Grenze International Journal of Computer Theory and Engineering , Special issue

An IOT Enabled Connected Homes

Shruthi K R[1] and Dr K Natarajan[2]
[1]M Tech, DCE, RIT, Bangalore
Email: deeparaj57@yahoo.com
[2]HOD and professor Telecom, RIT
Email: hod_te@msrit.edu

***Abstract*— This paper proposes a reliable and efficient way to control the different loads through cloud and also an efficient way to detect the harm full gas in an apartment and send email to all the homes through cloud. The main aim of the project is to establish wireless communication between the homes in an apartment by which common information can be shared with in the apartment. Common information such as water level in tank, if fire is detected ,any intruder entering the apartment ,all these information is shared to all the residence in the apartment. Loads are integrated to the ESP 8266 12 microcontroller, which has a serial wifi module which is used to establish wireless communication. With the help of amazon cloud loads of the home can be controlled from anywhere which helps in energy conservation. Whenever fire is detected in any of the homes in apartment smoke is detected and this information is send to amazon cloud, cloud will send the email to all the homes in the apartment regarding the fire detected. By adopting this we are benefited with energy saving, to provide comfort, can control the switches from anywhere and also security solutions.**

***Index Terms*— ESP8266 12 controller, fire sensor, aurdino software, amazon cloud, email.**

I. INTRODUCTION

There are many applications of IOT for homes. A smart home is one which can be automated by sensors and send the information through SMS or email. The different types of applications are smart lighting, smart appliances, intrusion detection, fire/gas detectors. By adopting the smart lighting helps in saving energy by switching on/off the lights when ever needed which is controlled by an android app or web application when cloud is used. Fire/gas sensors detects the fire/gas within the home or building which gives an alert through SMS or email. Sending an alert through email uses cloud services.

Connected homes is a new concept where all the homes within an apartment is connected that is they share the general and common information about the water level in tank, fire detection in any home or even can share movies, songs etc.

In this paper we develop a cloud based connected homes. The system which is proposed is classified into 3 subsystem i.e interfacing the hardware, sensing and control.

(1) we use ESP 8266-12 microcontroller which is interfaced with fire sensor and relay to control the loads and a web application is made where amazon cloud is used as a server.

(2) whenever the fire is detected in any of the home the fire sensor senses the fire and it sends a notification to the cloud, the server sends the email to the two homes regarding the issue. Monitoring subsystem contains

Grenze ID: 01.GIJCTE.3.4.70

ESP8266 wifi module which sends the data to the server.

(3) Control subsystem contains web application using which the user can check the incoming data and control the loads with the switches in web application from anywhere.

The system designed is very advantageous and cost efficient and its aim is to provide a system where the information about any fire in an apartment is updated to every home through email and automatically control the loads through web application from anywhere not only within the home which helps in saving energy. Latter of the paper is analyzed as follows: section 2 discusses the related work, section 3 describes the proposed system section 4 implementation details section 5 gives the conclusion of the system.

II. RELATED WORK

A new smart home control system based on sensor networks system to make home network automatic and intelligent is proposed and the more efficient way to control the lighting system in order to save energy is been implemented [1]. Cloud bases smart home is proposed which is conceptual framework and talks about the architecture of cloud that provide web services or web applications [2]. To adopt smart lighting systems which controls and allows to saves energy consumption for lighting up to 25% in industrial and commercial and up to 45% in educational institute is proposed [3]. The total consumption of power by the lighting system which impacts on the sustainability of smart cities is been proposed and this system requires high connectivity, context awareness, control level, and finally the definition of standard [4]. The gas sensor should be kept in a certain altitude to detect the gas and it is made intelligent by designing it to alert the nearest fire station about the incident and the values of voltage of the hardware is detected and that values are displayed on the PC for the further activation of other modules [5]. The three layers system architecture is implemented which provides hierarchical service provision and control to improve the system efficiency and also dynamic services, openness of architecture, and distribution of intelligence [6]. Based on layer framework of IoT an intelligent home system architecture was implemented [7]. The service platform is embedded with OSGi technology in the home automation which targets the adding of a level of transparency between the higher level services and the physical devices blended with home automation functionality. Efficiently various home control applications can be built by ROCob AP a developer [8]. The use of cloud based services in home automation system provides many advantages from cost reduction to value added services. When intruder is detected the cloud sends a message to the user where the user can assess the home from any network from the cloud web service [9]. A home is the place where privacy is expected. Most smart home devices have processing power, memory, and energy limitations. An efficient way of conservation of energy, management of memory efficiently is proposed [10].

III. PROPOSED SYSTEM

The proposed system involves the integration of sensor, design of the switching system and sending the data to the server using ESP8266. In the system design we use a fire sensor for accurate measurement when fire is detected, Each home is set up with ESP 8266 12 microcontroller which has a WIFI module in it, solid state relay to loads(such as fan, light, geyser). Microcontroller has ESP8266 wifi module which is used to connect the homes wirelessly. Each home in the apartment is provided with the set up of microcontroller with relay and fire sensor. Whenever the fire is detected in any home with in an apartment the fire is sensed by the fire sensor and this information is sent to amazon cloud through the wifi module and e-mail is sent to all the homes in the apartment regarding the fire in particular home.

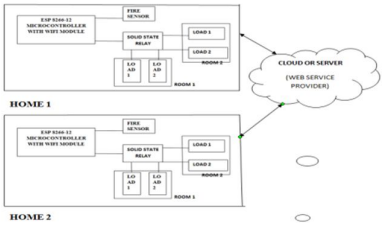

Fig. 1 Block Diagram Of The Proposed System

Arduino IDE is used to code to the ESP 8266-12 microcontroller the code is dumped to the controller serially from Tx and Rx pins of controller.

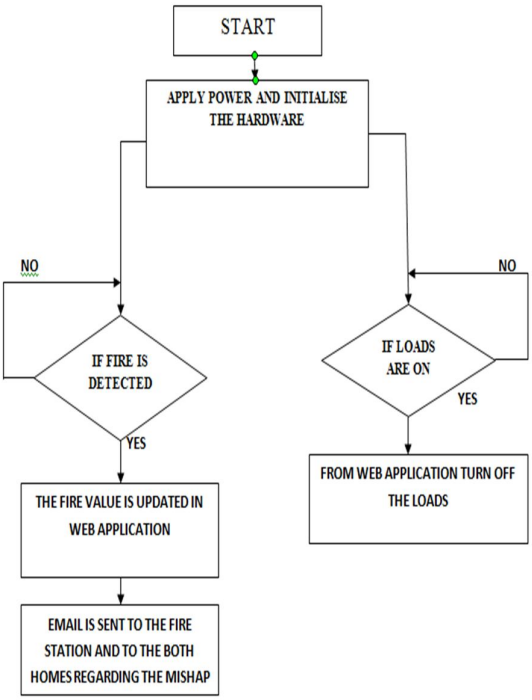

Fig. 2. Flowchart Depicting The Process

IV. IMPLEMENTATION DETAILS

In the setup we have created a test bed where two modules of home is made. For test bed each home consists of four AC loads, four bulbs are chosen as the four AC loads which are connected to the solid state relay for each home.

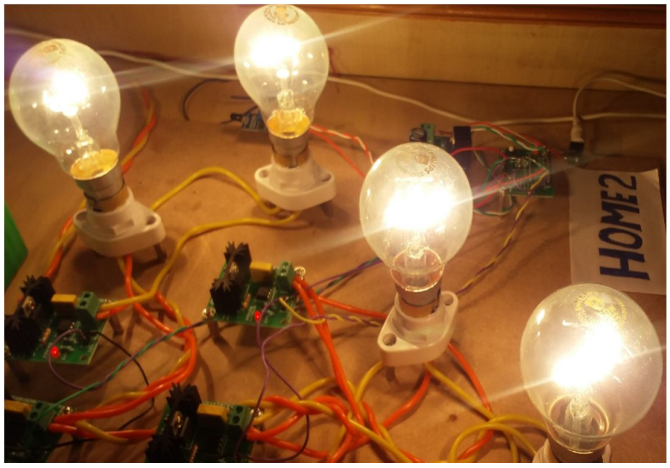

Fig.3. Test bed with four loads connected to it

The output of the fire sensors is given to the ESP 8266-12 controller and the input of the relay is given to the GPIO pins of the controller to actuate the loads where relay acts as switch to control loads. fig 3 and fig 4 depicts the test bed created.

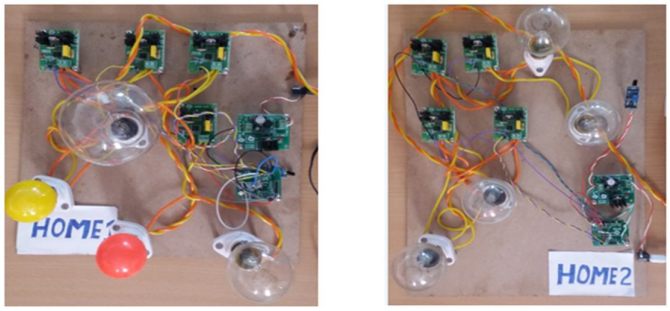

Fig. 4. Experimental Setup Showing Components

Esp 8266-12 microcontroller consists of a WiFi module which is used to send data to the cloud. Here we are using amazon cloud to host the application. Once our application is hosted in cloud the IP address of the server is used to access the web page. Both home have different login id and password. The signal strength of WiFi which are used for home2 is shown below.

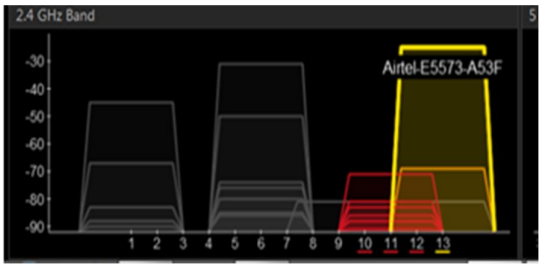

Fig. 5. Signal Strength Near The Software

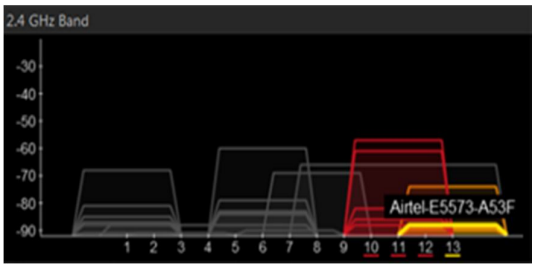

Fig. 6. Signal Strength About 30m Away From The Software

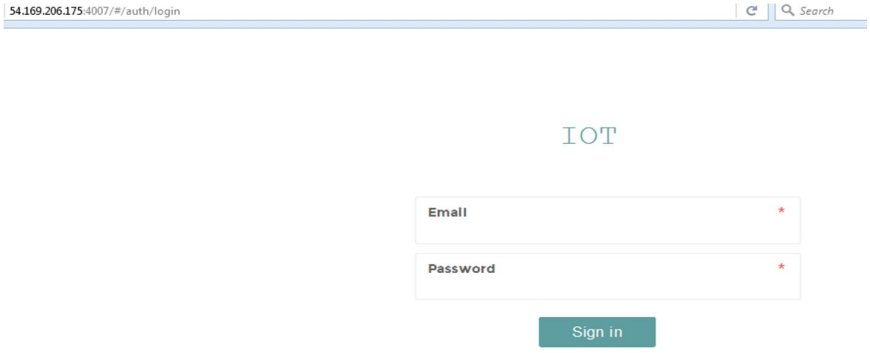

Fig. 7. The web page with login id and password

Once the web page is opened with password it has switches which control the loads of that home and with fire which shows the status.

The figure 6 shows the web application of home1 where the status of fire is displayed. It consists of button by pressing which we can remotely turn on and off the AC loads from anywhere in the world. This provides a real time application by connecting the homes to the cloud for interacting which acts as server provide more reliable IoT platform.

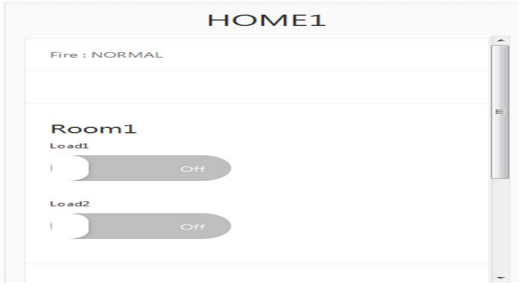

Fig. 8. The Web Page Of Home1 With Buttons And With Fire Status

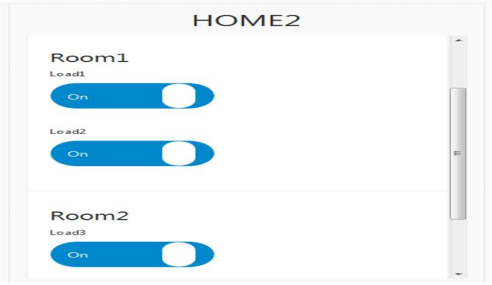

Fig 9. The web page of home2 with buttons on and with fire status normal

In the similar way the web page for home2 is also created. When button are pressed in the web page coresponding bulbs switch on\off.
When fire is detected in any of the home the status is updated in web page of that home and email is sent to both homes.

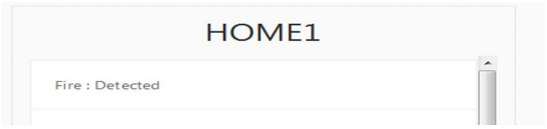

Fig. 10. The Web Page Showing The Status Of Fire As Detected In Home1

Fig. 11. The Web Page Showing The Status Of Fire As Detected In Home2

When fire is detected in home1the email is send to both homes and fire station, below are the pictures showing the mail sent to fire station and both homes.

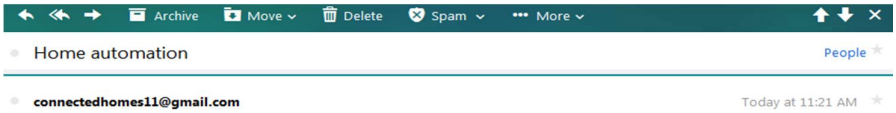

Fig. 12. The picture showing the mail sent to fire station

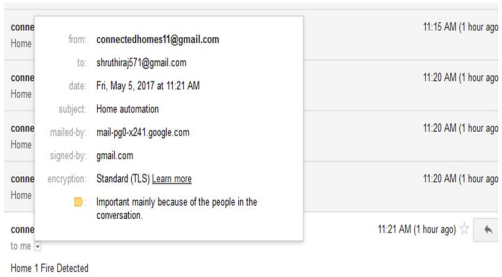

Fig.13. The Picture Showing The Mail Sent To Home1

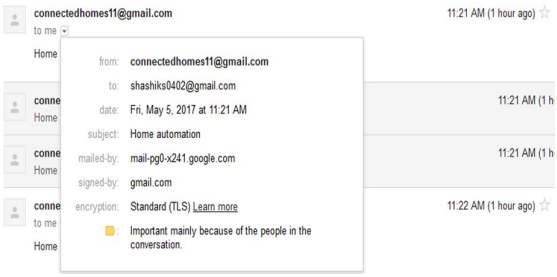

Fig.14. The Picture Showing The Mail Sent To Home2

Similarly when fire is detected in home2 in web page fire status is updated as detected and email is send to the fire station and both the homes as shown in the above figures. The analysis from this is that in real time the system is efficient in terms of safety issues. It makes the home safer than before with normal scenarios. The conservation of energy is implemented by controlling the loads of home with the help of web application which is hosted in amazon cloud.

V. CONCLUSION

In this paper an efficient and reliable way to control loads by the web application which helps in saving energy is demonstrated. We have discussed an IoT enabled connected homes where WiFi based control and processing model which is used to send the data to the internet in real time is demonstrated. The loads are controlled through web applications which are in the form of switch on/off from anywhere. When fire is detected in any of the home an alert is send to the cloud where the email is send to both homes regarding the issue and an alert to the fire station is also send to take immediate action.

VI. FUTURE WORK

The future work is that this can be applied to the homes which are not in single apartment that is any home can be connected and also the water tank level information can be implemented where this data is shared among the homes in apartment. Intruder detection can be implemented where this information is shared among homes.

REFERENCES

[1] Dae-Man Han and Jae-Hyun "Smart Home Energy Management System using IEEE 802.15.4 andZigbee" IEEE 2010.

[2] Xiaojing Ye, Junwei Huang, "A Framework for Cloud-based Smart Home" International conference on computer science and Network Technology 2011.

[3] Luigi Martirano "A Smart Lighting Control to Save Energy" The 6th IEEE International conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications 15-17 September 2011.

[4] Miguel Castro, Antonio J.Jara and Antonio F.G. Skarmeta, "Smart Lighting for Smart Cities" 27th International Conference on Advanced Information Networking and Applications Workshops 2013.

[5] Nivedhitha S , Padmavathy A P , Susaritha U S "Development of Multipurpose Gas Leakage and Fire Detector with Alarm System" 2013 Texas Instruments India Educators' Conference.

[6] Qinglong Wu, Fei-Yue Wang "The open distributed intelligent management system architecture and prototype for internet connected homes"Proceedingsof the 2002 IEEE InternationalSymposium on Intelligent Control Vancouver, Canada.

[7] Shushan Hu, Cunchen Tang, Riji Yu, Feng Liu, Xiaojun Wang "Connected intelligent home based on the internet of things" International School of Software, Wuhan University, Wuhan, China.

[8] Nektarios Papadopoulos, Apostolos Meliones, Dimitrios Economou, Ioannis Karras, Ioannis Liverezas "A Connected Home Platform and Development Framework for Smart Home Control Applications" 2009 7th IEEE International Conference on Industrial Informatics (INDIN 2009).

[9] Anindya Maiti and S. Sivanesan School of Computing Science & Engineering "Cloud Controlled Intrusion Detection and Burglary Prevention Stratagems in Home Automation Systems" 2012 2nd Baltic Congress on Future Internet Communications

[10] Joseph Bugeja, Andreas Jacobsson, and Paul Davidsson "On Privacy and Challenges in Smart Connected homes" 2016 European Intelligence and Security Informatics Conference.