IOT Based Secure Smart Home

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ABSTRACT
Securing by monitoring and controlling home security system from remote location means pioneering research area in Internet of Things. The security is in demand ie in robbery, accidents, gas leakage etc…these are the main significant features of any Home Security System. In this I have developed a prototype which is the secured smart home model. A home security system mainly uses a signals in the form of alarm in order to detect the intruder. However, the secured smart home system mainly uses a mobile communication, GPS based Home Security System. In these system it provides a more security that can be used worldwide through the android app and amazon services. In this system an alert message will be sent as an SMS or email. When a particular event is detected from the sensor, an instant actions could be taken by the owner. The projected SSH sends notification using GPS (General Packet Radio Service) -Module and email through RENESA micro-controller. The prototype of projected system uses RENESAS micro-controller board for commands processing and control. It uses GPS technology and Amazon AWS, which provides universal access to the Smart Home Security System. The prototype SSH, developed is cost effective, can be used for transforming current homes into smart and secure homes at comparatively reasonable cost and with convenience.

Keywords
Amazone AWS, GPS, SMS, multisensor,theft alarm, Andriod app.

1. INTRODUCTION
A Secure Smart home is one that integrate innovative automation systems in order to provide its occupants, the advanced monitoring and regulating conveniences over us various functions. Example, a smart home may have automated facilities for regulating light bulbs, fans, air conditioners, room temperature, hypermedia appliances such as home theatre systems along with window, door operations, curtains and many more functions. The term "Internet of Things" is coined by Kevin Ashton 1999.Early example, 1982, Coke machine at Carnegie Mellon University was connected to internet: report its inventory and temperature. The plea for home automation has increased at great pace in the past few decades [1]. The process of refining the quality of residents, it is a life by assisting a flexible, comfortable and secured atmosphere [2]. The three main elements in a smart home are (i) Internal home network, (ii) Intelligent control and (iii) Home automation with wired/wireless access gateways. [6]. Remote access to the home appliances can be provided with the smart home set up using IOT, Thus providing access from remote places to the user , along with the recent information, continuous connectivity for continuous monitoring of the house. Such a monitored house can kept from illegal tress-passing, fire accidents, theft and other non-internal hazards. The devices and appliances which are inside the home are get connected to a sensors, which mainly helps to diminish labor and physical effort, by actively sensing and responding automatically to their needs. A Home Security System should provide safety and security for a home, by alarming the home members from intruders, burglary, natural calamities and accidents such as fire accident, gas leakage, animal invading etc. In this paper, I aim to write a prototype which is a multi-functional home security system, and I have discuss related technologies. In a secured smart home, safety is an important aspect and feature [3]. Technologies tangled in a home security system have been advancing significantly the last few decades, and will be changing much auxiliary in the impending years [4]. The emerging concept of secured smart home offers a safe atmosphere, operational convenience and a contented life for its inhabitants. Generally, a home the home inmates being alerted by security alerts in terms of alarm systems, thereby keeping their valuables safe from burglars and accidents. By facilitating adaptability, the landscapes of a home security system, may offer more sophisticated functionalities. Advanced home security systems are the great need of these days, in terms of guarding properties, detecting crime, and notifying the fire or gas leak etc., thereby providing amity of mind to all inhabitants of a home. The sense of being safe from intruders makes a person more focused, productive and healthy. Hence, adapting an advanced home security system to our homes may help in giving us a supplementary coat of defense against any potential intruders. This paper is organized in the following way. Section I Introduction, Section II, discusses the technologies on "Secured Smart Homes", which can be adopted for Home Security and Home Automation Systems. Design details of the projected system; Hardware and Software are described in Section III. Results of some of the performance evaluation experiments and observations are discussed in Section IV. Section V gives a brief summary and conclusion of the prototype SSH system developed, along with the scope of further work.

The reminder of this paper is organized as follows: Section II discusses the motivation for this paper. Section III presents related work done on this front. We discuss the proposed system in Section IV. Section V presents system configuration for implementing the proposed system. Section VI talks about the future work. Finally, we conclude the paper in Section VII

2. MOTIVATION
2.1 Generel MotivationTemplate
First, the motivation for developing smart home systems comes from many reasons, but most prominent are convenience, security, energy management, connectivity and luxury. Smart Home systems are one of the newer areas of research that have not been fully integrated into our society. This is because the research requires many other disciplines of research and engineering to produce a functional smart home. The biggest motivation behind smart home systems is the convenience. Convenience is really another way of saying "time saver", and into day's world where everything is moving faster, every second has value. Most of the technology we use today is based

of convenience, for example cars get us where we need to go faster, phones get us information from other people faster, and computer's get work done faster. Smaller conveniences in the home will be desirable because they allow the home to save the user time as well.

2.2 Energy Efficiency

The There are so many ways of bad habits of using electricity such as running space heaters under desks while air conditioning is on because buildings are over cooled, propping doors or windows open in retail stores or office buildings to mitigate over-cooling or to draw in shoppers, running heating and cooling systems at the same time due to improperly maintained, keeping lights on all day even though sunlight could be used, utilizing all of the lighting in a space when task-specific lighting would easily cover the area, leaving lighting, heating or cooling systems on during the night at levels that would be appropriate only for daytime occupancy when more people present, keeping computers, printers and computers on all night or over the weekend when they are not being used.

2.3 Realated work

It has been observed that there are lot of research and innovations being emerged in smart and secure home system integrated with IoT. We gaze into many of the related works wherein the implementation is centric to in-house infrastructure and low efficient over remote accessing and controlling. In addition, we are also looking for near real time and cost effective mechanism by using high performing secure cloud infrastructure to increase the efficiency in monitoring and controlling.

In [1], authors propose (GSM) based Home Security System, which helps to provide a better security to have systems that can be universally connected. In their proposed system, whenever an event from any sensor is detected, a text message is sent by system, so that immediate actions could be taken by the home owner. The projected system sends SMS using GSM-Module and mail through Raspberry Pi micro-controller. The prototype also uses an Arduino micro-controller board for commands processing and control. They implemented Web-cam to take photos and sends it to the user over email whenever PIR sensor signals the micro-controller. They showcased when an incorrect password is entered more than three times, the GSM technology is used to call the owner. They have used AT commands in the system to explore the services of mobile and control the services adaptably.

In [2], author explains about Remote Monitoring, Security Device, SMS, GSM, One Way Communication, and Sensor Technology. He proposes the device provides a means for being able to securely monitor a stationary or mobile plant by use of sensors integrated with a micro-controller and a GSM unit. He thinks economical and convenient way to alert users of a possible intrusion into the property by using SMS.

[3], in this Paper authors shared their experience on the study took place in the summer of 2010 when they conducted semi-structured visits to 14 households with home automation. They recruited households that had at least one of the following home automation systems: remote lighting control, multi-room audio/video systems, security cameras or motion detectors. They have shown the statistics of number of years' household has lived with automation; brands installed, and estimated cost. He also discussed about the home automation barriers

In [4], author has analyzed and presented on the design and implement of a microcontroller based home security system with GSM technology He has used two microcontrollers with other peripheral devices which include Light Emitting Diode (LED), Liquid Crystal Display (LCD), Buzzer and Global System for Mobile Communication (GSM) which are responsible for reliable operation of the proposed security system. In addition, he explained mobile phone interface with microcontroller through a Bluetooth device in order to control the system. He has used Compiler Code Vision AVR is used to design a program that controls the system along with maintaining all security functions.

In [5], authors demonstrated how VR module can recognize voice commands, irrespective of the speaker, accent or linguistic dialect. They have conducted experiment with various people aging between 19 to 20 years prompting all the commands at distances ranging from 1cm to 20cm and their observation are (i) Average number of attempts to recognize a command in VR Module is 1.102. (ii) Best results in the range 5cm to 10 cm. (iii) Most accurate result at 7.25cm.

[6] This groups have provided huge information on Bluetooth Core Specification, and Warless LANs Adopted Specifications, Enhancements, Deprecated Specifications, Legacy Specifications, Qualification Test Requirements, Submit Idea for a Specification. Explains how Bluetooth® 5 focusing on increasing functionality for the Internet of Things (IoT). Bluetooth 5 delivers a "connectionless" IoT, advancing beacon and location-based capabilities in home, enterprise and industrial applications. This will create significant advantages for developers and manufacturers, while providing a better user experience for their customers.

[7] In this paper, it has presented and examined on the how to prepare and implement of a microcontroller based home security system with a one of the technology called GSM technology. The author has make used of two microcontroller with the other devices which contains Light Emitting Diode (LED), Liquid Crystal Display (LCD), Buzzer and Global System for Mobile Communication (GSM),these peripheral devices are mainly responsible for the trusty operation of the proposed security system. The author also done how to control the system through the Bluetooth devices using the mobile phone interface with the microcontroller.He has used Compiler Code Vision AVR is used to design a program that controls the system along with maintaining all security functions. At last, in the results of practical circuit he has shown the proper functions and also verifies the reliable security within reasonable cost

In [8], it talks about NFC technology. NFC enables short-range wireless interaction between consumer electronics, mobile devices, personal computers, electrical appliances, and NFC-compatible tags. NFC is a technology standard that harmonizes and extends existing contactless standards unlocking the full capabilities of NFC technology for the different contactless operating modes. The Technical specifications developed by the NFC Forum bridge gaps between existing technologies and devices to enable new applications/services

In [9], authors explained different components, technologies and protocols used for wireless sensors communication along with different type application software being developed. With circuit diagram they explain how these devices and software can be integrated in secure home system. They believe, for all sources of incidents that occur in our home, we need to draw some baselines for an appropriate respond. The security system is there to protect your home when you are not around and to protect your home when you are around or both. Home security system need to do at least three functions, (1). Detection: system should be able to sound an alarm (or not depend on scenario) when a certain sensor is triggered. (2). Response: system should be able to call for appropriate help (calling you, your family or

neighbor). (3). Prevention: should be able to help prevent problems before they occur (automatically turning on the outside light at night when someone approach the front, back entrance or garage).

3. PROPOSED SYSTEM

The proposed system will enable home security systems to communicate over the cloud infrastructure through internet.

3.1 Architecture

RENESAS microcontroller will be used as primary controller processing system in connection with Amazon web services (AWS) will be used to monitor and control the devices from remote. AWS, provides on-demand computing resources and services in the cloud, with pay-as-you-go pricing. For example, you can run a server on AWS that you can log on to, configure, secure, and run just as you would a server that's sitting in front of you. Android, a Linux-based operating system whose code was released by Google under the Apache license, is used primarily in touchscreen devices. It has a large developer community, which writes apps that expand the functionality of these devices. It is by far one of the most popular platforms for mobile developers. Android applications developers can now benefit from the power of cloud computing to deliver exciting applications to enterprises.

3.2 Implementation

The system will be activated by providing and guarding from the secret key (password).If that secrete key matches with the set secret key SSH system will get activated. A movable solid door will mechanically closed after the activation and a text message will be sent to the owner saying that the system is activated and the text message is also displayed on LCD.

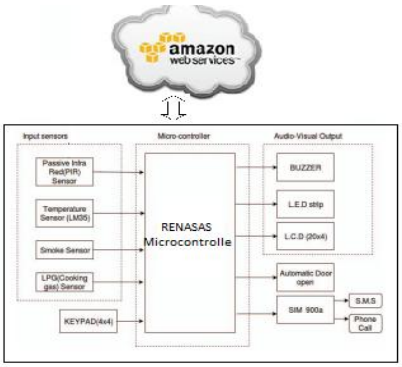

Fig. 1. Implementation

Screen. Basic password policy will be applied to manage passwords Suppose If a person unable to enter the correct password in three attempts a defer of 3 minutes is provided to enter the password again. In this mean time we get an alert-message that somebody has tried to deactivate or activate the system

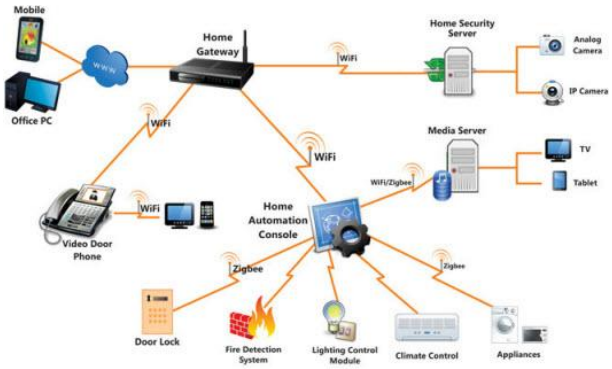

Fig. 2. Implementation

If the P.I.R sensor detects any motion in any room, it sends signal to microcontroller. Then microcontroller activates the security devices (buzzer, L.E.D strip, GPS module) and sends signals to web-cam, Snapshots will be sent to owner via email message. Snapshots also help to overcome the problem of false alarm if any. Upon the trigger of GPS module, we get a phone call later we also get a message that there is motion in a respective room. The buzzer keeps on buzzing till we de-activate the system by entering the password again. also we get a message If we de-activate the SSH System. The status of SSH System is displayed on L.C.D screen. The AWS system will receive real time status data and update into data base. This data can be accessed on web via Amazon AWS services and mobile through android app. If the system is retire the temperature of the house will be displayed on L.C.D screen.

In case of any unexpected fire accident occurs then the temperature goes beyond 65 degree then we get announcement message as "FIRE alert". If the smoke level goes beyond 200ppm immediately we get a text message as, "Alert!! Increased smoke-level!" On de-activating the system PIR sensors, buzzer and LED strip become inactive and door gets automatically opened.

4. SYSTEM CONFIGURATION

The proposed system need both software and hardware components to function as desired.

Software Specification:

In the proposed SSH system embedded python code is used for RENESAS. The desired functions and information are performed by regular sequential form according to the flow. Other software and tools are

1) Android development tool kit
2) AWS
3) .Net tool

Hardware Specification:

The hardware for our proposed system requires,

1) Sensors (LM35, MQ2, PIR Sensor)
2) RENESAS micro-controllers, USB-to-RS232 adapter
3) Web-cam, GPS system with RS-232 DB9 connector, Buzzer, a SIM card with active plan, L.C.D, led strip, mobile devices to control the appliances

5. CONCLUSION

From literature survey we understood that implementation of Secured Smart Home System, would be not luxurious and not difficult to use. The GPS based security system integrated with Amazon cloud services like aws helps to communicate between

mobile or web application and security system with ease, which provides a supplementary safety to our home. User can access or get alert anywhere in the world as GPS is a wireless technology and web services can be accessed globally. Thus building the system autonomous of location. If any event is encountered inside the home the owner will get the alert communication message through the text message. Smoke detection over a certain range, whenever system gets activated and de-activated, on fire detection

General Packet Radio Services (GPRS) is a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. In order to communicate with the GPRS, AT commands will be used in the prototype. Our proposed system will provide new edge to the smart and secure home system by integrating the today's technologies and adaptability for future technologies.

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7. REFERENCES

[1] Vishy Karri and Daniel J. S. Lim, "Method and Device to Communicatevia SMS After a Security Intrusion", in Proc 1st International Conference on Sensing Technology, New Zealand, Nov 21-23 (2005).J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.

[2] The-History-of-Home-Security" 4th July 2010 [Online]. Available: http://ezinearticles.com. (Last viewed on 25 May 2016)K. Elissa, "Title of paper if known," unpublished.

[3] A. J. Bernheim Brush, Bongshin Lee, Ratul Mahajan, Sharad Agarwal,Stefan Saroiu and Colin Dixon, "Home automation in the wild: challenges and opportunities", proceedings of the SIGCHI Conference on Human Factors in Computing Systems 11, ACM, USA, 2011..

[4] Rana, G. M. S. M. Khan, A. A. M. , Hoque, M. N and Mitul, "Design and Implementation of a GSM Based Remote Home Security and Appliance Control System" in Proc. 2nd International Conference on Advances in Electrical Engineering, Dec 2013.

[5] Y. Mittal, P. Toshniwal, Sonal Sharma, S. Deepika, Ruchi Gupta and Vinay Kumar Mittal, "A Voice-Controlled Multi-Functional Smart Home Automation System", in Proc. IEEE 12th International INDICON 2015 Conference (E3-C3), Jamia Millia Islamia, New Delhi, 17-20 Dec 2015

[6] B. S. I. Group, "Bluetooth Specification Adopted Documents",2015. Available: https://www.bluetooth.org/en-us/specification/adopted-specifications

[7] I. S. Association, "IEEE Standards Association - IEEE 802.11: Wireless LANs", 2012, [Last accessed on 24 May 2016].

[8] ETSI Mobile Technologies GSM", ETSI, 2015, [Last accessed on 25 May 2016]. [online] Available: http://www.etsi.org/technologiesclusters/ technologies/mobile/gsm.

NFC-Forum, "Specifications and Application Documents-NFC Forum", NFC-Forum, 2015