Stable RPM Based Linux Distros for the Raspberry Pi 4

Rexx LA 2021 Online Symposium
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Last Revised: November 10, 2021

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Criteria for Distro Selection

Objectives and Desired Functionality for Install and Use

- **Open Source**

- Take Advantage of the **RPi4 64 Bit Processor** (aarch64 Architecture)

- **Ease of Installation** – Reliability of Installation Process; No Post Install System Freezes

- **GUI Manager Installation Available** – Stability & Speed of the GUI Windows

- **Runs on 4GB Raspberry Pi 4B** without Excessive Wait Time

- **Performance That is Better than Windows 10 Professional**

- **Long-Term Support** (LTS) Life Cycle That is at Least 2 Years

- **Stable Update Process** (No "Bleeding Edge" System Breaks)

- Allows Setup of **Open JDK 8 (1.8) or Oracle JDK8**

- Allows Setup of **NetRexx** v3.09GA and Up

- Allows Setup of **ooRexx** 5.0 Beta and BSF4ooRexx v641

Candidates Considered and Selected

Red Hat Project Family

- Fedora 33 and 34 (aarch64)

- RHEL 8 (aarch64)

CentOS Project Family

- **CentOS 7** (aarch64) <==

- CentOS 8 (aarch64)

- **Alma Linux 8.4** (aarch64) <==

- Rocky Linux 8 (aarch64)

OpenSUSE Project Family

- **Leap** v15.2 and **15.3** <==

Oracle Linux Project

- Oracle Linux v7.9 and 8.4

Candidates Accepted and Rejected with Reasons

Red Hat Project Family

- Fedora 33 and 34 (aarch64) <== Fedora Releases are Maintained for about a year and a month --

- RHEL 8 (aarch64) <== Fee for Installation --

CentOS Project Family

- CentOS 7 (aarch64) <== Server with GUI Installation Relatively Easy to Install: End of Life is June 30, 2024 ++

- CentOS 8 (aarch64) <== Red Hat Shortened End of Life to December 31, 2021 --

- Alma Linux 8.4 (aarch64) <= Server with GUI Installation Relatively Easy and similar to CentOS 7 Install ++

- Rocky Linux 8 (aarch64) <== Both an SD Card and USB Drive are required for Standard Installation. -- ==>Update ... There is now a 3rd Party SD Card Based Install Image

OpenSUSE Project Family

- openSUSE Leap v15.2 and 15.3 <== 15.2 has no Audio Support & Poor Monitor Use --; 15.3 has Audio & Improved Monitor Use; Customizations to Speed Up Startup on the Raspberry Pi SBCs +++

Oracle Linux Project

- Oracle Linux v7.9 and 8.4 (aarch64) <== Unable to Configure GUI; causes System Startup Freeze ---

CentOS 7 64 Bit – OS Installation How To - I

Navigate to a CentOS 7 Server ARM64 Download Directory

- **Example URL for UC Berkeley Mirror** :

https://mirrors.ocf.berkeley.edu/centos-altarch/7.9.2009/isos/aarch64/images/

- For SDHC Card **64 Bit Image** Select The Following Compressed Image File:

CentOS-Userland-7-aarch64-generic-Minimal-2009-sda.raw.xz

Flash the Image to a SDHC Card

- Use a Utility such as **Balena Etcher** or **Raspberry Pi Imager** to Flash The Image to a SDHC Card (Recommendation use a Good Quality Card with at Least 64GB Capacity)

CentOS 7 64 Bit – OS Installation How To - II

Insert SDHC Card into the RPi4 and Initial Boot Steps

- **Enter Credentials -- User**: root **Password**: centos

- To change root password from OS Prompt

    # **passwd**

- To Add a New User Id:

    # **useradd** USERNAME -G wheel -p PASSWORD

- To Apply System Updates logged in as root

    # **yum update -y**

- To Apply System Updates logged in as a super user

    $ **sudo yum update -y**

CentOS 7 64 Bit – OS Installation How To - III

GUI Desktop Setup for CentOS 7

- To List Install Groups

    # **yum grouplist**

- To Add the GNOME Desktop GUI:

    # **sudo yum groupinstall "GNOME Desktop"**

- Reboot The RPi4 Workstation and Login

- The KDE Desktop is Also Available but Does Require More Overhead and is slower Performance versus GNOME

CentOS 7 64 Bit – OpenJDK Installation How To - IV

OpenJDK 1.8 Setup for CentOS 7

- To Search for OpenJDK Packages:

    # **yum search openjdk**

- To OpenJDK Version 1.8:

    $ **sudo yum install openjdk-1.8**

- **Set $JAVA_HOME and $PATH Environments** in .bashrc (local to User Id logged in)

    - Use a Text Editor such as nano, SciTE, jedit, nedit or gedit

    - Add the Followining to .bashrc:

        export JAVA_HOME=/usr/lib64/jvm/java-1.8.0
        export PATH=$JAVA_HOME/bin:$PATH

- To Test Environment Settings:

    $ **javac -version**

OpenSUSE Leap 15.3 64 Bit – OS Installation How To - I

Navigate to a openSUSE Leap 15.3 Download Directory

- **Example URL for Xfce Image File Download** :

http://download.opensuse.org/distribution/leap/15.3/appliances/openSUSE-Leap-15.3-ARM-XFCE-raspberrypi.aarch64.raw.xz

- Download Images also exist for the Following Desktop GUIs:

JeOS, E20, LxQt, KDE and X11

Flash the Image to a SDHC Card

- Use a Utility such as **Balena Etcher** or **Raspberry Pi Imager** to Flash The Image to a SDHC Card (Recommendation use a Good Quality Card with at Least 64GB Capacity)

OpenSUSE Leap 15.3 64 Bit – OS Installation How To - II

Insert SDHC Card into the RPi4 and Initial Boot Steps

- **Enter Credentials --** **User**: root **Password**: linux

- Follow The Sets for the openSUSE Setup Wizard (This GUI wizard covers more setup features than CentOS 7 and Alma Linux 8.4)

To Apply System Updates logged in as root

   # **zypper update** (Answer "y" to prompt)

- To Apply System Updates logged in as a super user

   $ **sudo zypper update**

- Wiki Reference for openSUSE Installation on the Raspberry Pi 4:

   URL: https://en.opensuse.org/HCL:Raspberry_Pi4

OpenJDK 1.8 Setup for openSUSE Leap 15.3

- To Search for OpenJDK Packages:

    # **zypper se openjdk**

- To OpenJDK Version 1.8:

    $ **sudo zypper install openjdk-1.8**

- **Set $JAVA_HOME and $PATH Environments** in .bashrc (local to User Id logged in)

    - Use a Text Editor such as nano, SciTE, jedit, nedit or gedit

    - Add the Following to ~/.bashrc File:

        export JAVA_HOME=/usr/lib64/jvm/java-1.8.0-openjdk-1.8.0
        export PATH=$JAVA_HOME/bin:$PATH

- To Test Environment Settings:

    $ **javac -version**

AlmaLinux 8.4 64 Bit – OS Installation How To - I

Navigate to a AlmaLinuxServer aarch64 Download Directory

– **Download the Minimal Server Image Customized for the RPi4** :

https://repo.almalinux.org/rpi/images/AlmaLinux-8-aarch64-RaspberryPI-Minimal-4-sda.raw.xz

Flash the Image to a SDHC Card

- Use a Utility such as **Balena Etcher** or **Raspberry Pi Imager** to Flash The Image to a SDHC Card (Recommendation use a Good Quality Card with at Least 64GB Capacity)

AlmaLinux 8.4 64 Bit – OS Installation How To - II

Insert SDHC Card into the RPi4 and Initial Boot Steps

- **Enter Credentials -- User**: root **Password**: almalinux

- To change root password from OS Prompt

    # **passwd**

- To Add a New User Id:

    # **useradd** USERNAME -G wheel -p PASSWORD

- To Apply System Updates logged in as root

    # **dnf update -y**

- To Apply System Updates logged in as a super user

    $ **sudo dnf update -y**

AlmaLinux 8.4 64 Bit – OS Installation How To - III

Resize the Root Partition to Use Available Space on SDHC Card Steps

- **Execute parted as root** (# Prompt on Shell):

    # **parted**

- Run print free to get partition list and sizes including free space. The root file system will exist on the 3rd partition: *dev*mmcblk0p3

    print free

- **Resize the 3rd Partition to Use All Free Space**

    resizepart 3

- For The **End** Prompt Enter the Size of Your SDHC Card in GB. For Example, a 64GB Card:

    64GB

- Save The Changes

    quit

- **Resize The File System 3rd Partition**

    # **resize2fs /dev/mmcblk0p3**

- Verify Available Used and Free Space

    # **df -h**

Alma Linux 64 Bit – OpenJDK Installation How To - IV

OpenJDK 1.8 Setup for Alma Linux 8

- To Search for OpenJDK Packages:

  # **dnf search openjdk**

- To OpenJDK Version 1.8:

  $ **sudo dnf install openjdk-1.8**

- **Set $JAVA_HOME and $PATH Environments** in .bashrc (local to User Id logged in)

  - Use a Text Editor such as nano, SciTE, jedit, nedit or gedit

  - Add the Followining to .bashrc:

    export JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-1.8.0.302.b08-0.el8_4.aarch64
    export PATH=$JAVA_HOME/bin:$PATH

- To Test Environment Settings:

  $ **javac -version**

NetRexx v3.09GA Installation

Download the Zip Archive from URL:

- http://www.netrexx.org/downloads.nsp

Create a netrexx subdirectory off the /opt Path

- $ cd /opt

- $ sudo mkdir netrexx

Copy to the Distros '/opt/netrexx' directory:

- $ sudo cp $HOME/Downloads/NetRexx3.09GA.zip **/opt/netrexx**

Unzip The Archive

- $ sudo unzip NetRexx3.09GA.zip

Copy The lib and runlib Jar File to OpenJDK8 Extension Library

- $ sudo cp ./lib/*.jar $JAVA_HOME/jre/lib/ext

- $ sudo cp ./runlib/*.jar $JAVA_HOME/jre/lib/ext

Open Object Rexx 5.0 Beta Installation - I

Install The Following Packages with Dependencies Using Distro Command Line Package Tool

- **CentOS 7**

    $ sudo yum install cmake

    $ sudo yum install subversion

    $ sudo yum install g++

- **openSUSE Leap 15.3**

    $ sudo zypper install cmake

    $ sudo zypper install subversion

    $ sudo zypper install gcc-c++

- **AlmaLinux 8.4**

    $ sudo dnf install cmake

    $ sudo dnf install subversion

    $ sudo dnf install g++

Open Object Rexx 5.0 Beta Installation - II

Open A Terminal Command Shell And Run The Following To Build & Install the ooRexx 5.0 Beta

- **All 3 Distros**

    ```
    $ cd $HOME

    $ mkdir oorexx

    $ cd oorexx

    $mkdir build

    $ cd build

    $ svn checkout svn://svn.code.sf.net/p/oorexx/code-0/main/trunk oorexx-code-0

    $ cd oorexx-code-0

    $ cmake .

    $ sudo make install
    ```

- **Verify The Version Build of ooRexx**

    ```
    $ rexx -V
    ```

Open Object Rexx 5.0 Beta Installation - III

Install the ooRexx 5.0 Beta Issue on Alma Linux 8.4

- **Verify The Version Build of ooRexx Using sudo**

    $ **sudo rexx -V**

- **Alma Linux** is unable to locate the **rexx** and **rxqueue** binaries utilized by the BSF4ooRexx Linux Install Shell Scripts

- **Workaround**:

    Create Symbolic Link pointing ooRexx binaries in **'/*usr*/local/bin**' to **'/*usr*/bin'** (omitting the single quotes below)

    $ **sudo ln -s '/usr/local/bin/rexx' '/usr/bin/rexx'**

    $ **sudo ln -s '/usr/local/bin/rxqueue' '/usr/bin/rxqueue'**

- **All Distros**

    If rexx -V fails to find the ooRexx binary … consider refresing the Shared Object Library cashe

    $ **sudo ldconfig**

BSF4ooRexx v641 Installation - I

Navigate to the Following URL for BSF4ooRexx Download:

- https://sourceforge.net/projects/bsf4oorexx/files/beta/20200928/

Download the BSF4ooRexx Install Zip Archive:

- BSF4ooRexx_install_v641-20210807-beta.zip

- Open A Bash Shell; Unzip The Archive

Copy Folder bsf4oorexx to a Directory of Your Choosing

- For Example:

$ cp $HOME/Downloads/<bsf-version-folder>/bsf4orexx $HOME

Change to the install/linux subdirectory; Run The Install Shell

$ cd $HOME/bsf4oorexx/install/linux

$ sudo sh ./install.sh

BSF4ooRexx v641 Installation - II

Default Installation Will Reside in Directory:

- **/opt/BSF4ooRexx**

Copy Jar File to Java JRE Extensions Library:

- sudo cp bsf*.jar $JAVA_HOME/jre/lib/ext

Refresh The Shared Object Load Library Cache:

- sudo ldconfig

Run The Classic Rexx Sample Program: GetJavaSystemProperties.rxj

$ cd /opt/BSF4ooRexx

$ sh ./rexxj2.sh ./samples/classicRexxSamples/GetJavaSystemProperties.rxj

Comparing the 3 Distros

Best Desktop GUI:

- openSUSE Leap 15.3 Xfce

   - Fastest Performance

   - Make Optimum Use of Display

   - Best User Experience on a Small Screen Display

Best Performance:

- 1st: CentOS 7 2nd: Alma Linux 3rd: openSUSE

Fastest Bootup:

- 1st: Alma Linux 2nd: CentOS 7 3rd: openSUSE

Closest to CentOS Standard:

- 1st: CentOS 7 2nd: Alma Linux 3rd: openSUSE

- openSUSE deviates from certain Red Hat conventions more than the other 2 distros

Findings for the 3 Distros

OpenJDK 1.8:

- RPM Packages with Dependencies are Available for All 3 Distros

User Libraries:

- **Alma Linux** – References to '/usr/local/lib64' and '/usr/local/lib' needed to be added for Software to Find The Shared Object Libraries for ooRexx and BSF4ooRexx

OoRexx Binaries:

- **Alma Linux** – Running sudo to ooRexx executables in '/usr/local/bin' resulted in a Not Found Condition. Added Symbolic Link of **rexx** and **rxqueue** binaries to '/usr/bin'

RPI Userland Utilites:

- Unavailable for all 3 Distros; Unable to Install on openSUSE Leap 15.2 and 15.3
- Can Be Installed on CentOS 7 and Alma Linux 8

Pros and Cons – CentOS 7

CentOS7

+ Pros

- Closest to Red Hat Enterprise Linux Convention
- Boots Quickly
- 2nd Best Repository of Available Packages
- LTS Support Through End of June 2024

- Cons

- Install of GNOME Desktop Does Not Use The Full Display Screen
- Slow Speed of Software Updates
- GUI Software Updater is lacking in some of the Functionality of Other Install Facilities Such As Synaptic, For Example
- Limited Desktop GUI Installs: GNOME and KDE

Pros and Cons – openSUSE Leap 15.3

openSUSE

+ Pros

- Slickest Desktop that is Already Built into the Install Image
- Boots Quickly
- Best Repository of Available Packages
- Several Choices for Desktop GUI

- Cons

- Deviates from Red Hat Enterprise Linux Convention
- Slow Speed of Software Updates
- R Pi Userland Utilities Could Not Be Installed
- Earliest End of Life Support Date: End of November 2022

Pros and Cons – Alma Linux 8

Alma Linux 8

+ Pros

- Close to Red Hat Enterprise Linux Convention

- Boots Quickly

- Quick Speed of Software Updates

- Best LTS Support Through At Least 2029

- Cons

- Install of GNOME Desktop Does Not Use The Full Display Screen

- Worst Repository of Available Packages

- GUI Software Updater is lacking in some of the Functionality of Other Install Facilities Such As Synaptic, For Example

- Limited Desktop GUI Installs: GNOME and KDE

- Least Stable – Some Bugs due to the Very Recent Implementation

List of References – CentOS 7

CentOS 7 Installation Resources

Reference	URL
Download Mirror of Cent OS 7 aarch64 Minimal Server Image for Raspberry Pi	http://mirrors.ocf.berkeley.edu/centos-altarch/7.9.2009/isos/aarch64/
Rich Tech Security & Technology Guides – CentOS 7 Installation Guide on Raspberry PI	https://rharmonson.github.io/cos7instpi.html
Make Tech Easier – How to Install CentOS on a Raspberry Pi by John Perkins	https://www.maketecheasier.com/install-centos-on-raspberry-pi/
Open Logic – The Long-Term Outlook for CentOS 7 Support	https://www.openlogic.com/blog/long-term-outlook-centos-7-support

List of References – openSUSE Leap 15.3

OpenSUSE Raspberry Pi Installation Resources

Reference	URL
Download Mirror of openSUSE Leap 15.3 aarch64 Images for Raspberry Pi	https://download.opensuse.org/distribution/leap/15.3/appliances/
OpenSUSE Wiki – HCL:Raspberry Pi4	https://en.opensuse.org/HCL:Raspberry_Pi4
Raspberry Pi Tips – How to Install and Configure OpenSUSE on Raspberry Pi?	https://raspberrytips.com/install-opensuse-raspberry-pi/
Linux Kamarada – openSUSE on the Raspberry Pi 4 — part 1: downloading and installing	https://linuxkamarada.com/en/2020/12/26/opensuse-on-the-raspberry-pi-4-part-1-downloading-and-installing/

List of References – Alma Linux 8

Alma Linux 8 Raspberry Pi Installation Resources

Reference	URL
Download Mirror of Alma Linux 8 aarch64 Image for Raspberry Pi	https://repo.almalinux.org/rpi/images/AlmaLinux-8-aarch64-RaspberryPI-Minimal-4-sda.raw.xz
GitHub – Alma Linux / Raspberry Pi4	https://github.com/AlmaLinux/raspberry-pi/
ASCII Cinema – How to Install and Configure Alma Linux on Raspberry Pi?	https://asciinema.org/a/423618
You Tube Video – GNOME Desktop on Raspberry Pi	https://www.youtube.com/watch?v=HbPRKJrYFbQ

List of References – Miscellaneous

Various Resources Pertaining to Rpi Userland and Linux

Reference	URL
Download Mirror of Rpi Userland Utilities	https://github.com/raspberrypi/userland.git
GitHub – Rpi Userland Project – Source code for ARM side libraries for interfacing to Raspberry Pi GPU.	https://github.com/raspberrypi/userland
Distrowatch.com – Rankings, Information and News on Linux Distros	https://distrowatch.com/
GitHub – Rpi Userland Project – Readme File for Cross Platform/Cross Architecture Builds	https://github.com/raspberrypi/userland#readme

Acknowledgements

Special Thanks to Rexx LA Members …

Mr. Rene` Jansen – For Providing Subversion Checkout and Build Information for the ooRexx 5.0 Beta on Linux

Dr. Rony Flatscher – For Providing Subversion and Build Information for the BSF4ooRexx Source Code Build and Maintenance
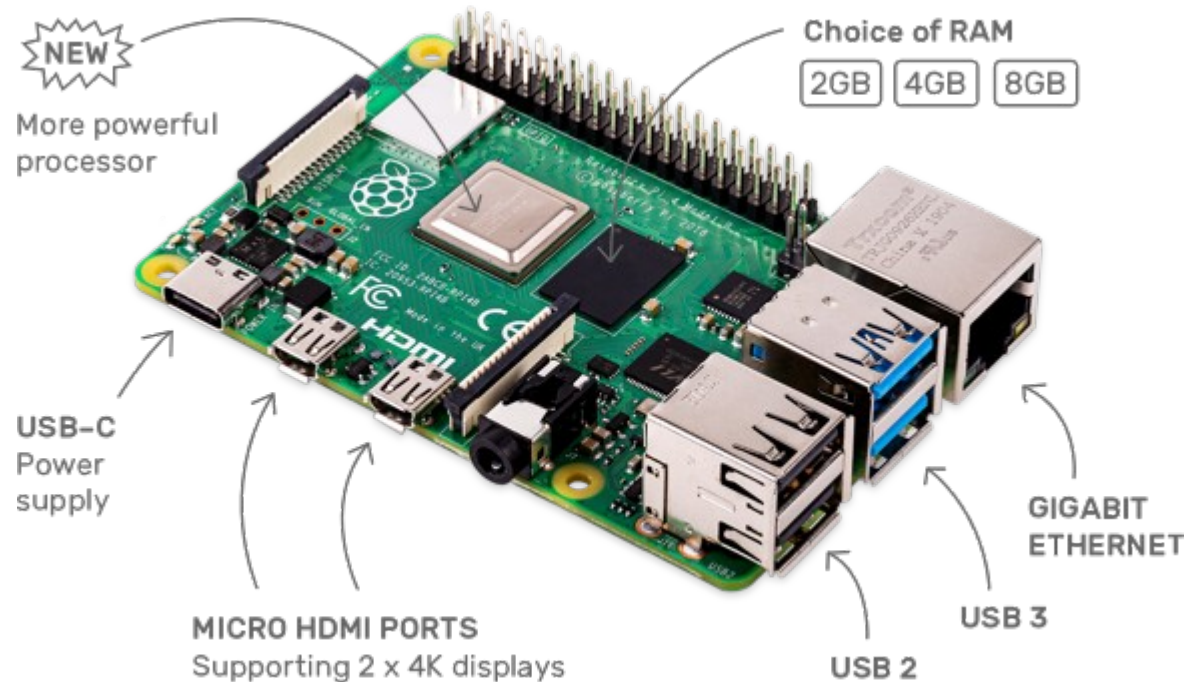
Special Thanks to Linux Contributor …

Mr. Pablo Greco – For His Efforts in Providing Raspberry Pi Images for both the CentOS and Alma Linux Linux Projects

Background Info on Pablo:

https://www.redhat.com/sysadmin/users/pablo-greco

End of Presentation

Image of Raspberry Pi 4B SBC

Questions?

Comments?