

Implementation of Embedded Web Server Based on ARM11 and Linux using Raspberry Pi

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Abstract: As ARM processor based web servers not uses computer directly, it helps a lot in reduction of cost. In this project our aim is to implement an Embedded Web Server (EWS) based on ARM11 processor and Linux operating system using Raspberry Pi. it will provide a powerful networking solution with wide range of application areas over internet. We will run web server on an embedded system having limited resources to serve embedded web page to a web browser.

Index Terms: Embedded Web Server, Raspberry Pi, ARM, Ethernet etc.

I. INTRODUCTION

With evolution of World-Wide Web (WWW), its application areas are increasing day by day. Web access functionality can be embedded in a low cost device which can be widely accessible from remote places through the web browser in a desktop. By using embedded processors such as Advanced RISC Machine (ARM) and linux as the operating system embedded web server can build with low cost, low power consumption, high performance, high reliability and support from large developing community. This paper introduces a solution for implementation of low cost embedded system using ARM1176JZF-S processor and ARM linux operating system which can be accessed remotely, monitored and maintained conveniently.

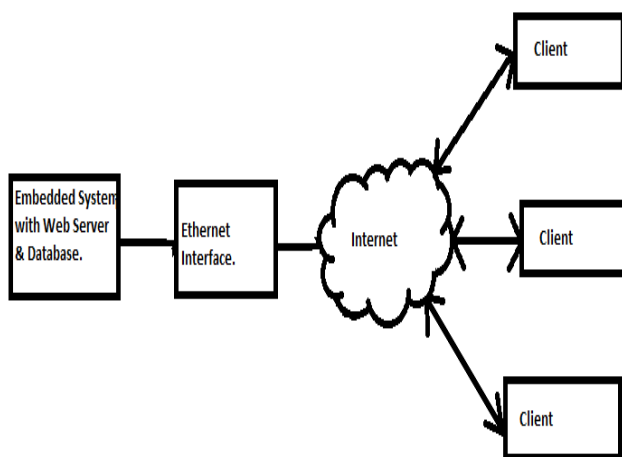


Fig. 1 Architecture of Embedded Web Server

II. EMBEDDED WEB SERVER

A web server can be embedded into a device which can be accessed remotely from a web browser. This embedded system can serve the web documents on request by a client from other system. Such type of a web server is called as Embedded Web Server(EWS). It consist of ARM processor that contains internet software which suite for monitoring, controlling and remotely access the system.

III. HARDWARE USED

We will use different hardware to implement this embedded web server, which are described in this section.

1. Raspberry Pi : The Raspberry Pi is low cost ARM based palm-size computer. The Raspberry Pi has microprocessor ARM1176JZF-S which is a member of ARM11 family and has ARMv6 architecture. It is build around a BCM2835 broadcom processor. ARM processor operates at 700 MHz & it has 512 MB RAM. It consumes 5V electricity at 1A current due to which power consumption of raspberry pi is less. It has many peripherals such as USB port, 10/100 ethernet, GPIO, HDMI & composite video outputs and SD card slot.SD card slot is used to connect the SD card which consist of raspberry linux operating system.

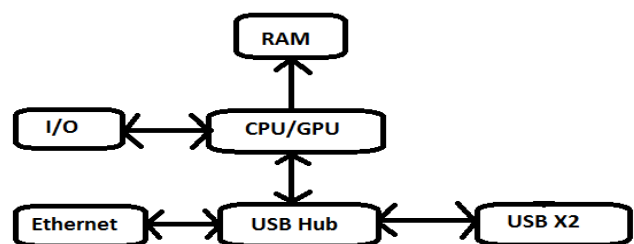


Fig. 2 Block Diagram of Raspberry PI

2. Ethernet: Ethernet is the computer networking technology which allows computers to communicate and share resources over the internet. Ethernet was standardized as IEEE 802.3. it is one of the most widely implemented LAN standard originally developed by Xerox. Different Ethernet networks also connect to a router that provides access to the internet.

IV. SOFTWARE USED

Different software's were used to implement the embedded web server, these are mentioned below:

1. Raspbian Wheezy: Raspbian wheezy is an open source operating system based on debian optimized for the raspberry pi hardware.

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It is linux kernel based operating system which uses on the light weight ARMv6 instruction set that a typical Broadcom processor understand.

2. Apache2: It is also known as “Apache HTTP Server” which allows the online distribution of website service using Hyper Text Transfer Protocol (HTTP). It is widely popular web server for different operating systems such as Linux, Unix, Windows, Solaris, Mac OS X, Novell NetWare, OS/2 etc. Apache2 version was used in this project for creating web server.

3. PHP5: The PHP hypertext preprocessor (PHP) is a server- side scripting language designed for web development. PHP code is integrated by a web server with a PHP processor module which generates the resulting web page. PHP is basically used for developing web based software applications and also to manage database, dynamic content, session tracking, even build entire e-commerce sites. PHP5 version was used in this project.

4. MySQL: MySQL is database management system which runs on a server. It support standard SQL and compiles on a number of platform. MySQL is open source, free to download and use.

5. Proftpd: Proftpd is a File Transfer Protocol(FTP) server which is used to transfer website from computer to raspberry pi. It is free and open source software, compatible to number of platforms such as Linux, Mac OS X, Solaris, Sun OS, Windows(via cygwin) etc. It is a secure and configurable FTP server with more number of option's.

V. IMPLEMENTATION

For implementation of this project we need to install the software and then copy website on raspberry pi. Install the software's by following the below mentioned steps:

1. Install the raspbian operating system ‘Wheezy’. By using the image write program write image of operating system in SD card and then configure it while boot by using below command :

```
sudo raspi-config
```

and enable ‘ssh’ so that we can access raspberry pi remotely.

2. Install the proftpd FTP server by running the following command:

```
apt-get install proftpd
```

It will be used to transfer website on raspberry pi.

3. Install Apache2 server but before that update the system by using below commands:

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

Now install apache2 by using below command:

```
sudo apt-get install apache2
```

Apache server will run after the installation. We can start/stop the server by executing the following commands:

```
service apache2 start
```

```
service apache2 stop
```

Now configure apache2 correctly for raspberry pi by editing the host name to change it to our chosen name for the server by using linux text editor ‘nano’. Install PHP5 programming environment by executing the following command:

```
apt-get install php5 libapache2-mod-php5 php5-intl php5-mcrypt php5-curl php5-sqlite
```

4. Install MySQL database management system by using following command:

```
apt-get install mysql-server mysql-client php5-mysql
```

5. Install APC support package for PHP which will improve the performance of apache2 and PHP program's. Run the following commands to install the APC support system:

```
apt-get install php-pear php5-dev
```

```
apache2-mpm-prefork-dev build-essential make && pecl install apc
```

6. Install NMAP utilities by executing the following commands:

```
sudo apt-get install nmap
```

```
sudo apt-get install zenmap
```

7. Install phpMyadmin which is one of the most useful tool for working with the MySQL database management system. Use the following command to install it:

```
apt-get install libapache2-mod-auth-mysql php5-mysql phpmyadmin
```

8. Install Webmin Administration tool for administering all aspects of linux. Install webmin package with the following command:

```
sudo apt-get install webmin
```

After installing all the powerful software, copy website on raspberry pi. Now, the website will be available on the local network. To make website available outside the local network too use a WAN IP, by using which we can access hosted website from outside local network.

VI. TESTING AND RESULT

After combining the hardware and software part test the system. The final setup of project will be as shown in below figure:

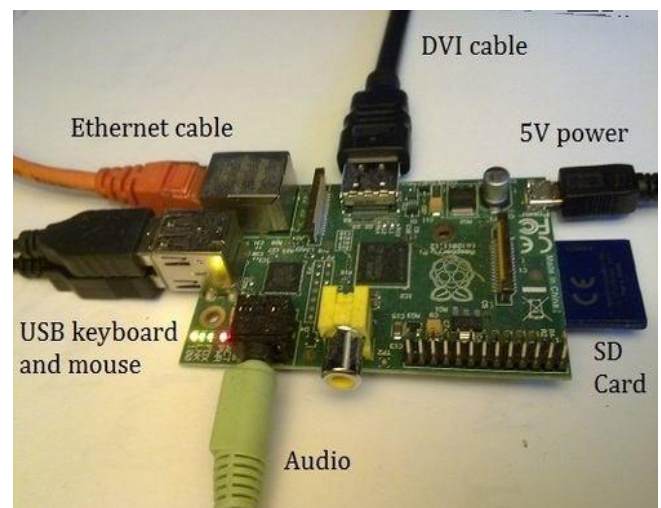


Fig. 3 Final Setup for Obtaining Result

The hosted website on raspberry pi can be accessed by client. The client has to type the WAN IP address of website in address bar of any web browser. Client should see the webpage as displayed in the following figure:

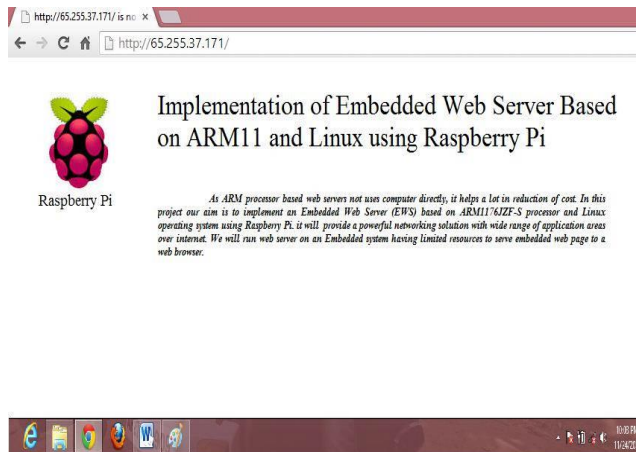


Fig. 4 Resulting Sample Webpage

VII. CONCLUSION

In this project our task is to implement an embedded web server based on ARM11 and linux which can be accessed by any client over internet. The hosted website on server can be transferred successfully when requested from any other system connected to the server.

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