

Using Raspberry Pi Implementation of Internet of Things for HAS

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ABSTRACT

This paper presents a low cost, flexible and standalone home devices control and monitoring system using an embedded Raspberry Pi micro-web server, with real IP connectivity for accessing and controlling devices and kitchen appliances remotely using Android structured Smartphone software running on android platform. Devices such as light switches, heat sensors, humidity sensors, current sensors, smoke/gas sensors and sirens have been included in the system to show the feasibility and effectiveness of the suggested smart (HAS) Home Automation System. Internet of Things (IoT) is a concept that envisions all objects around us as part of internet. IoT coverage is very wide and includes variety of objects like smart phones, tablets, digital cameras and sensors. . Here we have describe how Internet of Things and Cloud computing can work together can address the Big Data problems. We have also illustrated about Sensing as a service on cloud using few applications like Augmented Reality, Agriculture, Environment monitoring, etc. Finally, we propose a prototype model for providing sensing as a service on cloud. This system can perform varied functions to be performed at home. This allows accessibility over internet from any corner in the world. The main focus of this project is to minimize the usage of electricity and reduce human efforts Hence, cloud acts as a front end to access IoT. Applications that interact with devices like sensors have special requirements of massive storage to store big data, huge computation power to enable the real time processing of the data, information and high speed network to stream audio or video IoT based home automation system can be controlled over mobile devices. This is a low cost system. This system can control multiple devices.

Keywords:- Internet of Things(IoT), Smart Home, Home Automation System(HAS), Raspberry Pi.

I. INTRODUCTION

House automation is automation of the home or home activity. Home automation may include control of light, fans, appliances, and other systems, to provide more convenience, comfort, power cutting down and security[1]. The idea of home automation has been evolved trough many years and products have recently been on the industry for long, though no person solution has broken before the popular yet. Home automation also helps for the aged and disables folks that have reached home as they need not move from one location to another place just for switching on or off the appliances, beginning the door, etc. It would effectively create a relay of machines that provide stimulus to each other and require the minimum human intervention[2]. The description about the integrated network architecture and the interconnecting mechanisms for reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system will be able to provide

self-control mechanism for better operations of the devices during monitoring. The framework of the monitoring system is based on combination of pervasive distributed sensing units, information system for data aggregation, reasoning. With the rapid increase in the number of users of internet. it has made Internet a part of life, and IoT is the latest and emerging internet technology. Fig1.Shows Internet of things is a communication between multiple devices with no or less human intervention.

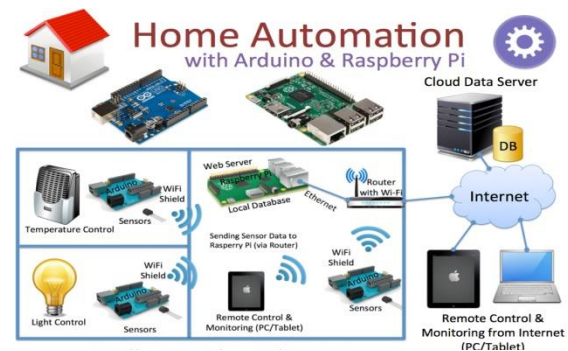


Figure 1. Detailed Architecture IoT based Home Automation

IoT can minimize human efforts. IoT analyzes the data retrieved from the sensors and performs appropriate activities thereby saving human time[3]. The assurance to people about their home activities and securities led to the advancement of Home Automation System. One can easily track the activities at his/her home even in the event of absence. The system will continuously update the system information as well as the user.

II. Related Work

Smart home is not a new term for science society, it is been used from years. As electronic technologies are advancing, the field of home automation is increasing fastly. Wi-Fi based home automation strategy is presented. That uses a PC (with built in Wi-Fi card) based web server that manages the linked home devices. The system facilitates a variety of home automation devices like fans, lights, other appliances for the home. Different papers such as also offered internet handled systems consisting of a web storage space, database and an internet site of websites for adjoining and handling the devices. Cloud computing is a one such model for on-demand access to a shared pool of configurable resources (compute, networks, servers, storage applications, services, software etc.) that can be easily provisioned as Infrastructure, software and applications (SaaS)[4]. Cloud based platforms help to connect to the things around us so that we can access anything at any time and any place in a user friendly manner using customized portals and in built applications (SaaS). Hence, cloud acts as a front end to access IoT.

2.1. Web services:

These systems start using a PC which brings about an immediate increase in cost and power usage. On the other aspect, the development and hosting of the web webpage will also costs high. Lately few researchers also have presented use of World Wide Web services, Simple Object Gain access to Protocol (SOAP) and Representational State Transfer (REST) as an interoperable application coating to remotely access home automation systems introduced an intelligent home management scheme within the Ethernet network based on XML SOAP standards. The Web-affiliated graphical user interface has been developed to deal with

the home devices. House automation using Cloud work that has also recently been proposed by where users could actually control various lamps and appliances within their home[5]. All above pointed out systems has made incredible contributions in home robotisation system. However, a COMPUTER is employed as a storage space that increases the cost and power consumption while others require web page hosting that can add up the extra cost. Internet of Things (IoT) is a concept that visualizes all objects around us as part of internet. Internet of things coverage is very wide and includes variety of objects like smart phones, digital cameras, sensors, etc. Once all these devices are connected to each other, they enable more and more smart processes and services that support our basic needs, economies, environment, health etc. Such large number of devices connected to internet provides many kinds of services and produce huge amount of data and information.

III. Hardware Description

3.1. ESP8266 : As shown in Fig:2. ESP Module The ESP module is an integrated chip which offers a inbuilt strong and high range wi-fi connectivity. For operating the devices on cloud or over the internet the data is transferred wirelessly to database and hence this module provides the most efficient service in its quality.

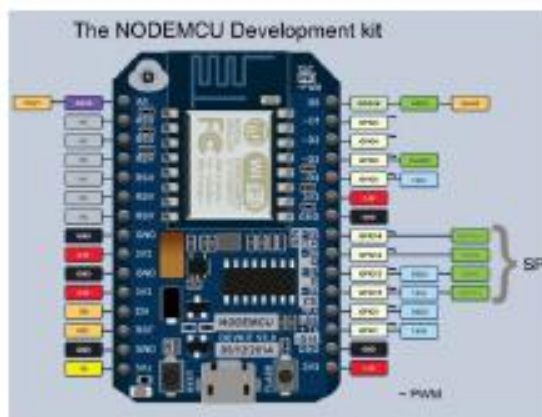


Figure 2: ESP8266

3.2. Wi-Fi Module

WiFi Module Wi-fi stand for wireless fidelity. Using wi-fi is very convenient and easy-to-use than a microcontroller. A wi-fi enabled device is able to send or receive data to the host wirelessly. Using wi-fi is faster and less hectic way of transferring data. In this

project, the loads of data is transferred to the cloud using wi-fi modules which is operated by the server. The range of wi-fi modules is very high and it can also penetrate through objects and hence can be placed anywhere in the house[6]. The use of this modules in the project will be for transferring the data obtained by the hardware which sends it to the server and stored into the buffer memory which then is transferred to cloud over wi-fi and the operations can be performed on the data.

3.3. Raspberry Pi :

The Fig.3 shows Raspberry Pi is a single board processing unit of very small size. The Raspberry Pi is used as the core processing unit, because of its small size and high usability. Its power consumption is very less. Its low cost has led to its widespread.

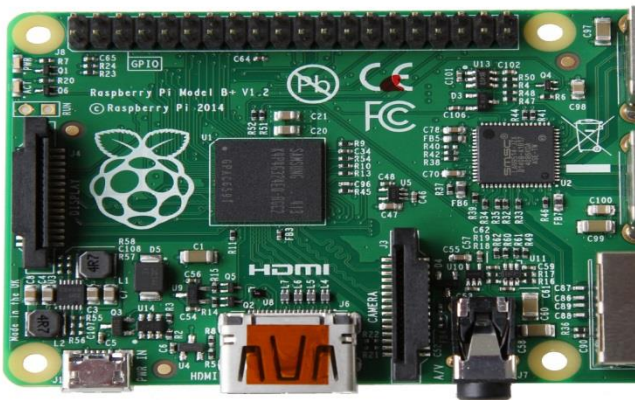


Figure 3: Raspberry Pi

IV. Working Description

4.1. The Raspberry Pi

It is slower than a modern laptop or desktop but is still a complete Linux computer and can provide all the expected abilities that implies, at a low-power consumption level. Fig 6 raspberry pi The Raspberry Pi is open hardware, with the exception of the primary chip on the Raspberry Pi, the Broadcom SoC (System on a Chip), which runs many of the main components of the board—CPU, graphics, memory, the USB controller, etc. Many of the projects made with a Raspberry Pi are open and well-documented as well and are things you can build and modify yourself. There are two Raspberry Pi models, the A and the B, named after the aforementioned BBC Micro, which was also released in a Model A and a Model B. The A comes with 256MB of RAM and one USB port. It is cheaper and uses less

power than the B. The current model B comes with a second USB port, an ethernet port for connection to a network, and 512MB of RAM[7]. The Raspberry Pi A and B boards been upgraded to the A+ and B+ respectively. These upgrades make minor improvements, such as an increased number of USB ports and improved power consumption, particularly in the B+. The latest release is Raspberry pi 3 (inbuilt wifi and BLE). However, the Raspberry pi used in the project is model 2 B.

4.2. RELAY MODULE

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state. Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps[8]. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts . Protective relays can prevent equipment damage by detecting electrical abnormalities, including over current, undercurrent, overloads and reverse currents. In addition, relays are also widely used to switch starting coils, heating elements, pilot lights and audible alarms.

V. Software Requirements

5.1. PHP (Hypertext Preprocessor)

PHP is a script language and interpreter that is freely available and used primarily on Linux web servers PHP , originally delivered from personal home page tools ,now stands for PHP: Hypertext Preprocessor, which the PHP FAQ describes as a "recursive acronym" .PHP is an alternative to Microsoft's Active Server Page(ASP) technology[9]. As with ASP, the PHP script is embedded within a web page along with its HTML. Before the page is sent to a user that has requested it ,

the Web server calls PHP to interpret and perform the operations called for in the PHP script.

5.2. PYTHON

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse[10]. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

5.3. HTML Hypertext Markup Language (HTML)

is the standard markup language for creating web servers and web applications. With Cascading Style Sheet (CSS) and java script it forms a triad of cornerstone technologies for the world wide web. Web browsers receive HTML documents from a web server or from local storage and render them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

5.4. CSS Cascading Style Sheets (CSS)

is a style sheet language used for describing the presentation of a document written in a markup language. CSS is the language for describing the presentation of Web pages, including colors, layout, and fonts[10,11]. It allows one to adapt the presentation to different types of devices, such as large screens, small screens, or printers. CSS is independent of HTML and can be used with any XML-based markup language.

5.5. JAVA SCRIPT JavaScript ("JS" for short): is a full-fledged dynamic programming language that, when applied to an HTML document, can provide dynamic interactivity on websites. It was invented by Brendan Eich, co-founder of the Mozilla project, the Mozilla Foundation, and the Mozilla Corporation.

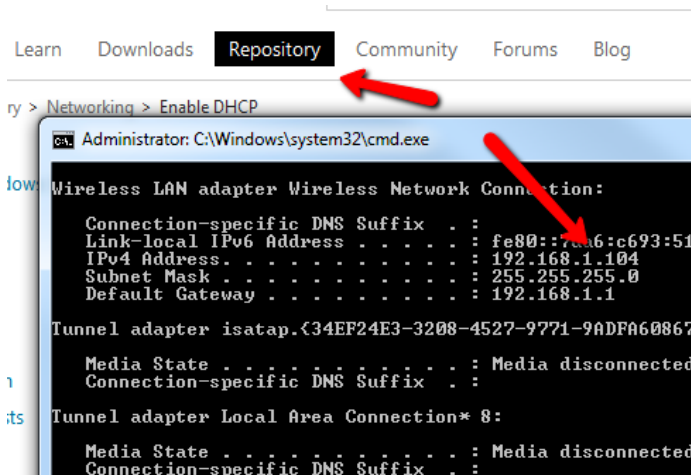


Figure 4: Internetworking

Whenever any unusual activity is noticed the user will be notified by the system. The Raspberry Pi is used as the core processing unit, because of its small size and high usability. The load can be controlled and monitored using a web page or android app with user configurable front end. As shown in fig.4, the user can send commands through the allotted IP and these commands are fed to Wi-Fi module. The Wi-Fi module is configured to access internet using any nearby wireless modem. The commands received by a Wi-Fi module are executed by a program within a Wi-Fi module[12]. The Wi-Fi module interfaced through the loads are turned ON & OFF based on commands. The load status (ON or OFF) will be displayed on the web page and app.

VI. Conclusion

The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet framework. Typically, IoT is expected to offer advanced connectivity of devices and systems, and services that goes beyond M2M i.e. machine-to-machine communications and covers a variety of protocols, various domains, and applications.

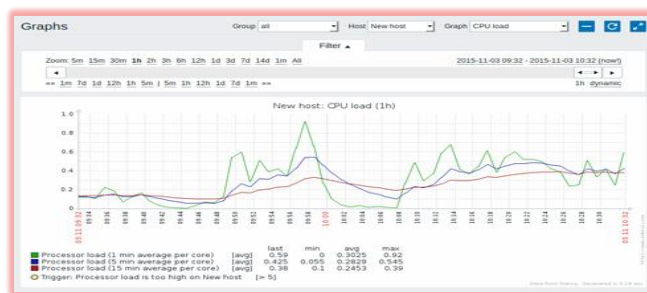


Figure 5: information to Cloud

Fig.5. shows all the information will be transmitted over the cloud to the user. The Internet has changed drastically the way we live, moving interactions between people at a virtual level in several contexts spanning from the professional life to social relationships. The IoT has the potential to add a new dimension to this process by enabling communications with smart objects, thus leading to the vision of “anytime, anywhere, any media, anything” communications. To this purpose, we observe that the Internet of Things should be considered as part of the overall Internet of the future, which is likely to be vividly different from the Internet we use today.

VII. Future Enhancement

The interconnection of all these embedded devices which also includes smart objects, is expected to lead in automation in nearly all fields enabling advanced applications like a Smart Grid. It is clear that the IoT will consist of a very large number of devices being connected to the Internet. The Internet of Things (IoT) refers to uniquely recognizable objects and their virtual representations in an Internet-like structure. Internet of Things refer to day-to-day objects, that are understandable, distinguishable, locatable, addressable, and or controllable via the Internet using either RFID, wireless.

LAN, wide-area network, or other means. In the near future the Internet and wireless technologies will connect different sources of information such as sensors, mobile phones and cars in a tighter manner. The number of devices which connect to the Internet is – seemingly exponentially – increasing. These billions of components produce, consume and process information in different environments such as logistic applications, factories, airports and in the work and everyday lives of people. The society need new and scalable, compatible and secure solutions for both the management of the ever more broad, complexly-networked Internet of Things, and also for the support of various business models.

VIII. REFERENCES

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