s, advances in wireless technology allowed "machine–to–machine" (M2M) enterprise and industrial solutions for equipment monitoring and operation to become widespread. Many of these early M2M solutions, however, were based on closed purpose–built networks and proprietary or industry–specific standards, rather than on Internet Protocol (IP)–based networks and Internet standards.[11]

II. WHAT IS INTERNET OF THINGS?

The Internet of things (IoT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.[1][2][3] In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society."[3] The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure,[4] creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.[5][6][7] When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.
Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection

ISSN:2231-5063.

of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to the areas such as smart cities.[1]

In following figure, "Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring or field operation devices that assist firefighters in search and rescue operations. Legal scholars suggest to look at "Things" as an "inextricable mixture of hardware, software, data and service". [4]These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include home automation (also known as smart home devices) such as the control and automation of lighting, heating (like smart thermostat), ventilation, air conditioning systems, and appliances such as washer/dryers, robotic vacuums, air purifiers, ovens or that use Wi-Fi for remote monitoring.[6]

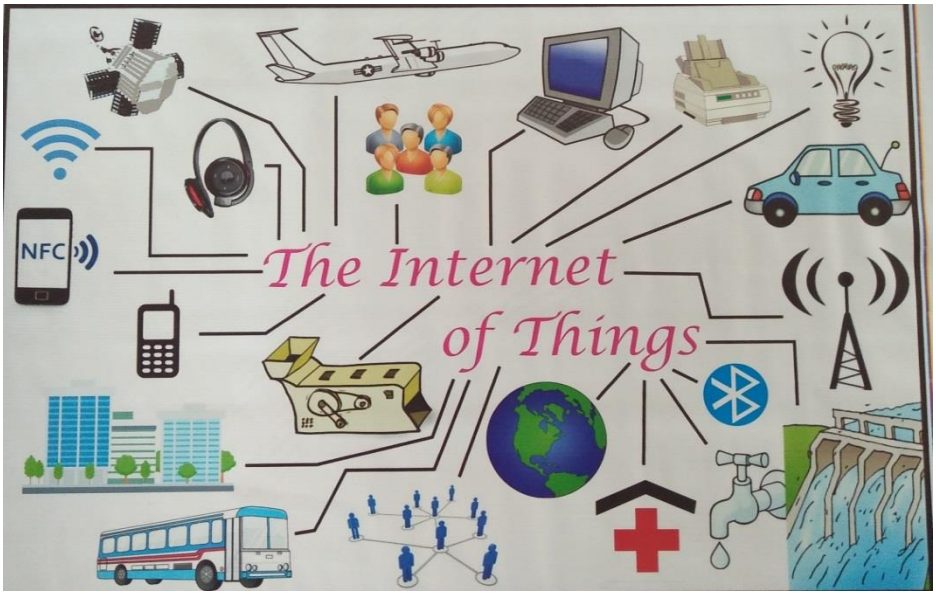

Fig 1: Internet of Things

As well as the expansion of Internet-connected automation into a plethora of new application areas, IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quick aggregation of the data, and an increase in the need to index, store, and process such data more effectively. IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.

The Internet of Things (IoT) is an important topic in technology industry, policy, and engineering circles and has become headline news in both the specialty press and the popular media. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities not previously possible.

III. APPLICATIONS OF THE INTERNET OF THINGS

1. **Smart Home:** The smart home is likely the most popular IoT application at the moment because it is the one that is most affordable and readily available to consumers. From the Amazon Echo to the Nest Thermostat,

ISSN:2231-5063.

there are hundreds of products on the market that users can control with their voices to make their lives more connected than ever.

2. **Wearables:** Watches are no longer just for telling time. The Apple Watch and other smartwatches on the market have turned our wrists into smartphone holsters by enabling text messaging, phone calls, and more. And devices such as Fitbit and Jawbone have helped revolutionize the fitness world by giving people more data about their workouts.
3. **Smart Cities:** The IoT has the potential to transform entire cities by solving real problems citizens face each day. With the proper connections and data, the Internet of Things can solve traffic congestion issues and reduce noise, crime, and pollution.
4. **Connected Car:** These vehicles are equipped with Internet access and can share that access with others, just like connecting to a wireless network in a home or office. More vehicles are starting to come equipped with this functionality, so prepare to see more apps included in future cars.
5. **Environmental monitoring:** Environmental monitoring applications of the IoT typically use sensors to assist in environmental protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements of wildlife and their habitats. Development of resource constrained devices connected to the Internet also means that other applications like earthquake or tsunami early-warning systems can also be used by emergency services to provide more effective aid.
6. **Medical and healthcare:** IoT devices can be used to enable remote health monitoring and emergency notification systems. These health monitoring devices can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as pacemakers Fitbit electronic wristbands or advanced hearing aids.
7. **Transportation:** The IoT can assist in integration of communications, control, and information processing across various transportation systems. Application of the IoT extends to all aspects of transportation systems (i.e. the vehicle, the infrastructure, and the driver or user).

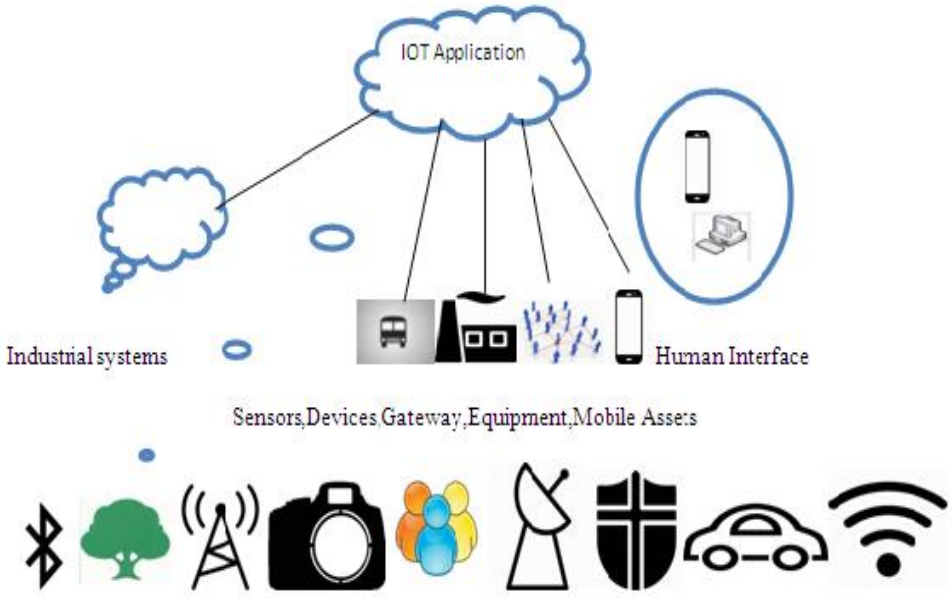

Fig 2 : Applications of the Internet of Things

IV. LITERATURE REVIEW

1. **Securing the Industrial-Tactile Internet of Things With Deterministic Silicon Photonics Switches**

This paper first surveys the security weaknesses of today's Best Efforts(BE) IoT. Today's BE- IoT can exhibit delays of 100s of milliseconds [10], [11], and it cannot be partitioned into distinct, interference-free Virtual Networks (VNs), which significantly compromises performance, cyber-security and energy efficiency. To reduce congestion and excessive delays, the BE- IoT is typically over-provisioned to operate at light loads, with typically less than 50% utilization. [12]

2. Big Health Application System based on Health Internet of Things and Big Data

The world is facing problems such as uneven distribution of medical resources, the growing chronic diseases, and the increasing medical expenses. Blending the latest information technology into the healthcare system will greatly mitigate the problems. This paper presents the big health application system based on the health Internet of Things and big data. [13]

3. SITE: The Simple Internet of Things Enabler for Smart Homes

This paper presents the Simple Internet of Things Enabler (SITE), a smart home solution that allows users to specify and centrally control IoT smart objects. Unlike most existing systems, SITE supports End-User Development. Hence, it defines a simple language for the specification of control rules for smart objects. It also provides a user interface to graphically illustrate data received from smart objects. To assess the usability of SITE. [14]

V. FUTURE SCOPE

Today, people all over the world are putting their faith in IoT and employ it in almost every aspect of daily life. Be it smart homes, fit-bits, indoor mapping or vehicle tracking, at the end of the day, it's all IoT. The internet of things is now growing exponentially and is reaching different verticals and industries. India is one of the countries where a lot of innovation is happening around IoT across different verticals and technologies. The IoT ecosystem in India is mainly driven by 3 players: Government, Industry and Startups.
Indian Government is also looking into this and have a plan for internet of things. The digital space has witnessed major transformations in the last couple of years and as per industry experts would continue to evolve itself. The latest entrant to the digital space is the Internet of Things (IoT). IoT can also be defined as interplay for software, telecom and electronic hardware industry and promises to offer tremendous opportunities for many industries.

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