

Comparative Analysis of Different Operating Systems for a Raspberry Pi

Prabodh S. Nimat¹
Dept. of CSE
MGICOET, Shegaon
psnimat@gmail.com

Amit S. Kakad²
Dept. of ENTC
MGICOET, Shegaon
ameetkakat@gmail.com

Deepavali P. Patil³
Dept. of CSE
MGICOET, Shegaon
dppatil1285@gmail.com

Nitish B. Bhawarkar⁴
Dept. of ENTC
MGICOET, Shegaon
nbbawarkar@gmail.com

Swapnil A. Tale
Dept. of ENTC
MGICOET, Shegaon
tale_swapnil@rediffmail.com

Abstract- In this paper we will take a look at different operating system for Raspberry Pi set up so you can try it and start using it for the variety of purposes. Raspberry Pi is small but powerful credit card sized little computer, but before doing anything awesome, you need to configure Raspberry Pi kit and install an operating system. Without an operating system Raspberry Pi is just a piece of silicon, fiberglass, and a few other semiconductor materials. This paper shed the light on different operating systems available for Raspberry Pi. We are going to compare them based on their emergent features, that makes them different than other Many from the available lists of operating systems, each one of them are segregated based on their applications, features and specifications. We have taken the 8 different operating system on our radar most use for Raspberry Pi including Raspbian, Pidora, ArchLinux, OSMC, RetroPie, RISC OS, Firefox OS and Kali Linux. This paper focuses on the which operating system is capable and useful for particular needs and purposes.

Keywords- Raspberry Pi, Raspbian, Pidora, archLinux, OSMC, RetroPie, RISC OS, Firefox OS, Kali Linux.

I. INTRODUCTION

The Raspberry Pi is a wonderful but powerful little computer that fits the palm of your hand. Despite of its size it has enough power to run your operating system smoothly, home media center, a VPN and a lot more. The Raspberry Pi has a SD card slot for mass storage and will attempt to boot off that device from SD card when the board is powered on by 5v micro USB supply.



Fig. 1: Raspberry Pi 3 model B

The Raspberry is a very capable mini computer and moreover its very inexpensive, it is available at unbelievable

price that you could not resist yourself to buy one, if you are technocrat. Latest Raspberry Pi ie. Pi 3 comes with caseless computer with HDMI and analog composite video output. It comes with 4 USB port that makes it more user friendly and programmable to achieve specific goals. This Raspberry Pi has an integrated 802.11n wifi adaptor and Bluetooth 4.1. wifi and Bluetooth to make it more user friendly, you doesn't need TP link anymore to use wifi on this kit. It runs 5v micro UBS supply. It also provide RJ 45 port to use Ethernet connection. The Raspberry Pi 3 B model excellent processing speed provided by a powerful new 1.2GHz 64-bit quad core ARMv8 CPU with four ARM cortex -A53 cores and 1 GB of RAM. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.[1]

In this paper we are going to compare different operating systems available for Raspberry Pi. Many from the available lists of operating systems, each one of them are segregated based on their applications, features and specifications

II. BRIEF DISCUSSION OF OPERATING SYSTEMS:

No matter how good and powerful the hardware of the Raspberry Pi is, without an operating system it is just a piece of silicon, fiberglass, and a few other semiconductor materials. There are several different operating systems for the Raspberry Pi, including RISC OS, Pidora, Arch Linux, and Raspbian.

A. List of Operating Systems for Raspberry Pi

1. Raspbian
2. Pidora
3. ArchLinux.
4. OSMC
5. Retro PIE
6. RISC OS
7. Firefox OS
8. Kali Linux
1. Raspbian

Currently, Raspbian is the most popular Linux-based operating system for the Raspberry Pi. Raspbian is an open source operating system based on Debian, which has been modified specifically for the Raspberry Pi (thus the name Raspbian). Raspbian is the default free and open source operating system that often comes with the Raspberry Pi kit. Raspbian is an official operating system of Raspberry Pi foundation. Raspbian is a version of Debian which is specially designed and optimized for the Raspberry Pi hardware and the build consists of more than 35,000 Raspbian packages. Raspbian is still under active development phase with an emphasis on improving the capability, stability and performance. For a beginner it's a good place to start especially if you're starting with programming and are used to a windows based system as it bears some resemblance to Windows. Raspbian comes with Python programming language. This OS is real treat to the python programmer. Raspbian also includes a 'Pi store' so you can download free and purchasable applications such as Libre Office, Free Civ (a game). Raspbian is an operating system which proves to be very efficient for the basic operating requirements with pi. Raspbian is designed to be easy to use and is the recommended operating system for beginners to start off with their Raspberry Pi.

2. Pidora

After waiting for a long time, Raspberry Pi users are finally getting an optimized version of Fedora, the Pidora, to replace the current Raspbian OS. The news caused excitement among the Raspberry Pi community, who are finally getting the opportunity to enjoy Fedora on their devices after the previous attempt to introduce Fedora Remix for Pi ended up as a failure. However, the Seneca Center for Development of Open Technology (CDOT), the authority group behind Pidora, is confident that the Raspberry Pi community would love the newly optimized OS, coupled with greater speed and most of the features of Fedora 18. The current Raspbian OS, which was a remix of the Open Source Debian OS chip based on ARMv6 would make way for Pidora, currently available for download on the CDOT website.[2]

3. Arch Linux

Arch Linux is an excellent choice for many reasons. One of the greatest advantages of the Arch Linux distribution is its simplicity in approach and attitude. Arch gives you the ability to build your system from the ground up, including only the software you actually need. This minimizes the amount of SD card memory it takes to hold the operating system for your Raspberry Pi, leaving more

space for everything else you'll be doing. On a cautionary note, Arch moves forward as technology evolves, and this can sometimes lead to documentation lagging behind. Arch has now finished its transition to SystemD from the old initscripts

4. OSMC

OSMC (Open Source Media Center) is a free and open source media player based on Linux. Founded in 2014, OSMC lets you play back media from your local network, attached storage and the Internet. OSMC is the leading media center in terms of feature set and community and is based on the Kodi project. Although OSMC is derived from Linux, you don't need to have any experience with Linux to use it up and running in the way you want. Everything is easily managed through the OSMC interface. This OS comes with over 30,000 packages from Debian repository.

5. RetroPie

RetroPie allows you to turn your Raspberry Pi into a retro-gaming machine. Its platform developed on the base of Raspbian, EmulationStation, RetroPie enable you to play your favourite Arcade, home-console, and classic PC games with the minimum set-up. For technocrat users it also provides a large variety of configuration tools to customize the system as per user need and purpose.[4] The RetroPie SD image is built on top of Raspbian but RetroPie can be installed on any Debian based linux distribution. RetroPie has the most supported and customizable operating systems out of any retro programming software for the Raspberry Pi. This OS is very useful emulation many games.

6. RISC OS

RISC OS is a British operating system originally designed by Acorn Computers Ltd in Cambridge, England, and was first released in 1987. It was specifically designed to run on the ARM chipset. It is fast, compact and efficient. RISC OS is not a version of Linux, nor is it in any way related to Windows and interestingly was developed by the original ARM team.

RISC OS Pi comes with a small set of utilities and applications, It includes a browser called NetSurf, a simple text editor, a scientific calculator, and it also has two software/package managers, packman and a store. Although it's not a modern operating system (when compared Linux, Windows and OSX) it does have number of unique features and aspects to its design. It is available to download from RISC OS Open Website or RaspberryPi.org.

7. Firefox OS

Firefox OS (also known internally as Boot to Gecko/B2G) is an OS which is more associated with being a Linux kernel-based open-source operating system primarily designed for smartphones and tablet computers. It was primarily designed as a community based alternative system utilizing open standards and HTML5 applications, JavaScript and open web API's. It mainly competes with Android, Windows Phone and Jolla Sailfish OS. Recently Mozilla on a Raspberry Pi. This OS is based on Mozilla technology

device is affordable and flexible as it can run a number of operating systems and might therefore be a very suitable device to provide an entry level upgrade in network protection.

8. Kali Linux

Kali Linux is a Debian-based security auditing Linux distribution. It is specially designed for digital forensics and penetration testing. It is maintained and funded by Offensive Security Ltd. Kali Linux provides many pre-installed packages with numerous penetration-testing programs, like nmap (a port scanner), Wireshark (a packet analyzer), John the Ripper (a password cracker), Aircrack-ng (suite for penetration-testing wireless LANs), Burp suite and OWASP ZAP (security scanners). Recently support for TFT touchscreens was added. If you want to install Kali on the Raspberry Pi kit you can download it from their official download page, it is freely available there.

III. COMPARISON OF OPERATING SYSTEM BASED ON EMERGENT FEATURES

A. Raspbian:

This operating system is a package of programs and utilities and that makes raspberry pi more user friendly. However, Raspbian comes with more than 35,000 packages, pre-compiled software platform for best performance on the raspberry pi. All this makes raspbian more than pure os it's a complete software suit that provides best user Raspbian incorporates customizations features that are designed to make the Raspberry Pi easier to use and also incorporates many different out of the box software packages.

B. Pidora

Pidora is a combination of Fedora software, with or without third-party software, that any community member can create at any time.[3]

The distribution includes "almost all of the Fedora 18 package set available via yum" precompiled to take advantage of the Pi, as well as C, Python, and Perl programming environments. Pidora offers graphical firstboot configuration, as well as a compact initial image size that can be automatically resized to take advantage of available storage, says CDOT.

.Pidora adds an auto swap creation feature that allows for larger memory usage, as well as the initial release of a headless mode for display-free devices. Other touted features include the Midnight Commander file manager, plugin support for the Gedit text editor for graphical mode, as well as other text editors for console operation. IP address information can be expressed via speakers or LEDs, and libraries are available for motors and robotics I/O, says CDOT.[13]

C. ArchLinux

The biggest feature of Arch Linux is its simplicity in real time approach and attitude. Here 'simplicity', in this context, shall mean 'without unnecessary additions, modifications, or complications'. The bottom line is, it has an elegant, minimalist approach that makes it more

happening. Arch Linux gives you platform that makes you able to build your system from the ground up, it only incorporate the software that you actually need [5]. This optimize the amount of memory on your SD card it needs to hold the operating system for your Raspberry Pi, leaving plenty of space for other things you'll be doing. Arch Linux provide a light-weight base structure that allows you to shape the system to your needs.[6]. It build optimized packages for ARMv series instruction, it gives ability to use to use each platform to its full potential. New updated versions are packaged into OS as they are released by the organization, makes you sure that you are on leading edge.

D. OSMC

OSMC on the other hand uses a custom skin, which seems to be inspired by the Mimic Skin. OSMC also provides easy access to Raspberry Pi hardware settings. if you are looking for ways to do more than just playing media and want more control over the hardware, without a doubt, go with OSMC [7]. OSMC Cloud, a new way to enjoy OSMC and wherever you are. Whether you watch TV on one one device or several, OSMC Cloud will simplify the way you archive your digital media and make managing your library simpler than ever. You'll be able to enjoy your library whether you're on a train on a rainy Monday morning, or tucked up in bed with your main streaming device downstairs.

E. RetroPie

This RetroPie operating system is a retro gaming project that brings together a collection of popular emulators for those computers and consoles that you grew up with from the 70's, 80's and 90's, all wrapped up and ready to run on the famous Raspberry Pi. From Atari 2600, to Sega Mega Drive to Sony PlayStation, all your favourite systems are covered [8]. Basic Joypad control in RetroPie-Setup menus. This OS offers more than 20 emulators and ports for gaming. It is pretty simple way to put together the hardware you need to get RetroPie up and running. You may buy the parts separately or may buy affordable kits that contain the various components that you will need, it is quite simplified way - e.g. the Canakit, or a kit from The Pi Hut, or Pimoroni[9]. RetroPie is a universal emulator, which means it can pretty much play any ROM you throw at it.

F. RISC OS

RISC OS provides an ultimate way of controlling a Raspberry Pi. It appeals to those who want to understand their pi better by interacting with it at a more basic fundamental level. RISC OS features a wonderful graphical interface, which uses windows in an ingenious manner, and makes clever use of context sensitive menus. Experienced users often comment on how efficiently RISC OS allows tasks to be tackled. This is partly because RISC OS facilitates users having several different applications open on the desktop at the same time, and using drag and drop to get these effortlessly interacting with one another[10]. Its fast bootable operating system, it boots in 15 seconds from SD card.

G. Firefox OS:

Firefox OS can be a viable, valuable and understandable OS for a range of programmable development boards and hardware related to IoT. Means Firefox OS and Raspberry Pi is a great treat for IoT developers. The main feature of Firefox OS in a Raspberry Pi is running without a Linux distribution installation previously[11]. So far Firefox OS is kid in a world of Raspberry Pi but it has a great potential to be a one of the most popular and most usable operating system.

H. Kali Linux

Kali OS allows you to fully customise Kali ISOs with live-build allowing you to create your own Kali Linux images – Kali Linux is heavily integrated with live-build, this OS gives you endless flexibility in customising and tailoring every aspect of your Kali Linux ISO images. Kali is one of the most secured operating system for Raspberry Pi. It stored data on drive in encrypted format[12]. It is specially designed for for digital forensics and penetration testing.

VI CONCLUSIONS

Raspberry Pi has changed the way of programming and usability. But without operating system it is just a piece of semiconductor material. Operating system havemade the Raspberry Pi more popular and user friendly. In this paper we have gone through 8 different operating system. Each operating has its own features. Hereby we are summarizing our study and research on 8 different operating system of Raspberry Pi.

Raspbian is the official operating system for Raspberry Pi so it is most used OS. Pidora is the newly arrived OS that has the capability to replace the Raspbian OS with more debian based packages. The biggest feature of Arch Linux is its simplicity in real time approach and attitude. OSMC is entertainment package that allows you to run home media center on your Raspberry Pi. RetroPie is gaming platform for almost every games. Its works as a emulator. RISC OS gives wonderful user interface, it is simplest operating system available for Raspberry Pi. Firefox OS is the different operating system in this league all other OS are Linux or Debian based. But Firefox OS developed by Mozilla for a range of programmable development boards and hardware related to IoT. Only disadvantage of this OS is that, it takes more booting time compared to other. Kali Linux specially designed for for digital forensics and penetration testing. Kali Linux is the most secured operating system available for Raspberry Pi. At last we conclude that Raspbian is the best all rounder Operating System for Raspberry Pi so far.

ACKNOWLEDGMENT:

The authors of this paper would like to thanks Hon'ble Chairman of our institute Dnyaneshwardada Patil, Hon'ble Principal Dr. C.M. Jadhao, Head of CSE Dept. Prof. N .N. Kasliwal, Prof. P. K. Shelke, Prof. V. P. Sawalkar, Prof. U. B. Shingote, Prof. R. G. Deshmukh, Prof. S.R. Deshmukh, Prof. A. G. Sharma, Prof. K. R. Mawale,

Prof. S. R. Chaware, Prof. D. P. Kadale and other staff of CSE department

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