

## RASPBERRY PI BASED GLOBAL INDUSTRIAL PROCESS MONITORING THROUGH WIRELESS COMMUNICATION

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**Abstract**— Industrial automation has become very much popular these days because of its various advantages. This is achieved by using local networking standards and remotely controlling and monitoring industrial device parameters by using Raspberry Pi and Embedded web server Technology. Raspberry Pi module consists of ARM11 processor and Real Time Operating system whereas embedded web server technology is the combination of embedded device and Internet technology.

Using embedded web server along with raspberry pi it is possible to monitor and control industrial devices remotely by using local internet browser. Use of these both technology reduce complexibility of devices and also reduces overall cost of the system.

### I. INTRODUCTION

As the world is getting more technologically forward looking, we find new technology coming deeper into to our personal and professional lives. Current home automation and industrial process monitoring systems make use of PC-based servers. Appliances in case of process monitoring system are connected to these servers and therefore it becomes necessary to keep the server on all the time which ultimately increases the cost of the system. The remedy to this problem is to use embedded web server instead of pc based server. Embedded web server is basically a only chip implementation of Ethernet networking standards which we can achieve by using Raspberry Pi board. By embedding Ethernet onto the device it has the competence to interconnect via Ethernet without using a PC. The server allows web access to the

automation and monitoring system and provides a mountable networking solution that is enhanced for instrumentation, and industrial as well as home automation. The user can surf the home page of the system using local web browser and can control the industrial appliances and enquire about their operational status from remote place. This project develops such a low cost electronic prototype which is designed for monitoring and controlling industrial appliances via web browser from remote place. At the same time user can monitor security situation at industry in real time through different sensors installed at industry.

### II. SYSTEM ARCHITECTURE

The proposed system is divided into two parts.

A. Industrial Nodes

B. Embedded Web server

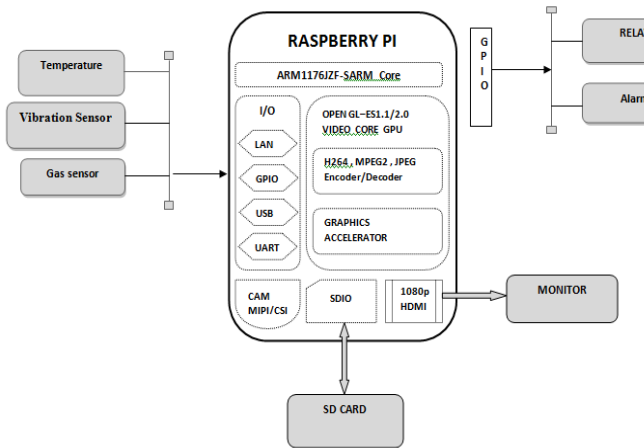
#### A. Industrial Node:-

This Node contains various sensors which can be used in Industrial plant for sensing various parameters like temperature, humidity, pressure, gas etc. along with Raspberry Pi module.

#### B. Embedded Web Server:-

Embedded web server consists of Linux ARM11 Based Raspberry Pi module to Monitor and Control above mentioned Industrial parameters using sensors from remote location. Raspberry pi is based on ARM11 processor which has HDMI port, Memory Card slot, Ram, Audio port, Ethernet port, Bluetooth and Wi-Fi to build Small Low Cost Computer with open source Linux based Operating System which is freely available.

#### Block Diagram:-



**Fig 1. System Block**

**Diagram**

Here the sensors transmits the digital values to the Raspberry Pi. In Raspberry Pi Board we will be setting some threshold values by coding using Python Language /Linux. If the sensors value goes up above the threshold value then it will controlled through Relay circuit. Relay will be connected with the Raspberry Pi which will do the work of controlling. As the sensors value goes up the Raspberry Pi sees which sensors value has gone high and accordingly it will give the instruction to the Relay circuit which will perform ON/OFF action depending upon requirement so as to control the industrial parameters which are under measurement. This data will also be monitored by the user through the PC by using local browser raspberry pi's particular IP address. Camera interfaced with Raspberry Pi will detect any suspicious moments near plant and send those pictures on concerned persons mobile phone automatically. Here Raspberry Pi will be connected to the Wifi which will send these images over the Internet by which the user will be able to see the images and can keep a watch on proper operation of his system.

**III. SYSTEM DESIGN**

The designing part includes basically two sections as follow.

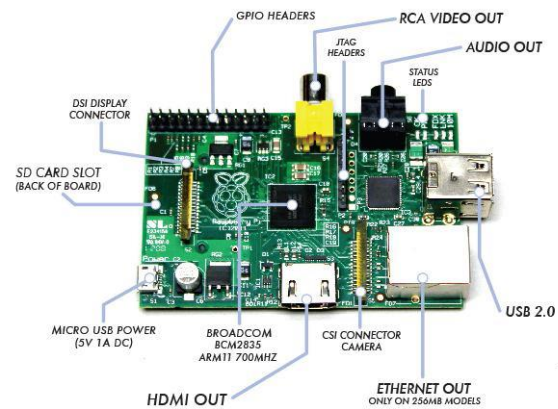
1. Hardware Section
2. Software Section

**1) Hardware Design**

It includes Raspberry Pi, Temperature sensor, Humidity Sensor, IR module, Camera, Liquid Crystal Display, Relay, Switch etc.

**a) Raspberry Pi :- Raspberry Pi 3**

The Raspberry Pi is a small computer about the size of a credit card. A complex board that integrates the major functional essentials in to a only chip in Raspberry Pi are its Quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz CPU, 400MHz VideoCore IV multimedia GPU, 1GB LPDDR2-900 SDRAM (i.e. 900MHz) Memory along with 4USB ports, HDMI, composite video (PAL and NTSC) via 3.5 mm jack video output, 10/100Mbps Ethernet and 802.11n Wireless LAN, 17 GPIO plus specific functions, and HAT ID bus, Bluetooth 4.1. It forms a embedded web server. All the sensors are connected to this which senses industrial parameter under control and send them to user by using either inbuilt Bluetooth or Wi-Fi. User can monitor this data from its local web browser by using dynamic IP address of Pi Module.



**Fig 2. Raspberry Pi 3**

**b) Temperature Sensor :- LM35**

The LM35 series are precision temperature sensors. Its output voltage is directly proportional to the Celsius temperature. Therefore LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user does not need to subtract a large constant voltage from its output to obtain



switch contacts. Most of the relays have double throw switch contacts.

#### f) Buzzer:

A buzzer is an audio signaling device which may be piezoelectric, mechanical or electromechanical. Buzzers are typically used in timers, alarming devices, and for confirmation of user input such as a keystroke or mouse click. It most generally comprises of various switches or sensors associated with a control unit that figures out whether and which switch was pushed or a preset time has slipped by, and for the most part enlightens a light on the fitting catch or control board, and sounds a notice as a nonstop or irregular humming or beeping sound. At first this device depended on an electromechanical framework which was indistinguishable to an electric bell without the metal gong which makes the ringing commotion.

## 2. Software design

### a) Raspbian OS

Raspbian is a free working framework in based on Debian. It is based on the Raspberry Pi module. A working framework is the arrangement of fundamental programs and utilities that make your Raspberry Pi run. It gives essentially speedier execution to applications that make substantial utilization for floating point arithmetic operations. Every single other application will likewise increasesome execution speed because of advanced

instruction of the ARM11 CPU in Raspberry Pi.

### B) Apache HTTP Server

The Apache HTTP Server which is called as Apache is the world's most famous web server software. It is based on the NCSA HTTP server. Apache has a big role in the initial growth of the World Wide Web. An open community of developers under the auspices of

the Apache Software Foundation have developed and maintained Apache. This is most commonly used on a Linux; this software is available for a wide variety of operating

systems, including UNIX, FreeBSD, Linux and Solaris.

### C) TCP IP Protocol

The same layered structure as used in the TCP/IP protocol suite is used by the software running on the embedded web server. The TCP/IP protocol suite permits PCs of all sizes, running distinctive operating systems to communicate with each other. The TCP/IP protocol suite is a blend of various conventions at different layers as appeared in Figure. Figure demonstrates Layers of TCP/IP protocol suit. Each layer is independent from each other. The Link Layer generally incorporates the device driver in the operating system and corresponding network interface (card) in the PC. An Ethernet controller driver controls the Ethernet interface and the network layer controls the communication.

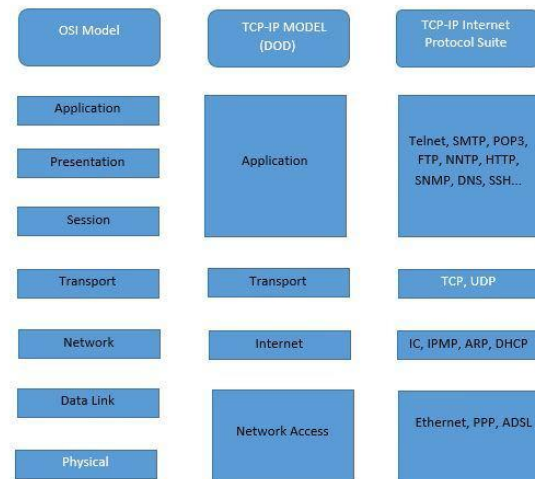


Fig. 6 TCP-IP

### Model

## IV. RESULT

Following parameters have been tested.

1. Temperature
2. Humidity
3. IR





### Fig.7 Result

#### CONCLUSION

Implementation of web server using Raspberry Pi for intelligent monitoring is a new method to monitor an industrial environment which designed here for the real time implementation. This system can have communication Port. It supports online supervision and control Private Network (LAN) as well as Public Network (Internet). The whole system has good portability, good openness and low cost and it is also easy for maintenance and upgradation. It is possible to interface various kinds of Sensors with these modules and make different applications. This system can monitor embedded system operation straight through Internet and achieve network monitoring. This work can further be extended by using high end embedded servers with wireless sensor networks with increase in sensor nodes and parameters.

#### REFERENCES

[1] Daogang Peng, Hao Zhang, Kai Zhang, Hui Li, FeiXia "Research of the Embedded Dynamic Web Monitoring System" 978-1-4244-4520-2/09 2009 IEEE. [2] Thiyagarajan ,T.G. Palanivel "AN EFFICIENT MONITORING OF SUBSTATIONS USING MICROCONTROLLER BASED MONITORING SYSTEM" IJRRAS 4 (1) , July 2010. [3] Miss.Vrushali R. Deore , Prof. V.M. Umale "Wireless Monitoring of the Green House System Using Embedded Controllers" Volume 3, Issue 2, February-2012 1 ISSN 2229-5518 IJSER © 2012. [4] Soham Banerjee, DivyashikhaSethia, Tanuj Mitta, Ujjwal Arora, Akash Chauhan "Secure Sensor Node with Raspberry Pi" IMPACT-201,978-1-4799-1205- 6/13/©IEEE [5] SurajPatinge, YogeshSuryawanshi, Sandeep Kakde "Design of ARM Based Data Acquisition & Control Using GSM & TCP/IP Network " 978-1-4799-1597-2/13/©2013 IEEE. [6] NakulPadhye and Preet Jain, "IMPLEMENTATION OF FARM

EMBEDDED WEB SERVER FOR DAS USING RASPBERRY PI." 2014 IJEDR | Volume 2, Issue 2 | ISSN: 2321-9939 Vol 04, Article 06118; July 2013. [7] <https://www.raspberrypi.org/> [8] Jiang. J.N, Peng D.G, Zhang.H, (2008) Design and Realization of Embedded Web Server Based on ARM and Linux. Mechatronics ,Vol.14 (10):37-40. [9] Kumaresan N, Manivannan M, International Journal of Engineering Science and Technology Vol. 2(11), 2010, 6074- 6081 Embedded web server & GPRS Based Advanced Industrial Automation using Linux RTOS.

