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Internet of Things

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Abstract: **The applications of Wireless Sensor Network (WSN) technologies are used in many areas of modern day living. This offers the ability to measure, conclude and understand environmental indicators, from delicate ecologies and natural resources to urban environments. The propagation of these devices in a communicating-actuating network creates the Internet of Things (IoT), where, sensors and actuators combine flawlessly with the environment around us, and the information is distributed across platforms in order to develop a common operating picture (COP). Fuelled by the recent edition of a series of enabling wireless technologies such as RFID tags and embedded sensor and actuator nodes, the IoT has stepped out of its early years and is the next revolutionary technology in transforming the Internet into a fully integrated Future Internet. As we move from www (static pages web) to web2 (social networking web) to web3 (ubiquitous computing web), the need for data-on-demand using sophisticated perceptive queries increases significantly. This paper presents a Cloud focussed vision for worldwide implementation of Internet of Things. The key enabling technologies and application domains that urge for IoT research in the near future are discussed.**

Keywords:
Internet of Things, Ubiquitous Sensing, Cloud Computing, Wireless Sensor Networks, Radio Frequency identification (RFID), Smart Environment.

I .INTRODUCTION

The next era of computing will be outside the realm of the traditional desktop. In the Internet of Things (IoT) paradigm, many of the objects that bound us will be connected to the network in one or the other form . Radio Frequency identification (RFID) and sensor network technology will rise to meet this new challenge, in which information and communication systems are invisibly embedded in the environment around us. This results in the generation of massive amounts of data which has to be stored, processed and presented in a perfect, efficient, and easily interpretable form.

Smart connectivity with existing networks and context-aware computation using network resources is an essential part of IOT. With the growing presence of Wireless Fidelity and 4G-LTE wireless Internet access, the advancement toward ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to *disappear* from the awareness of the user, the Internet of Things demands: (1) a shared understanding of the condition of its users and their appliances, (2) software architectures and pervasive communication networks to process and convey the contextual information to where it is relevant, and (3) the analytics tools in the Internet of Things that aim for autonomous and smart behaviour. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

The term Internet of Things was first coined by **Kevin Ashton in 1999** in the context of supply chain management. However, in the past decade, the definition has been more inclusive covering wide range of applications like healthcare, utilities, transport, etc.Although the definition of Things' has changed as technology evolved, the main goal of making computer sense information without the aid of human intervention remains the same. A radical evolution of the current Internet into a Network of interconnected objects that not only harvests information from the environment (sensing) and interacts with the physicalworld (actuation/command/control), but also uses existing Internet standards to provide services for information transfer, analytics, applications, and communications. Fuelled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes, iot has stepped out of its infancy and is on the verge of transforming the current static Internet into a fully integrated Future Internet . The Internet revolution led to the interconnection between people at an unprecedented scale and pace. The next revolution will be the interconnection between objects to create a smart environment. Only in 2011, the number of interconnected devices on the planet overtook the actual number of people. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020. According to the GSMA, this amounts to $1.3 trillion revenue opportunities for mobile network operators alone spanning vertical segments such as health, automotive, utilities and consumer electronics. A schematic of the interconnection of objects is depicted in Figure 1, where the application domains are chosen based on the scale of the impact of the data generated.

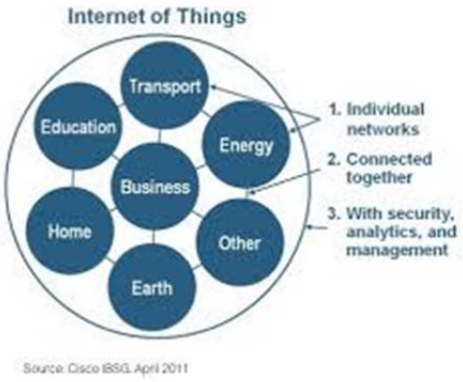

Fig 1: Internet of Things

II. CHARACTERISTICS OF IOT

A .*Intelligence*

Together algorithms and compute (i.e. Software & hardware) provide the "intelligent spark" that makes a product experience smart. Consider Misfit Shine, a fitness tracker, compared to Nest's intelligent thermostat. The Shine experience distributes compute tasks between a smartphone and the cloud. The Nest thermostat has more compute horsepower for the AI that make them smart.

B . Connectivity

Connectivity in the IOT is more than slapping on a WIFI module and calling it a day. Connectivity enables network accessibility and compatibility. Accessibility is getting on a network while compatibility provides the common ability to consume and produce data. If this sounds familiar, that's because it is Metcalfe's Law and it rings true for IOT.

C .Sensing

We tend to take for granted our senses and ability to understand the physical world and people around us. Sensing technologies provide us with the means to create experiences that reflect a true awareness of the physical world and the people in it. This is simply the analog input from the physical world, but it can provide rich understanding of our complex world.

D. Expressing

Expressing enables interactivity with people and the physical world. Whether it is a smart home or a farm with smart agriculture technology, expressing provides us with a means to create products that interact intelligently with the real world. This means more than just rendering beautiful User Inetrface System(UIS) to a screen. Expressing allows us to output into the real world and directly interact with people and the environment.

E.Energy

Without energy we can't bring our creations to life. The problem is we can't create billions of things that all run on batteries. Energy harvesting, power efficiency, and charging infrastructure are necessary parts a power intelligent ecosystem that we must design. Today, it is dolefully inadequate and lacks the focus of many product teams.

F. Safety

Safety is the major concern in IoT. safety has to be provided to the personal data , the network and the data moving across the network. By providing safety measure we gain efficiencies, novel experiences, and other benefits from Iot.

By framing IOT design with these characteristics, multi-discipline teams can work across their domains to make tradeoffs in interaction design, software architectures, and business models. Naturally a single product or service may choose to dial up or dial down these characteristics depending on the nature of user experience and constraints imposed by environmental and business factors.

III. APPLICATIONS OF IOT

The potentialities offered by the IOT make it possible to develop numerous applications based on it, of which only a few applications are currently deployed. In future, there will be intelligent applications for smarter homes and offices, smarter transportation systems, smarter hospitals, smarter enterprises and factories. In the following subsections, some of the important example applications of iot are briefly discussed.

A.Traffic Monitoring

Constructing an intelligent traffic monitoring system firstly depends on automatic identification for vehicles, at present, automatic identification technology based on image and vehicle license plate is going to fall in the trap due to its low recognition rate and affection by poor weather. Thus it is necessary to apply new technologies to solve this problem, and technologies based on Internet of Things provide a new approach for it. At first, we took global unique EPC code as identity identification of vehicles instead of vehicles license plate and utilized RFID reader to read EPC code by RF electromagnetic wave, which completely solved the problem of no all-weather operations. Secondly, we obtained positioning information of vehicles by using GPS technology. Thirdly, because GPRS provides high speed wireless IP services for mobile users, fully supports the TCP/IP, we took wireless GPRS scheme to transmit data of mobile objects. The realization of automatic detection and transmission of data provided a fundamental guarantee for constructing an intelligent traffic monitoring system.

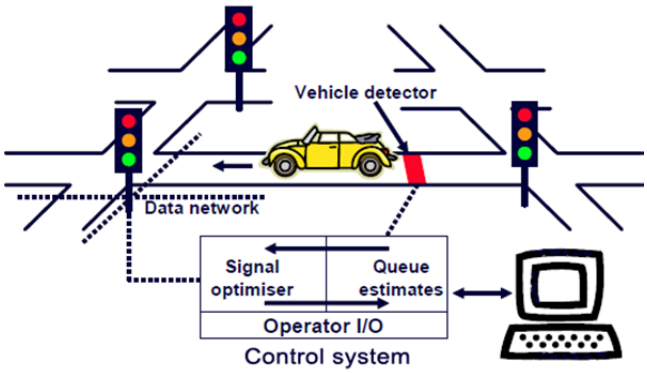

Fig 2 Traffic Monitoring System

B..Health

By collecting biosensor data several hundred times per second and applying state-of-the-art machine learning on top of it, computers get to know your body better than your doctor, coach, or psychologist.

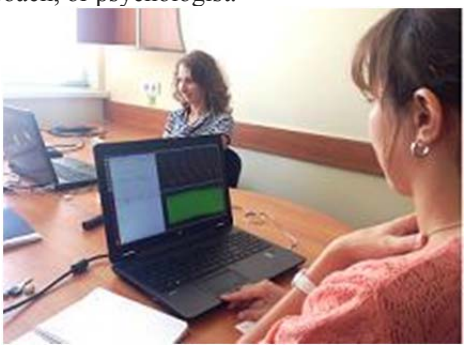

Fig.3: patient accessing information about health

More sensors mean more data, better performance of algorithms and more useful decisions. Nowadays, anybody can use biosensors to collect information about heart, skin, muscles, or even brain activity.

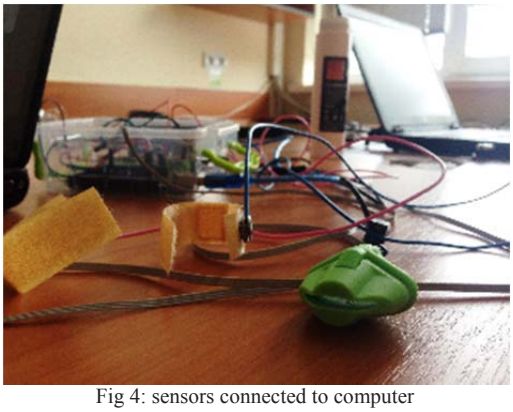

Fig 4: sensors connected to computer

Here is an example of how sensors data is being collected. By simply placing sensors on your fingers you will receive ppg and gsr raw data.

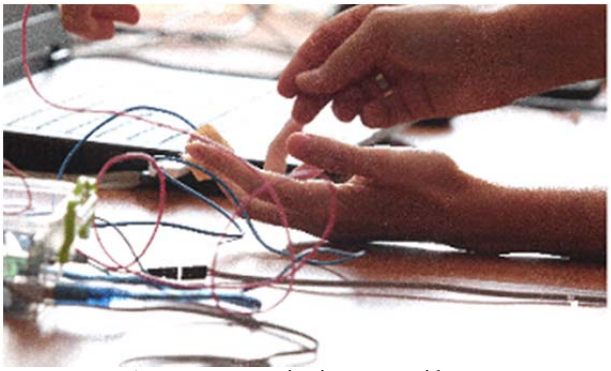

Fig 5: person coming in contact with sensors

C. Education

Students and teachers, being the core part of any society Internet of Things is helping in shaping the process of learning for scholars, instructors and students. Some of the very important benefits of IOT in the education sector are

1)Efficient processing:

RFID technology has replaced manual marking of attendance by teachers and allowing them to keep the track of students everyday.

2)Plays a keyrole in life of physically disabled:

Students who are visually impared gets special cards and use them on computers. the font size can be enlarged so they can easily read the material.this technology helps in building self confidence in students instead of taking help from the teacher for smaller doubts.

D. Transport And Logistics

With the IoT, companies can gain intelligence remotely around their assets in the field, allowing them to facilitate need-based maintenance and eliminating unnecessary and/or reactive responses. The technology can offer numerous benefits for your workforce, including:

- Insight into maintenance history, parts availability and inventory records.
- Updates on certain conditions such as bad weather or traffic, enabling them to better respond and/or prepare.
- Real-time insight enabling them respond to customer service inquiries in a timely manner.
- Access teal-time visibility into driver and vehicle performance, enabling them to increase the safety of drivers, reduce damaged inventory and decrease insurance related costs.

The use of mobile technology provides businesses line of sight into equipment, inventory and business processing, and leveraging these types of solutions with enabling technologies like the IoT can deliver more asset intelligence, leading to more informed decisions and ultimately increased efficiency.

Fig 6:transport and logistics

E.Dailylife

A “smart house” is one of the first things people think of when you bring up IoT, and we are already far down the road to having them.

Security systems allow you to monitor your home from afar, while smartphone apps can help you optimize your home heating , make sure you turned off the stove, and optimize your lighting perhaps most importantly, IoT technologies already allow people to keep track of children or pets left at home. You can even set up sensors that will notify you when certain doors in your house have been opened — a helpful tool for caregivers. Looks like our household objects will only get smarter.

Fig 7:dailylife

IV. CONCLUSION

Internet of things is the concept in which the virtual world of information technology connected to real world of things.the technologies of internet of things such as RFID and sensor make our life become more comfortable.

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