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Global Access of AC Appliances Securely using Internet of Things

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Abstract: The project focuses on ease of a user tending to control his devices remotely across the globe. The user has remote access to all devices which are situated at distant places. The user can communicate with devices using various interactive approaches like a website on a personal computer or using android. Various AC appliances can be controlled at global level remotely from any user's work place. These devices can be situated at distant places such as different countries or different continents. To manipulate appliances via internet the concept of internet of things is used. Micro-controller that is raspberry pi is used to enhance this process. These AC appliances are controlled with help of electromagnetic relays. Raspberry pi acts as a mediator between user and appliances which executes commands given by user. This system will eradicate use of a human agent to perform tasks of monitoring electrical usage and control them as well. This system will help in saving electricity at larger extent. Thus the system will comprise of advantages such as to reduce human efforts and efficient use of energy.
Keywords: Internet of things, Raspberry pi, Server, Static IP, Intranet

I. INTRODUCTION

Traditionally, a human is required for controlling all the devices in an office or room. And there is wastage of electricity and energy. Instead Internet of things can be used to provide modern way of controlling devices in a secure manner. Internet of things helps to connect various devices such as, AC appliances, global nodes etc. through network. The main motivation is awareness of automation for system having AC appliances so that user should be able to control his devices from any location. And to improve human computer interaction for the ease of user. To enhance real estate applications to handle devices from distant places. Human presence is required for managing different devices and devices can only be controlled from that place only. Instead website can be built to control and keep status of different devices from any network. For this purpose, microcontroller is used for connecting different AC appliances to internet. This paper proposed a system where devices will be connected to microcontroller and control to user will be provided using website which user can access through internet. The micro controller can be the raspberry pi as it is the most efficient and well known. Devices will be connected to raspberry pi and then accessed through website.

A. Efficiency of existing system can be increased using following points
1) For controlling and accessing devices: Different microcontrollers which can be used: Raspberry pi, Beagle Bone Black, Intel Edison, Arduino.
2) Accessibility of devices: Many of the research papers define the communication of devices in the same network which restricts user to access those devices from different networks. So to overcome this and allow, devices to communicate from different network with help of a server. This server will help to communicate those devices from any network and any place in world.
3) Security: Exposing the Raspberry pi to internet can prone it to hacking risks, which can be hazardous for the user so to get rid of it, the raspberry pi should be connected in intranet with the server for communication purpose.

II. RELATED WORK

In this section, we review some related technologies and previous works on the topic of "Global access of AC Appliances securely using Internet of Things". The works that were previously implemented were mainly based on implementing the home automation system which was generally done in single network. One such work which was proposed by Soumya S, Malini Chavali, Shuchi Gupta and Niharika Rao [3] in which they have emphasized on the importance of Internet of Things and the implementation of home automation system. Another system which explains about the communication of Raspberry Pi over the internet [4] and also explains how this can be used for fire alarm activation automatically whenever the sensors connected to the system detects the presence of fire.

Although there are plenty of uses still there are few limitations which include high risks to the data security, the data is uploaded on cloud which can be stolen so to reduce these risks a system was proposed to use raspberry pi as firewall [1]. Using raspberry pi over

the internet along with Arduino health monitoring system [2] can also be implemented. V. Sandeep, K. L. Gopal, S. Naveen, A. Amudhan and L. S. Kumar [5] proposed a similar system in which they were controlling the AC appliances from different networks using the cloud services offered by weaved, the raspberry pi was connected to internet and web pages were hosted on it.

III. PROPOSED SYSTEM

The system replaces the traditional methods of controlling devices remotely by making use of third party web services (for example remot3.it web services). With this system, one can create own system to access any device from any location. User will be able to access the website which will allow users to control different devices from any location. Website will be able to access the server to which microcontroller will be connected. And different devices will be connected to raspberry pi and raspberry pi will control these appliances as it receives command from user. Keeping the security concerns in mind, the system is to be developed in such a way that the microcntroller would be connected to a server through intranet.
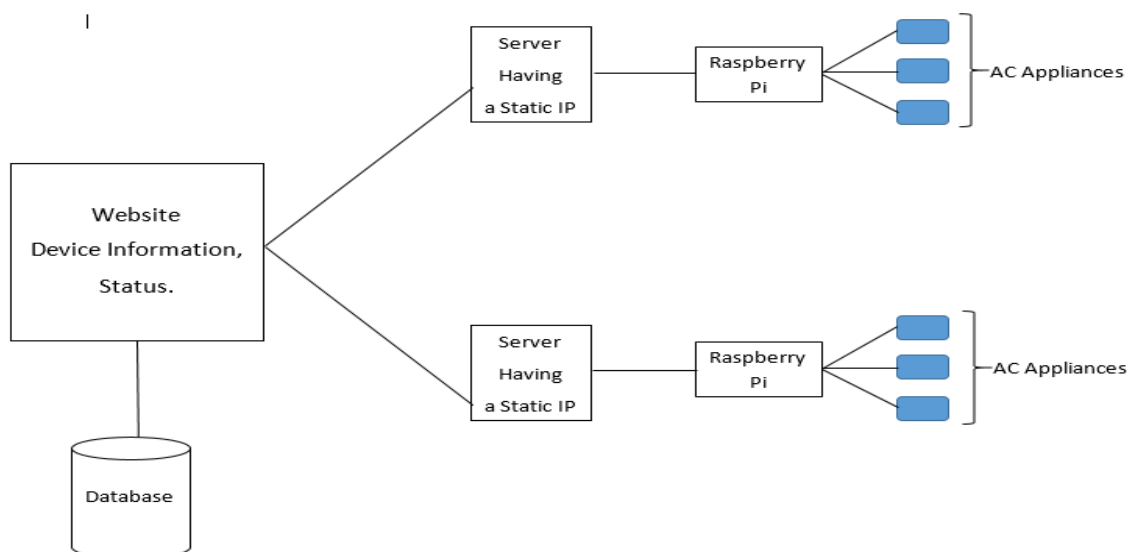

Fig. 1: Block diagram of proposed system

The website will be having various buttons for particular AC appliances and it will also display current statuses of those appliances. This website will be present over the internet. As soon as the user gives a command, it will be send to the server through internet. The server will have static IP address and it will communicate with the raspberry pi connected to it in intranet. Raspberry pi would be responsible for actual control and retrieval of status of AC appliances.
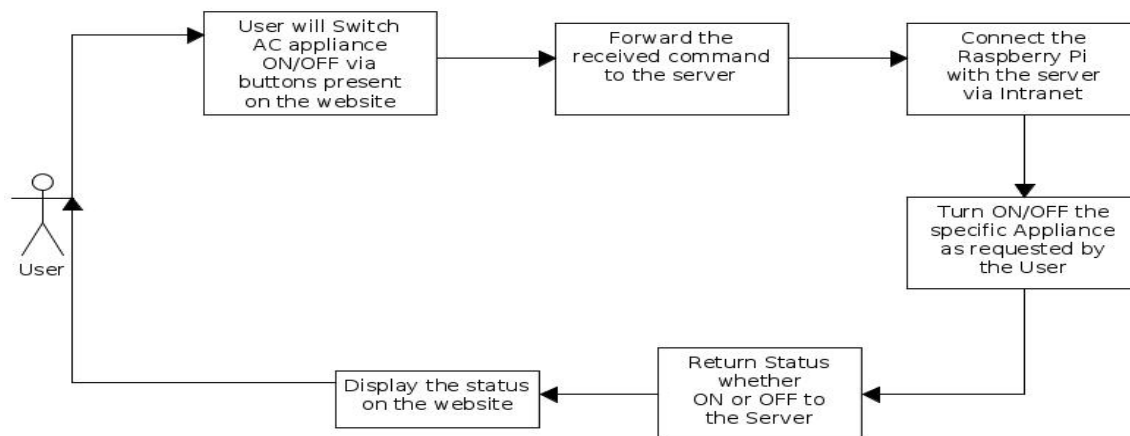

Fig. 2: Flow diagram of various operations of proposed system

A. *Steps involved in proposed system:*
1) User will access the website from any location where he will be able to get status of any appliances.
2) User will send command as per his requirement that is switch AC appliances ON/OFF.
3) Once user makes a request, it will be forwarded to specific server based on required raspberry pi.
4) Once the request is received by the server, the server will then forward the request to the raspberry pi through intranet.
5) Raspberry pi will perform action accordingly and then status will be sent back to website

IV. IMPLEMENTATION

The proposed system can be developed using website through which user will be able to control AC appliances from any network. Website can be hosted using domain name. There will be continuous interaction between raspberry pi and website as statuses needs to be updated automatically. Raspberry pi will be connected to local server which will be having static IP. Raspberry pi will not be directly exposed to internet instead will be connected to local server using intranet for security purpose. Whenever user makes a request for operation, database details will be searched to check for required raspberry pi address. Then command will be forwarded to that local server.

V. COMPARISON

Table 1: Comparison between Traditional System and Proposed System

Properties	Traditional System	Proposed System
Cost	More(as paid services of third party is used)	Less (as own server is built to store information)
Scalability	Less	More (as we can increase the number of raspberry pi according to need)
User-Interaction	Less	More(as a website is built so user can interact smoothly)
Security	Less(as raspberry pi is directly accessed through internet)	More(as raspberry pi is not directly exposed to internet)
Maintenance	More	Less

VI. CONCLUSION

This paper introduces an efficient method for monitoring and controlling AC appliances from any location remotely. Raspberry pi can be used to control AC appliances in different network and command can be given to raspberry pi. This proposed method is secure enough, reliable and provides an efficient way of communication in less expenses. The proposed system will work in any home automation system or any building or office devices. We are currently developing system for any building but it can be further extended in future.

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