

Industrial Automation using Linux based Webserver

Miss Bhagyashri Tambe¹, Mr. J.K. Singh²

Abstract— Automation is need of life and industries. In many small scale as well as large scale industries it requires automation of processes. Such system management using dynamic IP based Embedded Web-server (EWS) is presented in this project. In current era of networking, to maintain EWS with static Internet Protocol (IP) is difficult and costly to manage. Novel approach of assign dynamic IP to board is developed and tested for different dynamic IPs. Dynamic IP is obtained for embedded board by enabling (IOT) internet on things. The embedded system consists of raspberry-pi processor running on Linux operating system. Embedded board (EB) having dynamic IP contains different inputs from sensors for automation as well as web page designed in PHP with this web page any authorized person can monitor industrial automation parameters as well as can control industrial applications.

Keywords— Raspberry Pi ; Realys; Webserver ; LDR; LM35; IOT-Internet of Things.

I. INTRODUCTION

The primary function of a web server is to process, store and deliver web pages to customers. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are most frequently HTML documents, which may include scripts, style sheets, images, and in addition with text content. A user agent, commonly a web browser or web crawler, initiates communication by making a request for a specific resource using HTTP and the server responds with the content if unable to do so. The source is typically actual file on the server's secondary storage, but this is not necessarily the case and depends on how the web server is implemented. While the primary function is to aid content, a full implementation of HTTP also includes ways of receiving content from customers. This feature is used for succumbing web forms, with uploading of files. Many generic web servers also support server-side scripting using Active Server Pages (ASP), PHP, or other scripting languages. This means that the performance of the web server can be scripted in separate files, while the actual server software remains unchanged. Usually, this function is used to generate typically HTML documents dynamically ("on-the-fly") as opposed to returning static documents. The former is primarily used for repossessing and/or modifying information from databases. The latter is typically much faster and more easily cached but cannot deliver dynamic content.

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Web servers are not always used for helping the World Wide Web. They can also be found embedded in devices such as printers, routers, webcams and serving only a local network. The web server may then be used as a part of a system for monitoring and administering the device in question. This usually means that no additional software has to be installed on the client computer, since only a web browser is required (which now is included with most operating systems).common features of web server includes Virtual hosting to serve many web sites using one IP address Large file support to be able to serve files whose size is greater than 2 GB on 32 bit OS Bandwidth throttling to limit the speed of responses in order to not saturate the network and to be able to serve more clients Server-side scripting to generate dynamic web pages, still keeping web server and website implementations separate from each other In our project we are using web server to access different sensors data as well as to control different industrial applications.

II. DESIGN THEORY

In paper 'Review in Industrial Automation ' by Udit Mamodiya , Priyanka Sharma published in IOSRjournal Volume 9, Issue 3 Ver. IV (May – Jun. 2014), PP 33-38 it states that " Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers , heat treating ovens, switching in telephone networks, steering and stabilization of ships, aircraft and other applications with minimal or reduced human intervention. The biggest benefit of automation is that it saves labour, save energy, materials and to improve quality, accuracy and precision. The wireless communication technologies are widely applied in the fields like Industrial Automation. Injection molding machines can fasten the molds in either a horizontal or vertical position. Wireless communication and smart sensors and actuators pose means to sustainably improve automation technology. To learn about Industrial Automation, a review process involving 2 stage approaches has been undertaken for 15 research papers which were published in the period of year 2000 to year 2013. After an exhaustive review process, four key issues were found “Controlling method of injection molding machine for new technologies, new trends in industrial Automation, Energy Storage in co-generation power plant & Wireless Data Transmission” which is mostly need to enhance of Industrial Automation aspects to get better solution approach. The outcome of the review was in the form of various findings, found under various key issues. The findings included algorithms and methodologies used to solve particular research problem, along with their strengths

and weaknesses and the scope for the future work in the area." [1]

In paper ' Industrial automation – A Review' by Prof. Jaikaran Singh , Prof. Mukesh Tiwari , Mr. Manish Shrivastava published in y (IJETT) – Volume 4 Issue 8- August 2013 it states that " Despite years of activity, truly open and intelligent control systems seem still to be a promise of the future. Agreement on common architectures and application objects is needed to raise open control systems from exchanging raw data to the level of real interoperability of off-the-shelf components. Future control platforms and programming languages should have new built-in mechanisms that support implementation of intelligent functions, such as flexible resource management and exception handling. This article argues that many of these challenges can be met by taking full advantage of emerging software engineering technologies. This also means that the modeling techniques and design practices of software engineering should be combined with the traditional ways of thinking in automation." [2]

In paper 'Gsm based industrial security system 1m. ' by Sravan Kumar, M.Mounika,L.Ramya Pavani published in (IJCESR) it states that "Security and automation is a prime concern in our day-to-day life. The approach to home and industrial automation and security system design is almost standardized nowadays. In this paper, we have tried to increase these standards by combining new design techniques and developed a low cost home and industrial automated security systems. Everyone wants to be as much as secure as possible. The design of simple hardware circuit enables every user to use this wireless home security system with PIR sensor, Gas sensor, Smoke sensor and Main fuse Failure Detector at Home & Industries." [3]

In paper 'Wireless home and industrial automation security system using gsm' by R.Anandan , Mr.B.Karthik. , Dr.T.V.U.Kiran Kumar published in JGRCS it states that " Security and automation is a prime concern in our day-to-day life. The approach to home and industrial automation and security system design is almost standardized nowadays. In this paper, we have tried to increase these standards by combining new design techniques and developed a low cost home and industrial automated security systems. Everyone wants to be as much as secure as possible. The design of simple hardware circuit enables every user to use this wireless home security system with PIR sensor, Gas sensor, Smoke sensor and Main fuse Failure Detector at Home & Industries [6]. The system is fully controlled by the 8 bit P89V51RD2 microcontroller. All the sensors and detector are interconnected to microcontroller by using various types of interface circuits. The microcontroller will continuously monitor all the sensors and if it senses any security problem then the microcontroller will send the SMS to the user mobile through GSM modem. The Microcontroller also turns ON and OFF the electrical appliances in home and industry based on SMS received from the user. " [4]

In paper ' A Raspberry Pi Based Global Industrial Process Monitoring through Wireless Communication ' by Priyanka S Lonare , Dr. Mahesh Kolte published in IJARCCCE it states that " In recent research work the Wireless technologies are being more and more used in automation and also in the field of wireless communications are diverse. The advancement in wireless technology offers a good opportunity in the area of communication in perfect region. When the embedded devices are provided with internet

access the demand will rise due to the remote accessing capability of these devices. Users can monitor & control remote systems by using embedded Easy IOT server. Wireless based industrial automation is a prime concern in our day-to-day life. The approach to Wireless Network for Industrial Applications standardized nowadays. Intelligent and low-cost automation of industrial processes are crucial in order to improve process efficiencies, deliver quality products, and ensure timeliness and accuracy of systems .Wireless is predicted to be one of the fastest growing technologies in the area of process automation sector This paper is focused on design & implementing a secured wireless communication system of ARM embedded IOT server based on Raspberry Pi. For effective designing & implementing a system we use wireless technology. This wireless technology along with router makes the system Accessible from anywhere in the world. Various Sensors are interfaced with microcontroller. Parameters like Temperature, gas, motion, distance, humidity are measured & real time sensed data is available on the remote pc as well as on the android Smartphone. Due to the use of wireless technology we can achieve super speed transmission of large amount of data in very less time. As the overall system is based on generating of dynamic IP address every time, we can say that the system is much secured than all the previous systems. Thus Proper use of wireless sensor networks (WSNs) lowers the rate of failures, overall cost of the system, & increases the productivity, efficiency of overall industrial operations." [5]

A. Web Server

A web server is an information technology that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web. The term can indicate either to the whole computer system & an appliance, or specifically to the software that accepts and supervises the HTTP requests. The process is an example of the client/server model. All computers that host Web sites should contain Web server programs. Leading Web servers include Apache (the most widely-installed Web server), Microsoft's Internet Information Server (IIS) and nginx (pronounced *engine X*) from NGNIX. Other Web servers includes Google, Novell's NetWare server, Google Web Server (GWS) & IBM's family of Domino servers. Web servers often come as part of a larger package of Internet- and intranet-related programs for serving email, downloading requests for File Transfer Protocol (FTP) files, and building and publishing Web pages. Considerations in choosing a Web server must consider that how better it works with the operating system (OS) and other servers, its ability to handle server-side programming, security characteristics, and the particular publishing, search engine and site building tools that come with it. Web server means every Website sits on a computer. This server is always connected to the internet. Every Web server that is connected to the Internet is given a unique address made up of a series of four numbers between 0 and 255 separated by periods. For example, 68.178.157.132 or 68.122.35.127.

When you register the address of the web, which is also known as a domain name, like tutorialspoint.com you have to specify the IP address of the Web server that will host the site. You can load up with Dedicated Servers that can support your web-based operations. There are four leading web servers – Apache, IIS, lighttpd and Jigsaw. Now we will see these servers in bit more detail. Apart from these

Web Servers, there are other Web Servers also available in the market but they are very expensive. Major ones are Netscape's iPlanet, Beas Web Logic and IBM's WebSphere. In the absence of web servers the internet as we know it would cease to exist. Web servers are an integral part of the way the internet works. The web hosting industry is basically used to lease out web-servers, giving average business owners and individuals with the opportunity to use high-tech servers that make it possible to expand their outreach to the entire world. Without rental web servers the internet would be a fraction of the size it is today, as most web site owners can afford to buy their own web server in cash. Web servers are the gateway between the (WWW) World Wide Web and average individual. keeping in mind all these necessities we are using web server to show controlling and monitoring of different data.

B. Raspberry Pi

Raspberry Pi [7] is a small computer board working on the Linux operating system which connects to a computer monitor, keyboard, and mouse. Raspberry Pi can be applied to

a electronic structure and programming network work, it can also served as a personal computer and Apache Webserver, MySQL could be installed in the board. A GPIO [10] pin can be used as either a digital input or a digital output, and both operate at 3.3V. Unlike the Arduino, the Raspberry Pi which does not have any analog inputs. For that you should use an external analog-to-digital converter (ADC) otherwise connect the Pi to an interface board must be used.

III. SYSTEM DEVELOPMENT

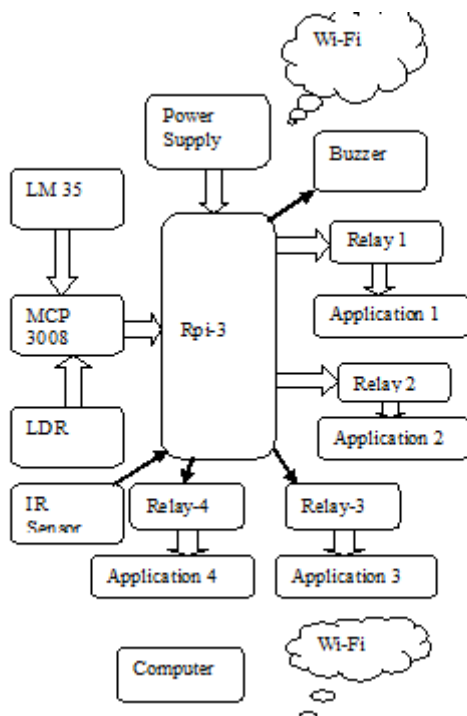


Fig.1 Block Diagram

ARM 11 is chief system in my project. This is used to control, monitor and decision making for application. For ARM 11 i have used raspberry pi. Raspberry Pi hardware has evolved through several versions that feature variations in hardware performance, memory capacity, and peripheral

device support. Now I am using MCP3008 as a Analog to digital converter. This ADC converts analog input from different sensors in to digital output which is fed to ARM11 which in turn to be displayed on web page. The Microchip Technology Inc. MCP3004/3008 devices are successive approximate 10-bit Analog to Digital (A/D) converters. As shown in block diagram three sensors are used they are Temperature sensor, IR sensor, Light sensor Output of sensors is fed to raspberry pi via Analog to digital converter. the respective sensor value are shown on web page using IOT application.

IV. IMPLEMENTATION AND RESULTS

In this project Raspberry pi with all sensors & relays are working properly with good interaction .This system provides the user with comfort & convenience since the user can control the connected Industrial appliances from any remote machine having internet connectivity. There is better communication between webpage and web server. the webpage is showing dynamic response to show the sensor values. this system can be further extended by increasing Wi-Fi area of range.

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