SMART HOME AUTOMATION USING IOT

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ABSTRACT: Internet, a revolutionary inve- ntion, is always trans- forming into some new type of hard- ware and soft- ware making it unavoid- able for anyone. The form of communi- cation that we see now is either human to human or human to computer, but the Internet of Things (IoT) promises a great future for the internet where the kind of communi- cation is machine to machine (M2M). This paper goal to provide a compre- hensive over viewing of the IoT scenario and reviews its enabling tech- nologies and the sensor net- works. Also, it describes a six-layered architecture of IoT and points out the equivalent key challenges.

Keywords: Internet of Things, RFID, WSN, Internet of Things architecture, Internet of Things Vision, Internet of Things applications, Internet of Things security.

1. Introduction

The IoT can be des- cribed as the tech- nology in which the actual physical entities with data sensing, proc- essing & self adoption capa- city can be used to inter- act with other such device and process that data to take an intelli- gent decision which will prove help- ful for our daily life. IoT is defined as an envi- ronment in which devices are given unique identi- fiers and the ability to transfer data over a network without having human-to-human or human-to-computer inter- action.

IoT mainly has the following three characteri- stics: compre- hensive perception, which means that entity's in- formation can be obtained at anytime; reliable trans- mission, which means that entity's sensory infor- mation is required to pass out accurate in real-time; intelligent process, which means that the mass of infor- mation can be ana- lyzed and process effici- ently, then the entity's inte- lligent control is reali- zed.

IoT is refer to the general idea of things, es- pecially All day objects, that are read- able, recognized, locata, address through infor- mation sensing device and/or controll- able via the Internet, ir- respective of the communi- cation meaning (whether via RFID, wireless LAN, WAN, or other means). Allday all objects involve not only the elect- ronic devices we en- counter the all products of higher tec- hnology dev- elopment such as Car, Bike and other equipment etc. IoT is a global in- frastructure for the in- formation society, en- abling advanced services by inter connecting (physical and virtual) things based on exis- ting and evolving in- teroperable info- rmation and communi- cation technologies.With the IoT the communi- cation is extended via Inter- net to all things that surround us.

The Internet of Things is much more than machine to machine communication, wireless sensor networks, sensor networks, 2G/3G/4G,GSM,GPRS,RFID, WI-FI, GPS, microcontroller, microprocessor etc. There are considered as being the enabling technologies that make “IoT” applications possible.

VISION

In 2005, ITU reported about a ubi quitous network erea in which all the network are inter connect and allthings from tires to attires will be a part of this big network . assume myself doing an internet search for your watch you lost some of your house. So this is the main vision of Internet of Things, an envi- ronment where things are able to talk and their data can be pro- cessed to perform desired tasks through machine learning . How ever different people and organi- zations have their own differ- ent visions for the Internet of Things .

An article public- shed in Network World Internet of Things strat- egies of top IT ven- dors, they carried out some inter- views from the key IT ven- dors. As of HP’s vision, they see a world where people are always connect to their content. Intel is watch ful on em- powering billions of ex- isting devices with inte- lligence. Micro-soft does not consider Internet of Things as any future tech- nology; they believe that it

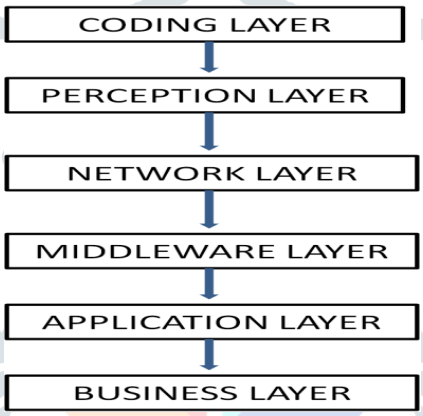
al- ready exists in today's power- ful devices just need to be con- nected for a huge amount of in- formation which could be help ful.

3. ARCHITECTURE

More than 50 Billion things are ass- ume to be conn- ected by 2022 which is a big number so the old archi- tecture of internet with TCP/IP proto- cols, adopted in 1980, can't handle a network as big as Internet of Things which cau- sed a need for a new open archi- tecture that could address various security and Quality of Service (QoS) issuance as well as it could support the old network appli- cations using open protocols. With- out a proper privacy assur- ance,

For further develop- ment of Internet of Things, a number of multi-layered security archi- tectures are pro- posed. Des- cribed a three key level archi- tecture of Internet of Things while des- cribed a four key level archi- tecture. Suggest a five layer archi- tecture used the good features of the archi- tectures of ITMN based on TCP/IP and TMN models res- pectively. Uni- formly a six-layered architecture was also Suggest based on the network hier- archical structure.

The six layer of Internet of Things are describe below:



3.1 Coding Layer

Coding layer is the founda- tion of Internet of Things which pro- vides identifi- cation to the objects of inte- rest. In this layer, each other object is promote a unique ID which makes it easy to discern the objects .

3.2 Perception Layer

This is the device layer of IoT which gives a physic- cal meaning to each things. It consider of data sensors in different forms like Radio Fre- quency Identifi- cation tags, IR sensors or other sensor networks which could sense the tempera- ture, humidity, speed and location etc of the objects. This layer collect the use- ful infor- mation of the things from the sen- sor devices linked with them and converts the infor- mation into digital signals which is then passed onto the Network Layer for further action.

3.3 Network Layer

The purpose of this layer is receive the useful infor- mation in the form of digital waves from the Perception and transmit it to the processing systems in the Middle ware Layer's through out the trans- mission mediums same WiFi, Bluetooth, WiMaX, Zigbee, GSM, 3G etc with protocols like IPv4, IPv6, MQTT, DDS etc.

3.4 Application Layer

This layer realizes the applications of Internet of Things for all kinds of industry, based on the processed data. Because applications promote the develop- ment of Internet of Things so this layer is very helpful in the large scale develop- ment of Internet of Things network . The Internet of Things related appli- cations could be smart homes, smart trans- portation, smart planet etc.

3.5 Business Layer

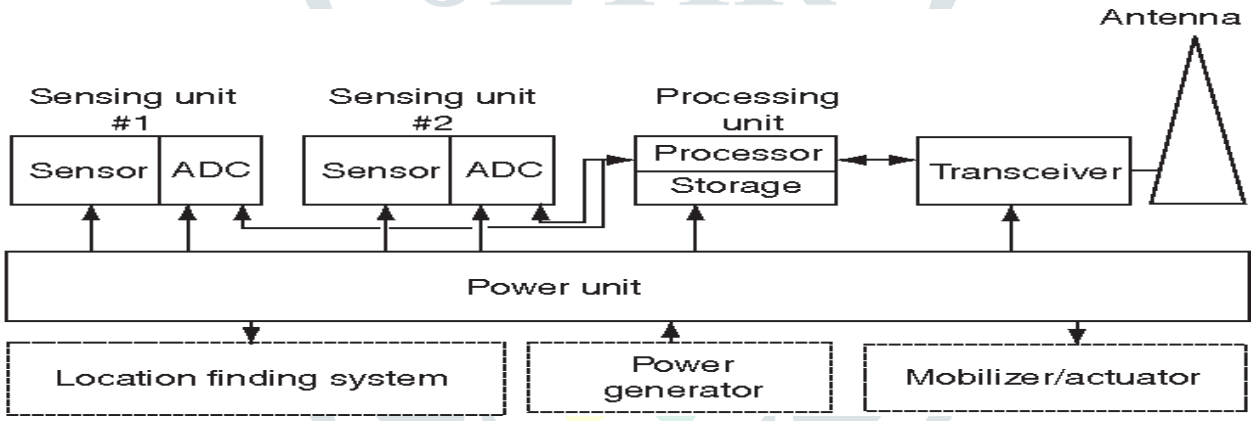
This layer manages the appli- cations and services of Internet of Things and is respons able for all the research related to Internet of Things.

4. TECHNOLOGIES

The growth of a ubi quitous computing system where digital objects can be uni quely identified and can be able to think and interact with other objects to collect data on the basis of which auto mated actions are taken, requires the need for a combi nation of new and effective tech nologies which is only possible through an integration of different technologies which can make the objects to be identified and communicate with each other . In this section we discuss the relevant tech nologies that can help in the large-scale develop ment of Internet of Things.

4.1 Wireless Sensor Network (WSN)

WSN is a directional wire- lessly connected network of sensors in a multi-hop fashion, built from several nodes scattared in a sensor field each connected to one or several sensors which can recover the things specific data. The sensing nodes communi- cate in multi-hop Each sensor is a transceiver having an antenna, a micro-controller and an interfacing circuit for the sensors as a communi- cation, actuation and sen- sing unit respect along with a sourced of power which could be both battery or any energy harvesting technology However has proposed an addition nal unit for saving the data, named as Memory Unit which could also be a part of the sensor node. A typical sensor node is shown in the figure below:



Wireless Sensors Network tech- nology and Radio Frequency Identi- fication technology when combined together opens up possi- bilities for even high smart de- vices, for which a number of solu- tions have been pro- posed. An example solution is provided by the Intel Research Labs in the form of Wireless Identi- fication Sensing Platform . Wireless Internet Service Provider is a passive wireless sensor network with built-in light, tempe rature and many other sensors. Both Wireless Sensor Network and Radio-Frequency Identi fication Sensor Networks have their own advantages but Radio-Frequency Identification Sensor Networks have a low range and their communication is Asymmetric while Wireless Sensor Network have a comparatively longer range and their communication is Peer-to- Peer. The tech- nologies that enables the integration of Wireless Sensor Network with the Internet of Things are a hot research topic, many solutions have been proposed for that including that of a LOW PAN standard, that allows IPv6 pack to be trans- mitted through the networks that are computationally restrict- ted. Also there's ROLL routing standard for end-to-end rout- ing solutions.

4.2 Cloud Computing

With millions of devices ex- pected to come by 2020, the cloud seems to be the only tech- nology that can analyze and save all the data effectively. It is an intel- ligent computing tech- nology in which number of servers are conver- ged on one cloud plat form to allow sharing of resources between each other which can be accessed at any time and any place. Cloud computing is the most import- ant part of Internet of Things, which not only conver- ges the servers but also proce- sses on an in- creased proce- ssing power and analyzes the useful information obtained from the sensors and even provide huge storage capa- city. But this is just a beginning of un- leashing the true potential of the technology. Cloud computing interfaced with smart objects using potentially millions of sensors can be of en- ormous benefits and can help Internet of

Things for a very large scale development so researches are being carried out since Internet of Things will be totally dependent on the Cloud Computing.

4.3 Networking Technologies

These tech- nologies have an important role in the success of IoT since they are res- ponsible for the connection between the objects, so we need a fast and an effective network to handle a large number of poten- tial devices. For wide-range trans mission network we commonly use 3G, 4G,5G etc. but As we know, mobile-traffic is so much predict- able since it only has to per- form the tasks using making a call, sending a text message etc. so as we step into this modern area of ubi- quitous computing, it will not be predict- able anymore which calls for a need of a super-fast, super- efficient fifth generation wire- less system which could offer a lot extra band width . Similarly for a short range comm- unication network we use tech- nologies like Bluetooth, WiFi etc.

4.4 Nano Technologies

This tech- nology rea- lizes smaller and im- proved version of the object that are inter connected. It can decrease the consum- ption of a system by ena- bling the develop- ment of devices in nano meters scale.

4.5 Micro-Electro-Mechanical Systems (MEMS) Technologies

MEMS are a combi- nation of electric and mechanical compo- nents working together to provide several appli- cations including sensing and actuating which are already being comer- cially used in many field in the form of trans- ducers and accelero- meters etc. MEMS combined with Nano tech- nologies are a cost-effective solution for im- provising the communi- cation system of Internet of Things and other advan- tages like size reduction of sen- sors and actu- ators, inte- grated ubi quitous computing devices and huge range of fre- quencies etc.

4.6 Optical Technologies

Rapid develop ments in the field of Optical tech- nologies in the form of tech- nologies like Li-Fi and Cisco's BiDi optical tech- nology could be a major break through in the develop- ment of IoT. Li-Fi, an epoch-making Visible Light Communication (VLC) tech- nology, will provide a break through in the develop- ment of IoT. Li-Fi, an epoch-making Visible Light Communi- cation (VLC) technology, will provide a great connecti- vity on a higher band width for the ob- jects inter connect on the concept of IoT. Similarly Bi-Directional (BiDi) tech- nology gives a 40G ether net for a big data from multi- farious devices of IoT.

5. APPLICATIONS

Most of the daily life appli- cations that we normally see are al- ready smart but they are unable to communi- cate with each other and enabling them to communi- cate with each other and share use- ful infor- mation with each other will create a wide range of inno- vative appli- cations . These emerging appli- cations with some auto n- mous cap- abilities would certainly improved of the qua- lity of our lives. A few of such appli- cations are already in the market , let's take the example of the Google Car which is an

initiative to provide a self-driving car ex- perience with real-time traffic, road conditions, weather and other infor- mation ex- changes, all due to the con- cept of IoT. There are a number of possible future app- lications that can be of good advantages.

5.1 Smart Home.

IoT will also provide DIY Do It Yourself solutions for Home Auto- mation with which we will be able to remotely con- trol our appliances as per our needs. Proper moni- toring of uti- lity meters, energy and water supply will help saving re- sources and de- tecting un- expected over loading, water leaks etc.

5.2 Smart Hospitals.

Hospital will be equipped with smart flex able wearable em- bedded with RFID tags which will be given to the patients on arri- vals, through which not just doc- tors but nurses will also be able to moni- tor heart rate, blood pressure, temper- ature and other conditions of patients inside or outside the premi- ses of hospital . There are many medical emergen- cies such as cardiac arrest but ambu- lances take some time to reach patient, Drone ambu- lances are already in the market which can fly to the scene with the emer- gency kit so due to proper moni= toring, doctors will be able to track the patients and can send in the drone to provide quick medi- cal care until the ambu- lance arrive.

6. SECURITY AND PRIVACY CHALLENGES

IoT makes every thing and person local table and address which will make our lives much easier than before; how ever with out a lack of confidence about the security and privacy of the user's data, it's more un- likely to be adop- ted by many . So for its ubi quitous adopt, Internet of Things must have a strong secu- rity infra- structure. Some of the possible IoT related issue are as followed:

6.1 Unauthorized Access to RFID

An un- authorized access to tags that cont- ains the identifi- cation data is a major issue of Inter- net of Things which can ex- pose any kind of confi- dential infor- mation about the user so it needs to be address. Not just the tag can be read by a miscreant reader but it can even be modi- fied or possible be damage. In this context, summ- arized some of the real life threats of RFID which in- cludes RFID Virus.

6.2 Sensor-Nodes Security Breach

WSNs are vulnerable to several types of attacks because sensor nodes are the part of a bi-direction sensor network as dis- cussed in Section 4.2, which means other than the trans- mission of data, ac- quisition of data is also possi- ble. described some of the possi- ble attacks that in- cludes Jamming, Flood and some other kinds of attacks, which are sum arized as followed:

(1) Jam obstructs the entire network by inter fering with the fre- quencies of sensor nodes.

(2) Sybil attack claims multiple pseudo- nymous identities for a node which gives it a big in- fluence.

(3) Flood is a kind of a DOS attack caused by a large amount of traffics that results in memory ex- haustion.

7. CONCLUSION

The concept of Internet of Things will soon be in- exorably develop- ing on a very large scale. This emerging para- digm of net- working will in- fluence every part of our lives ranging from the auto- mated houses to smart health and environ- ment moni- toring by em- bedding intelligent into the objects around us. In this paper we dis- cussed the vision of Internet of Things and present a well-defined archi- tecture for its deploy- ment. Then we high- lighted various enabling techno- logies and few of the related security threats. And finally we dis- cussed a number of appli- cations resulting from the Internet of Things that are ex- pected to facile- tate us in our daily lives. Re- searches are already being car- ried out for its wide range adop- tion, how ever with- out addressed the challenge in its develop- ment and provid confi dentiality of the privacy and security to the user, it's highly un- likely for it to be an omni-present tech- nology. The deploy- ment of Internet of Things requires stren- uous efforts to tackle and present solutions for its security and privacy threats.

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