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PROSPECTIVE: SMART CITIES WITH INTERNET OF THINGS

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Abstract: ***As internet in today's world is playing vital role in enhancing quality life of people, it is being implemented on various things used in daily lives. The IoT allows you to automate and control the tasks that are done on a daily basis, increase efficiency, reduce costs, saves time and takes necessary action in case of emergencies. Thus, it is one of the emerging technology that requires attention to be developed in a synergic manner. The IoT has been facing growing demands in the years due to its potential to bring revolutionary change in daily lives. There is hardly any application domain left were IoT cannot find an implementation and, most of all, there is no application domain where IoT can find disruptive potentials. This has generated a lot of expectation for the uptake of IoT-based solution while planning for a smart city.***

Index Terms: Internet of Things, Emerging Technology, Smart City

I. INTRODUCTION

'Smart city" is a concept aimed at providing a set of new generation services and infrastructure with the help of information and communication technologies (ICT) which is given in [1] [2]. Smart cities are expected to be composed of many different smart domains. Smart transportation, smart security and smart energy management are some of the most important components for building smart cities, which was described in [3]. However, in term of market, smart homes, smart grid, smart healthcare, and smart transportation solutions are expected to generate the majority of sales. According to Markets and Markets report on Smart Cities Market (2011 - 2016), the global smart city market is expected to cross $1 trillion by 2016[4].

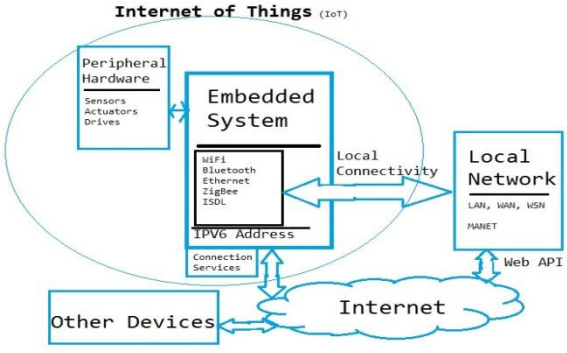

Fig: 1

Things that can be connected through various equipments like RFID, sensors, nanotech and smart-tech equipments. Context-aware technologies are used in the IoT solutions in the industry's marketplace is vital for academics, researchers, and industrialists so they can identify trends, industry requirements, demands, and innovation opportunities.

Today's information technology is so dependent on data originated by people that our computers know more about ideas than things. If we had computers that knew everything there was to know about things using data they gathered without any help from us we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best.

Architecture of internet Of Things contains basically 4 layers:

1. Application Layer
2. Gateway and the network layer
3. Management Service layer
4. Sensor layer

Essential Technology involved in IoT are:

- RFID Technology.
- Sensor Technology
- Wireless Communication.
- Energy Harvesting Technology.
- Cloud Computing.
- Advanced Internet Protocol (IVP6)

RFID technology is a major breakthrough in the embedded communication paradigm which enables design of microchips for wireless data communication. They help in the automatic identification of anything they are attached to acting as an electronic barcode. The passive RFID tags are not battery powered and they use the power of the reader's interrogation signal to communicate the ID to the RFID reader [6]. This has resulted in many applications particularly in retail and supply chain management. The applications can be found in transportation (replacement of tickets, registration stickers) and access control applications as well. The passive tags are currently being used in many bank cards and road toll tags which are among the first global deployments. Active RFID readers have their own battery supply and can instantiate the communication. Of the several applications, the main application of active RFID tags is in port containers for monitoring cargo [5]. Active RFID is nearly the same as the lower end WSN nodes with limited processing capability and storage. The scientific challenges that must be overcome in order to realize the enormous potential of WSNs are substantial and multidisciplinary in nature. Sensor data are shared among sensor nodes and sent to a distributed or centralized system for analytics. A mechanism to combine cyber infrastructure with a Service Oriented Architecture (SOA) and sensor networks to provide access to heterogeneous sensor resources in a deployment independent manner. This is based on the idea of isolating resources that can be used by several applications. A platform-independent middleware for

developing sensor applications is required, such as an Open Sensor Web Architecture. An efficient and secure data aggregation method is required for extending the lifetime of the network as well as ensuring reliable data collected from sensors. Node failures are a common characteristic of WSNs, the network topology should have the capability to heal itself.

II. PROSPETIVE OF SMART CITY WITH IoT

A very important application of IoT is detecting pollution and natural calamities. We can monitor the emissions from factories and vehicles to minimize air pollution. We can track the release of harmful chemicals and waste in rivers and the sea, thereby arresting water pollution. We can also keep tabs on the quality of water being supplied for drinking. We can send warnings of earthquakes and tsunamis by detecting tremors. We can keep the water level of rivers and dams under surveillance to be alert in case of floods. The detection of forest fire is also possible with this technology. Advanced cars, trains, buses as well as bicycles are becoming equipped with advanced sensors, actuators with increased processing powers. Applications in 16 Debases Bandy opadhyay, Jay dip Sen. the automotive industry include the use of smart things to monitor and report various parameters from pressure in tyres to proximity of other vehicles. RFID technology has already been used to streamline vehicle production, improve logistics, increase quality control and improve customer services. The devices attached to the parts contain information related to the name of the manufacturer and when and where the product was made, its serial number, type, product code, and in some applications the precise location in the facility at that moment. RFID technology provides real-time data in the manufacturing processes, maintenance operations and offers new ways of managing recalls more effectively.

Telecommunications Sector

IoT will create the possibility of merging of diverse telecommunication technologies and create new services. An illustrative example is the use of GSM, NFC (Near Field Communication), low power Bluetooth, WLAN, multi-hop networks, GPS and sensor networks together with SIM-card technology. In these types of applications the reader (i.e. tag) is a part of the mobile phone, and different applications share the SIM-card.

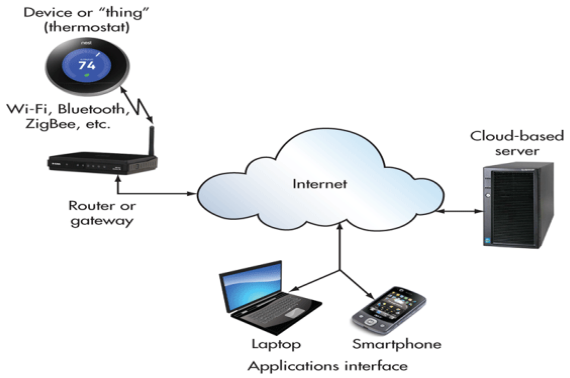

Fig 2: Application of IoT

Medical & Healthcare Sector

IoT will have many applications in the healthcare sector, with the possibility of using the cell phone with RFID-sensor capabilities as a platform for monitoring of medical parameters and drug delivery. The advantage gained is in prevention and easy monitoring of diseases, ad hoc diagnosis and providing prompt medical attention in cases of accidents. Implantable and addressable wireless devices can be used to store health records that can save a patient's life in emergency situations, especially for people with diabetes, cancer, coronary Internet of Things [7] heart disease, stroke, chronic obstructive pulmonary disease, cognitive impairments, seizure disorders and Alzheimer's disease. Edible, biodegrade able chips can be introduced into human body for guided actions. Paraplegic persons can have muscular stimuli delivered via an implanted smart thing-controlled electrical simulation system in order to restore movement functions.

Independent Living

IoT applications and services will have an important impact on independent living by providing support for an aging population by detecting the activities of daily living using wearable and ambient sensors, monitoring social inter-actions using wearable and ambient sensors, monitoring chronic disease using wearable vital signs sensors, and in body sensors. With emergence of pattern detection and machine learning algorithms, the things in a patient's environment would be able to watch out and care for the patient. Things can learn regular routines and raise alerts or send out notifications in anomaly situations.

Pharmaceutical Sector

In IoT paradigm, attaching smart labels to drugs, tracking them through the supply chain and monitoring their status with sensors has many potential benefits. For example, items requiring specific storage conditions, e.g. maintenance of a cool chain, can be continuously monitored and discarded if conditions were violated during transport. Drug tracking and e-pedigrees allow for the detection of counterfeit products and keep the supply chain free of fraudsters. Counterfeiting is a common practice in this area as illustrated in [5], and it particularly affects the developing countries. The smart labels on the drugs can also directly benefit patients, e.g. by enabling storing of the package insert, informing consumers of dosages and expiration dates, and assuring the authenticity of the medication. In conjunction with a smart medicine cabinet that reads information transmitted by the drug labels, patients can be reminded to take their medicine at appropriate intervals and patient compliance can be monitored.

Transportation Sector

IoT offers solutions for fare collection and toll systems, screening of passengers and bags boarding commercial carriers and the goods moved by the international cargo system that support the security policies of the governments

and the transportation industry, to meet the increasing demand for security in the globe. Monitoring traffic jams through cell phones of the users and deployment of intelligent transport systems (ITS) will make the transportation of goods and people more efficient. Transportation companies would become more efficient in packing containers since the containers can self- scan and weigh themselves. Use of IoT technologies for managing passenger luggage in airports and airline operations will enable automated tracking and sorting, increased per-bag read rates, and increased security.

Agriculture and Breeding Sector

The regulations for traceability of agricultural animals and their movements require the use of technologies like IoT, making possible the real time detection of animals, for example during outbreaks of contagious disease. Moreover, in many cases, countries give subsidies depending on the number of animals in a herd and other requirements, to farms with cattle, sheep, and goats. As the determination of the number is difficult, there is always the possibility of frauds. Good identification systems can help minimize this fraud. Therefore, with the application of identification systems, animal diseases can be controlled, surveyed, and prevented. Official identification of animals in national, intra community, and international commerce is already in place, while at the same time, identification of livestock that are vaccinated or tested under official disease control or eradication is also possible. Blood and tissue specimens can be accurately identified, and the health status of herds, regions, and countries can be certified by using IoT. With the Internet of Things, single farmers may be able to deliver the crops directly to the consumers not only in a small region like in direct marketing or shops but in a wider area. This will change the whole supply chain which is mainly in the hand of large companies, now, but can change to a more direct, shorter chain between producers and consumers.

Social Media Sector

Deployment of IoT technologies will enable ad hoc news gathering based on locations of the users. The news gathering could happen by querying IoT, to see which multi-media-capable devices are present at a certain location, and sending them a (financial) offer to collect multimedia footage about certain event. Near field communication tags can be attached to posters for providing more information by connecting the reader to an URI address that contains detailed information related to the poster.

III. CURRENT ISSUES WITH THE IoT TECHNOLOGY

Loss of privacy and security

As all the household appliances, industrial machinery, public sector services like water supply and transport, and many other devices all are connected to the Internet, a lot of information is available on it. This information is prone to attack by hackers. It would be very disastrous if private and confidential information is accessed by unauthorized intruders[8].

Compatibility

As devices from different manufacturers will be interconnected; the issue of compatibility in tagging and monitoring crops up. Although this disadvantage may drop off if all the manufacturers agree to a common standard, even after that, technical issues will persist. Today, we have Bluetooth-enabled devices and compatibility problems exist even in this technology! Compatibility issues may result in people buying appliances from a certain manufacturer, leading to its monopoly in the market[8].

Complexity.

The IoT is a diverse and complex network. Any failure or bugs in the software or hardware will have serious consequences. Even power failure can cause a lot of inconvenience [8].

Lesser Employment of Menial Staff.

The unskilled workers and helpers may end up losing their jobs in the effect of automation of daily activities. This can lead to unemployment issues in the society. This is a problem with the advent of any technology and can be overcome with education [8].

Technology Takes Control of Life

Our lives will be increasingly controlled by technology, and will be dependent on it. The younger generation is already addicted to technology for every little thing. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology[8].

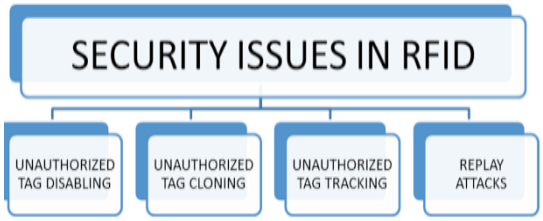

Fig. 3 Security issues in RFID

IoT is simply the point in time when more “things or objects” were connected to the Internet than people. While implementing the concept in various smart cities it is estimated that there will be 350 billion devices connected to billion by 2020. It is important to note that these estimates do not take into account rapid advances in Internet or device technology; the numbers presented are based on what is known to be true today. Additionally, the number of connected devices per person may seem low. This is because the calculation is based on the entire world population, much of which is not yet connected to the Internet. By reducing the population sample to people actually connected to the Internet, the number of connected devices per person rises dramatically. Currently, IoT is made up of a loose collection of disparate, purpose-built networks. Today’s cars, for example, have multiple networks to control engine function, safety features, communications systems, and so on. Commercial and residential buildings also have various control systems for heating, venting, and air conditioning

(HVAC); telephone service; security; and lighting. As IoT evolves, these networks, and many others, will be connected with added security, analytics, and management capabilities. This will allow IoT to become even more powerful in what it can help people achieve.

IV. CONCLUSION

The most important terms in regards to the Internet of Things we have considered are the things, devices, resources and services, as well as identification, addressing, resolution and discovery. It has been shown – in particular regarding the distinction between the entity of interest and the device – that an absolute, clear-cut categorization is not always possible. Rather, it depends on the perspective from which one looks at a particular thing. The intent was to remove some of the hindrances in scientific discourse and the development of the Internet of Things as one key aspect of an overall Future Internet. Acceptance of these definitions and uniform use in the future would ensure that research and development on the topic of the Internet of Things can progress more easily. Having clear terminology will allow to focus on the real research issues like how to connect and interact with a myriad of heterogeneous devices, how to deploy and manage such infrastructures, and how to model business processes that interact with things in the real world. Only by solving these real issues will it become possible to actually reap the many potential benefits of the Internet of Things that have been proposed; be it in supply chain management, the energy grid, health care, environmental management or public safety.

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