



Case Study: RASPBERRIES Pi B+

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Abstract -- The initial advancements in the field of computing which shaped the way they are perceived now are dated back to 1970s and since then the industry has not look back. Multiple developments in field of VLSI technology, electronic devices have shaped today's industry. One of the most astonishing one is the development of miniature computers and Raspberry pi is the latest one in this field so the following project has been aimed at it. In this project authors focused on setting up a raspberry pi to operate as a standard personal computer with basic software such as video player, internet browser, terminal, GUI based operating systems. The methodology that has been adopted for the process deals with downloading of the essential software tools from the websites. Then downloading the raspbian O.S. for Raspberry pi. After that using SD card formatter the SD card is formatted and loaded with the boot image using software win32 disk imager. The process then involves connecting essential hardware components. Once that has been completed one can start booting by connecting the power supply. Then the system is configured as per our requirements. At the end the project deals with configuring network settings using the LX Terminal i.e. commands mode and goes on to also show how to use the Omx player.

Key words-- Raspberry pi, Linux, USB port

I. INTRODUCTION

Mostly Minicomputers regarded as the ancestors of the today's microcomputers used microchip technology but the absence of strong microprocessors really limited their field of application. Only when the transition of technology occurred from LSI to VLSI one could see some of the "really efficient" computers grab the centre stage, and since then the technology has been still going up by leaps and bounds to provide smaller and faster PCs. Notable events of history are Intel's 4004 microprocessor launch in 1971, Radio electronics a reputed journal described Mark 8 computer kit based on 8008 processor. Predictions of role of computers in human life came quite close to reality between 1977 and 1983 and people started growing faith in this technology.

Raspberry pi is a miniature board consisting of a mounted processor chip along with multiple peripheral slots for USB, camera, SD cards, HDMI cable etc. It was basically the idea of colleagues of Cambridge University. The whole concept was to provide versatile and reliable miniature PCs to everybody, which not just satisfy the traditional demands but also are open to modification purposes. Eben Upton formerly of University but now working as the chip designer for Broadcom joined forces with old University colleagues Pete Thomas, David Berban to for the Raspberry pi foundation which aims at the development of new and better Raspberry pi models.

Pi was made available online on 29 Feb 2012. On 4 Feb 2013 model A was launched which had 256 MB RAM, one USB port and Ethernet connections. Raspberry pi B+ on July 2014, and is still quite popular. The newest version was launched in Feb 2015 i.e. Raspberry pi 2B. Before starting our task of setting up Raspberry pi, we shall take a close look at the essential software and hardware required.



Fig1: Photograph of Raspberry pi 1 and B+

II. RASPBERRY PI B+ SPECIFICATIONS

- 700 MHZ Broadcom BCM2835 processor with 512MB RAM
- 40pin extended GPIO
- Full size HDMI
- 4 USB ports
- Micro SD slot

III. NECESSARY HARDWARE

Raspberry pi model B+

- HDMI display: In absence of it a normal VGA monitor can be used along with HDMI-VGA cable.
- Keyboard and mouse
- Power supply: It may be provided either through a adaptor rating 5V-700mA , or using a USB power cable.
- SD card: 8 GB recommended, preferably new

IV. NECESSARY SOFTWARE

- Boot image of Raspbian
- SD formatter
- Win32 disk imager

V. BASIC CONCEPTS

- Operating system: An operating system is the set of basic programs and utilities that allow you to run Raspberry Pi run. Common examples include Linux, Unix, Windows etc. It has a KERNEL to hand the core hardware operations. While SHELL acts as an interface tool to facilitate the communication between the KERNEL and the User.
- Debian: Debian basically represents an operating system created by the Debian project that aims at providing free software to all the users over internet and other means. They commonly use the Linux Kernel and Free BSD kernel. It has over 43000 packages (pre compiled software which come with easy installation features), a package manager, and other utilities for smooth running of the system.
- Raspbian: Raspbian is basically an operating specifically designed in order to meet the requirements of the Raspberry pi users. Raspbian is an advancement of pure OS: equipped with over 35,000 packages; pre-compiled software have been bundled in a concise format to suit easy installation on your Raspberry Pi. A Raspbian image basically denotes a file which one can write onto an SD card which is implemented to boot your Raspberry Pi and Via APC into the Raspbian operating system. Using a Raspbian image is a smart and efficient way to get started with Raspbian operating system.
- Iso image: An iso image is the archive file of the optical disc, a type of disc image composed of data contents from every written sector on an optical disc file system. Thus it is evident that a mere copy paste of the image would keep the data intact but until the data has been strictly speaking organized on the other device it will not function as a BOOTABLE device.
- Win32 image writer: It is a software which provides the ability to read and write the iso images and other formats 'to' and 'from' the external hardware attached. This feature of the software plays a crucial role in turning a normal SD card into a bootable device which is the key for loading an operating system to Raspberry pi.
- SD card formatter: It is a specialized software that has the ability to format an SD card even in accessing certain protected write areas of the card which cannot be formatted by the system utilities thus allowing wider capabilities for the process.
- LXTerminal: It basically stands for Lightweight X11 Terminal. It comes with advantages of being : reliable, easy to use and learn, light on hardware, cost effective thus has gained popularity and has been readily accepted by the Raspbian operating system and is comes along with it.
- Omx player: Omx player is a video player specifically made for the Raspberry Pi's GPU made by Edgar Hucek from the XMBC project. It is available free of cost with Raspbian. Unlike other players Omx player does not display control buttons, menu bar and other miscellaneous options.

VI. PROCEDURE

A. Downloading BOOT IMAGE of Raspbian:

- Go to www.raspberrypi.org/downloads [1].
- Download zip file of the latest available Raspbian image.
- The image is now available in zipped form in your downloads folder.
- Unzip it using WinZip or any archive manager.

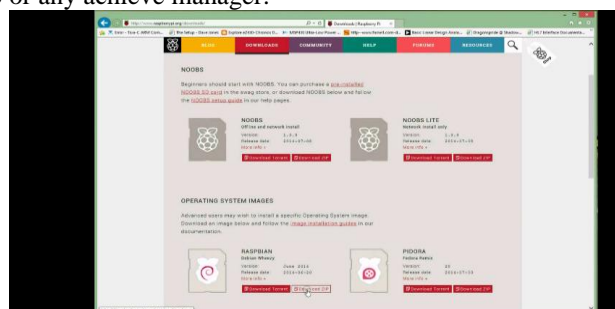


Fig2: View of www.raspberrypi.org/downloads⁽¹⁾

B. Formatting the SD card:

- Download the SD card formatter from [sdcard.org](http://www.sdcard.org/downloads/formatter_4/) link as given: https://www.sdcard.org/downloads/formatter_4/ [2]
- Insert SD card.
- Select SD formatter from program options.
- Format SD card using settings quick format, format size adjustment ON.

C. Loading the iso image to SD card:

- Download the software Win32 Disk Imager from many sites, the one opted here is given below: <http://sourceforge.net/projects/win32diskimager/files/Archive/> [3]
- Open the software mentioned above.
- “Write” the contents of the iso image file to the SD card. This might take 5-10 minutes.
- Safely eject SD card.
- Discharge your SD card against a piece of metal for safety.

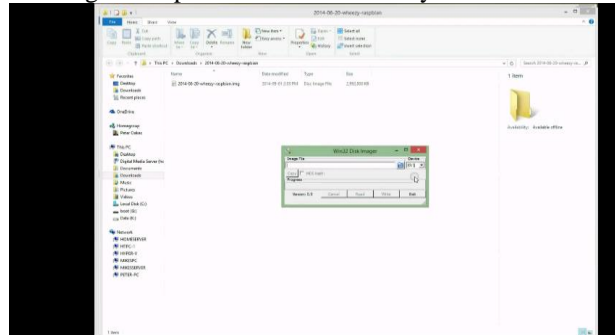


Fig3. View of Win32 Disk Imager

D. Making the hardware connections for the Raspberry pi:

- Connect Ethernet cable between modem and board.
- Connect mouse and keyboard using USB ports.
- Attach the SD card at the SD card slot.
- Make connections for HDMI display.
- In absence of HDMI display create a connection between HDMI and VGA using the HDMI-VGA cable.

E. Booting raspberry pi for first time:

- Connect power supply and you shall see activity on the monitor.
- In a couple of minutes you shall see a CONFIGURATION SCREEN.
- Using first option on the screen expand the BOOT PARTITION for higher storage capabilities.
- Now, using the third option enable boot to desktop.
- Go into localization options using option no.4 and configure your time zone, area keyboard type etc.
- Go to advanced options and enable SSH connections.
- Go to finish and reboot the system.

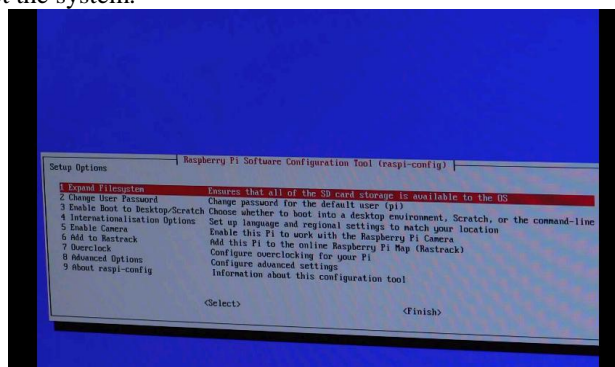


Fig.4: View of configuration screen

F. Configuring Network:

- Find network details like I.P address and Default gateway from your current computer. You can use command “ipconfig” on the command prompt.
- Go to the screen of Raspberry pi and open the Lx Terminal.
- In Lx Terminal type the command “sudo nano /etc/network/interfaces”
- Change “manual” to “static” in line “iface eth0” and save changes to the document.

- Go to network settings Dialog box on top right of screen and configure connections as interfaces eth0.
- Put in IP address and other details.
- Go to epiphany web browser and run it to connect to internet.

G. Running Omx player:

- For updating and installation of the omx player the set of commands is as follows:
sudo apt-get update
sudo apt-get install -y omx player
omx player <FILE PATH>
- For example:
omx player a.MP4
on doing so a screen running the video shall appear.

VII. CONCLUSION

The project is concluded here, as all the goals of the project have been achieved. This includes successful download of Raspbian, creation of a bootable SD card, connecting the essential hardware components, first configuration of the Raspbian O.S. on the command mode, configuring of the internet networking the command mode using the LXTerminal, running of Omx player through the command mode.

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