IOT security risks and vulnerabilities

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Abstract-

The Internet of Things(IoT) is emerging as the third wave in the development of the internet. The Internet of things is a complex network or it is a framework in which multiple objects is embedded on electronic devices and sensors with a software application to form a network that can catch real time data. The IoT has a variety of application domains, like smart cities, agriculture, public places, Ehealth. It will sense real time data and maintain it in to digital form to analyze data and provide the ideal action to improve efficiency, accuracy and improve economy than the existing systems. This survey paper highlights some applications that have the potential to make a striking difference in human life, especially for the differently abled andthe elderly. As compared to similar survey papers in the area, this paper is far more comprehensive in its coverage and exhaustively covers most major technologies.

1.INTRODUCTION

The internet of things is the interconnection of uniquely identifiable embedded computing devices within the existing internet infrastructure. So internet of things or IoT basically is connecting embedded system to internet. let us understand embedded systema little.

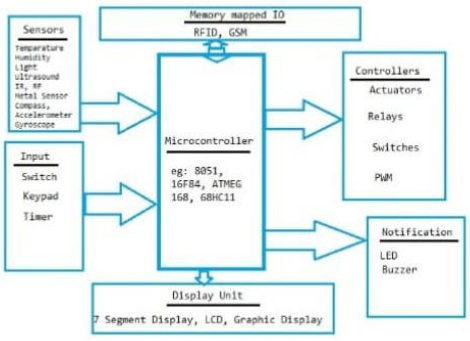

Fig. 1. Basic embedded system

The heart of the embedded system is a RISC family microcontroller like PIC 16F84/Atmel 8051/Motorola 68HC11 and so on. Internet of things is presently a hot technology worldwide.Government, industry and academia are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application ranging from civilian to defencesectors. These domains include agriculture, space,healthcare,manufacturing,construction,water and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT based applications such as innovative shopping system, infrastructure management in both urban and rural areas remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology. The internet of things demands a shared understanding of the situation of its users and their appliances, softwares, architectures and pervasive communication networks to process and convey the contextual information to where it is revelant, and the analytics tools in the internet of things that aim for autonomous and smart behaviour.

2.ARCHITECTURE

Architecture of internet of things contains basically four layers:

- Application layer
- Gateway and the network layer
- Management service layer
- Sensor layer

APPLICATION LAYER:

- Lower abstracting layer.
- With sensors we are creating digital nervous system.

- Incorporated to measure physical quantities.
- Interconnects the physical and digital world.

GATEWAY AND THE NETWORK LAYER:

- Robust and high performance network infrastructure.
- Supports the communication requirements for latency, bandwidth or security.

MANAGEMENT LAYER:

- Capturing of periodic sensory data.
- Data analytics
- Streaming analytics
- Ensures security and privacy of data.

SENSOR LAYER:

- Provides a user interface for using IoT.
- Different applications for various sectors like transportationhealthcare,agriculture,supply chains,government,retail etc.

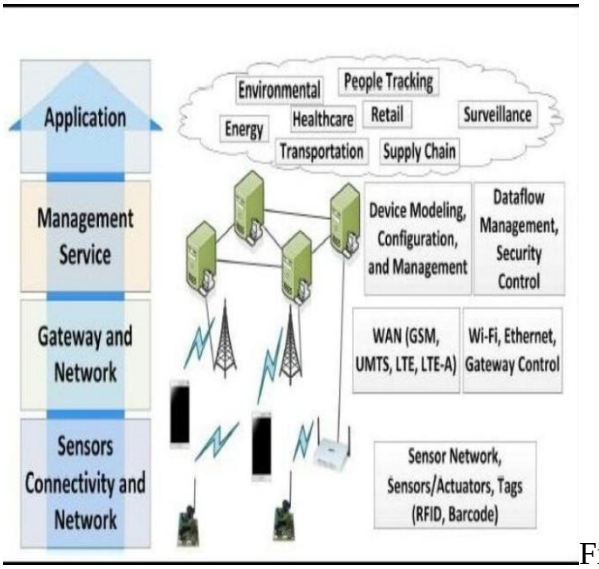

Fig. 2. IoT Architecture layers

3.APPLICATIONS

There are several application domains which will be impacted by the emerging internet of things. The applications can be classified based on the type of network availability, coverage,scale,heterogenity,repeatability,user involvement and impact. 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,smarterhospitals,smarter enterprises and factories. In the following subsections,some of the important example applications of IoT are briefly discussed.

A.AEROSCAPE AND AVIATON INDUSTRY

IoT can help to improve safety and security of products and services by reliably identifying counterfeit products and elements. The aviation industry,for example,is vulnerable to the problem of suspected unapproved parts. An SUP is an aircraft part that is not guaranteed to meet the requirements of an approved aircraft part. Thus, SUPs seriously violate the security standards of an aircraft.Aviation authorities reports that at least 28 accidents or incidents in the United States have been caused by counterfeits [24]. Apart from time-consuming material analyses, verifying the authenticity of aircraft parts can be performed by inspecting the accompanying documents, which can be easily forged. It is possible to solve this problem by introducing electronic pedigrees for certain categories of aircraft parts, which document their origin and safety-critical events during their lifecycle. By storing these pedigrees within a decentralised database as well as on RFID tags, which are securely attached to aircraft parts, an authentication of these parts can be performed prior to installing them in an aircraft. In this way, safety and operationl reliability of aircrafts can be significantly improved.

B. AUTOMOTIVE INDUSTRY

Advanced cars, trains, buses as well as bicycles are becoming equipped with advanced sensors, actuators with increased processing powers. Applications in 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 , maintainance operations and offers new ways of managing recalls more effectively. Dedicated Short Range Communication(DSRC) technology will possibly help in achieving higher bit rates and reducing interference with other equipment.

C.TELECOMMUNICATIONS INDUSTRY

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 is a part ofthe mobile phone , and different applications share the SIM-card.NFC enables communication among objects in simple and secure way just by having them close to each other. The mobile phones can therefore be used as a NFC-reader and transmit the real data to a central server . when used in a mobile phones, the SIM-cards plays an important role as storage for the NFC-reader and authentication credentials. Things can join networks and facilitate peer-to-peer communication for specialized purposes or to increase robustness of communications channels and networks.

D.MEDICAL & HEALTHCARE INDUSTRY

IoT will have many applications in the healthcare sector, with the possibility of using the cell phone with RIFD-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 patients life in emergency situations, especially for people with diabetes, cancer, coronary heart diseases,stroke,chronic obstructive disease, cognitive impairments, seizure disorders and Alzheimers disease. Edible,biodegradable chips can be introduced into human body for guided actions. Paraplegic persons can have muscular stimuli delivered in an implanted smart thing-controlled electrical simulation system in order to restore movement functions.

E.TRANSPORTATION INDUSTRY

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 supports the security policies of the governments and the transportation industry, to meet the incresing demnd for security in the globe. Monitoring traffic jams through cellphones 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 lugguage in airports and airline operations will enable automated tracking and sorting, increased per-bag read rates, and increased security.

We categorise the applications into four application domains:

1. Personal and home
2. Enterprise
3. Utilities

4. Mobile
   There is a huge crossover in applications and the use of data between domains. For instance, the personal and home IoT produces electricity usage data in the house and makes it available to the electricity (utility) company which can in turn optimize the supply and demand in the utility IoT. The internet enables sharing of data between different service provides in a seamless manner creating multiple business opportunities.

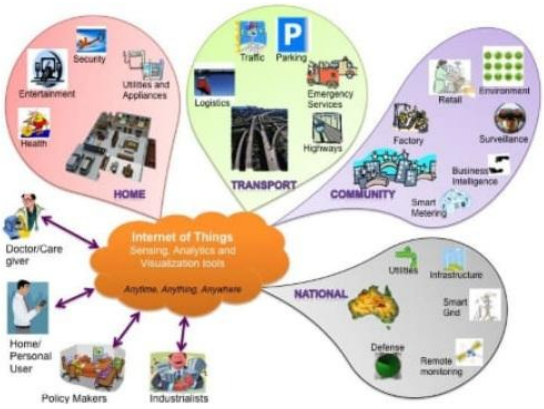

Fig.3. Internet of things schematic showing the end users and application areas based on data.

4.BENEFITS

a. Improved citizen's quality of life: Healthcare from anywhere better safety, security and productivity.
b. New business opportunities:
   IoT can be used in every vertical for improving the efficiency.
   Creates new businesses, and new and better jobs.
c. Economical growth:
   Billions of dollars in savings and new services.
   Improved competitiveness:
   Competitive in providing cutting edge products/services.
   Better environment:
   Saves natural resources and trees.
   Helps in creating a smart,greener and sustainable planet.

5.CONCLUSION

In conclusion, the internet of things is closer to being implemented than the average person would think. And some manufacturers and agencies have already begin implementing a small-scale version of it. The main reasons why it has not truly been implemented is the impact it will have on the legal, ethical, security and social fields. Workers could potentially abuse it, hackers could potentially access it, corporations may not want to share their data, and individual people may not like the complete absence of privacy.For these reasons, the internet of things may very well be pushed back longer than it truly needs to be.And organisations need to come to a consensus on an international standard of compatibility. The evolution of the next generation mobile system will depend on the creativity of the users in designing new applications. IoT is an ideal emerging technology to influence this domain by providing new evolving data and the required computational resources for creating revolutionary apps.

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