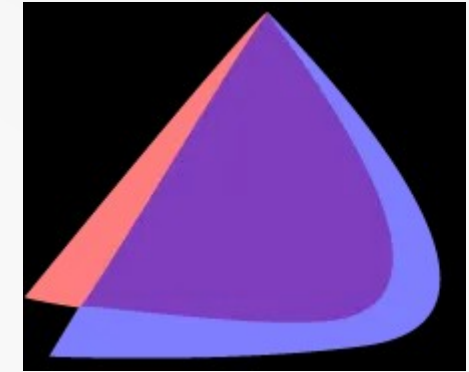


A First Look at Rexx



Packages for Endeavour OS for The Raspberry Pi4

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Rexx Language Association 2022 Online Symposium

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Overview of Presentation

- History of Endeavour OS
- Desktop Choices CPU Architectures for Artemis Release
- Installing Endeavour OS Artemis on the Raspberry Pi 4
- Selecting and Configuring the Endeavour OS Desktop Manager
- Available Pacman aarch64 Packages for Rexx Development
- Installing Java on Endeavour OS
- Installing NetRexx on Endeavour OS
- Installing the ooRexx 5 Beta on Endeavour SO
- Installing BSF4ooRexx GA on Endeavour OS
- Fixing The vcgencmd Temperature Measurement
- Findings and Recommendations
- Sample Endeavour Xfce Screenshot
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- Acknowledgments
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History of Endeavour OS - I

- Terminal Centric Linux Distro **Based Upon Arch Linux**
- Developed in the Netherlands
- **Initial Release:** December 2019 (64 Bit Intel Architecture x86_64)
- **ARM64 Bit Support Added** with September 2020 Release (aarch64)
- Cumbersome Install Process for the ARM Devices Initially
(Required Install of Arch Linux first; Then Endeavour OS Steps)
- December 2021 – **Version 21.5**
- June 25, 2022 – **Version 21.6** (Artemis Release)

History of Endeavour OS - II

- Version Name Inspired by the **NASA Artemis Project** Proposed Series of Lunar Missions
- **ARM64 Bit Install** Now Built-In to the Live DVD ISO
- Two Families of SBC Devices Currently Supported by The Installer:
 - **Odroid N2/N2+** and **Raspberry Pi**
- **Much Easier** Install Than The Prior Process
- Still in a Release Status Currently; **Install is GitHub Based** for Prompt Updates and Fixes
- Consistently in The **Top 5 Ranked Linux Distros Based on Distrowatch** Hit Count for The Website
- Link for Distrowatch Linux Endeavour OS Release History and Package Versions:
 - <https://distrowatch.com/table.php?distribution=endeavour>

Desktop Choices CPU Architectures (Artemis Release)

- Online Installation allows you to choose one of **8 Official GUI Desktops**:
 - Xfce, KDE Plasma, GNOME, Mate, Cinnamon, Budgie, LXQt, LXDE and i3-wm
- **5 Community Contributed GUI Desktop Managers** Also Available:
 - Sway, Qtile, BSPWM, Openbox and Worm (Exclusive for Endeavour OS)
- RPi4 Installation Desktop Manager Used in This Presentation: **Xfce**
- All Options for Installation are Now on The **Artemis Release ISO**
- **GitHub Link** for ISO Download:
 - https://github.com/endeavouros-team/ISO/releases/download/1-EndeavourOS-ISO-releases-archive/EndeavourOS_Artemis-22_6.iso

Installing Endeavour OS Artemis on the Raspberry Pi 4

- **Burn ISO Image** to a DVD or USB (Current Live DVD Image is 1.8 GB)
- Format a **Large Capacity (>= 32 GB)** microSDXC Card for Extended FAT Format
- Good Quality Brands include **SanDisk, Samsung** and **PNY**
- Good GUI Tools to Use for Format of microSDXC Card:
 - **Raspberry Pi Imager**
 - **Win32 Disk Imager**
- Boot Intel x86_64 PC to Live DVD or USB
- Verify Live OS has Internet Access Capability
- Select **Endeavour OS ARM Image Installer** from the Endeavour OS Welcome Screen
- Insert Formatted microSDXC Card to a USB or SD Card Reader Port on the same PC

Installing Endeavour OS Artemis on the Raspberry Pi 4

- Select Start ARM Installer
- From Here A Series of Blue Background N Curses Based Panels will Guide You Through The Initial Installation Selections
- If You Used any Apps on the Live DVD Make Sure to Close Them
- Select <Ok>
- **SBC Model Selection:** Raspberry Pi 4b 64 Bit
- Select <Ok>
- **Filesystem type:** **ext4** (Most Commonly Used Linux FS) or **btrfs** (Selected for Presentation)
- Select <Ok>

Installing Endeavour OS Artemis on the Raspberry Pi 4

- The next Step is Very Important to Avoid Format of The Wrong Storage Device Type
- **Hint:** The Correct Storage Device will have a **vfat** FSTYPE
- **Hint:** SIZE will be a Value just under the capacity of your microSDXC Card Capacity (Example: **64GB** Card **SIZE** 59.6G)
- **Micro SD Configuration:** /dev/sd? Where “?” is the letter of your usb storage device (Usually letter “**b**” or higher)
- In A Case with only the DVD and microSDXC Card inserted:
 - /dev/sdb <Ok>
- **Filesystem types:** **ext4** (Most Commonly Used Linux FS) or **btrfs** (My Choice) <Ok>

Installing Endeavour OS Artemis on the Raspberry Pi 4

- A Utility will run to **Partition the microSDXC Card** for the RPi4 Based Upon the Selected Filesystem
- The Utility will also **download and decompress a required tar file image** from github.com
- The bottom of the screen will show a **##% [==] Progress Status** for Various Installation Processes with an ETA
- **Estimate for untarring the Image:** 4 to 5 Minutes. On my Intel Core i5 ASUS Laptop from 2010 for a 64 GB microSDXC Card, it took nearly **10-12 Minutes**.

Installing Endeavour OS Artemis on the Raspberry Pi 4

- The Utility will then “sync” The File. Estimate for untarring the Image: 4 to 5 Minutes. On my Intel Core i5 ASUS Laptop from 2010 it took only 3 Minutes.
- Default User: **alarm** Password: **alarm**
- Root User: **root** Password: **root**
- **Note:** Use a File Manager to Properly Unmount th USB SD Reader
- Press Any Key to Continue ...
- The Thunar File Manager (Icon Next To Endeavour OS Launcher on the Left Bottom of the Display) Can Be Used to Unmount the USB SD Card
 - First: Select And **Open** Your USB Device on the Left Panel of Thunar FM
 - Under Devices Select **Unmount**
- Your USB Device Should No Longer Be in the **Devices** List

Installing Endeavour OS Artemis on the Raspberry Pi 4

- Shutdown the Live DVD System:
 - Endeavour OS ==> Shutdown (Lightning Bolt in Red Circle Icon)
- **Note:** Shutdown Process Did Not Prompt for An Eject of the DVD
- Remove the microSDXC Card with Adapter From The PC USB Port
- Insert the microSDXC Card in the Raspberry Pi 4
- Power On the RPi4
- Wait For Start of Endeavour OS Initial Desktop **EndeavourOS ARM Installer** Setup Screen

Selecting and Configuring the Endeavour OS Desktop Manager

- The EndeavourOS ARM Installer Will Have 3 Options
 - Install Official Editions
 - Install Community Editions
 - Edit Mirrorlist
- **Recommendation:** Opt for an Official Edition Desktop Manager
- The Welcome to EndeavourOS Setup Screen Should Appear
- I opted for **American English** on the **Welcome** Tab
- Click the **Next** Button

Selecting and Configuring the Endeavour OS Desktop Manager

- On The **Location** Tab of the EndeavourOS Step Program Screen The Following:
 - Selection of a **Region** and **Timezone** via a GUI Map Display
 - Click The **Next** Button
- On The **Keyboard** Tab Select The Keyboard Model via a GUI with a Default
 - In My Case:
 - Generic 105-Key PC
 - English
 - Default
 - Click The **Next** Button

Selecting and Configuring the Endeavour OS Desktop Manager

- On The **Desktop** Tab of the EndeavourOS Step Program Screen The Following:
 - Selection of a **Desktop** Manager via a GUI Map Display
 - I selected **Xfce4**
 - Click The **Next** Button
- A Packages Overview Screen Appears Which Includes Selection of Additional Desktops with Printing Support and Accessibility Tools Options
 - In My Case:
 - I did not select any additional packages or desktops
 - Click The **Next** Button

Selecting and Configuring the Endeavour OS Desktop Manager

- On The **Users** Tab of the EndeavourOS Step Program Screen The Following:
 - Prompt For a Name? Helps Setup Login User Id
 - I selected **TonyD**
 - Prompt for a Computer Name
 - Type In a Computer Name of Your Choosing
 - Entry of a Password and a Repeat Password
 - Type In a Password of Your Choosing; Passwords Must Match
- Optional Checkboxes Exist for Automatic Log In and Use The Same Password for the Administrator Account
 - In My Case:
 - I Checked The Option to Use the same password for the administrator account
 - Click The **Next** Button

Selecting and Configuring the Endeavour OS Desktop Manager

- On The **Summary** Tab of the EndeavourOS Step Program Screen The Following:
 - Confirmation of Location and Keyboard Entries
 - Click The **Setup** Button
- A Continue with setup? Dialog Appears
 - Click The **Set up now** Button
- An Endless Possibilities Screen with a % Toggle Log Status Bar Appears
- When Finished an **All done**. Check the **Restart now** Checkbox
- Click the **Done** Button

Selecting and Configuring the Endeavour OS Desktop Manager

- Security Based Utilities To Consider Adding to Your EndeavourOS System:
 - Rootkit Hunter (rootkit and malware detection utility)
 - Package: **rkhunter**
 - Install from Command Shell:
 - `$ sudo pacman -S rkhunter`
 - Clam Anti-Virus (Anti-Virus Scanner)
 - Package: **clamav**
 - Install from Command Shell:
 - `$ sudo pacman -S clamav`
 - Uncomplicated Firewall (Firewall Management Utility)
 - Package: **ufw**
 - Recommendation: **Do Not Install Currently**; Issues with Blocking Web Access when ufw is Enabled

Selecting and Configuring the Endeavour OS Desktop Manager

- Arch Linux Based System such as Endeavour OS and Manjaro Use **pacman** as The Command Line Utility for Package Management
- Some Sample pacman Example Commands:
 - \$ sudo pacman -Ss openjdk (Check Available **openjdk** packages)
 - \$ sudo pacman -S libreoffice-still (**Install Fixed Version of Libre Office**)
 - \$ sudo pacman -S clamav (Install **Clam Anti-Virus with its dependencies**)
 - \$ sudo pacman -Syu (**Sync, Refresh Cache & Update System**)
 - \$ sudo pacman -Qs nano (**Check** to see if **nano** Text Editor is Installed)
 - \$ sudo pacman -Rs nano (**Remove nano** Text Editor Package and its dependencies)

Available Pacman aarch64 Packages for Rexx Development

- As of July 15, 2022 There Were **No Endeavour OS Pacman Packages** Available for the **Following Rexx Technologies**:
 - **ooRexx**
 - **Regina Rexx**
 - **Net Rexx**
- There are a large number of Versions of the **Java OpenJDK** Available for Java Installations
- As Is Endeavour OS Artemis has most of the Development Tools installed in the Base System for Building ooRexx and Regina Rexx
 - Gnu C (**gcc**) Suite of Development Tools for aarch64 CPU Architecture

Installing Java on Endeavour OS

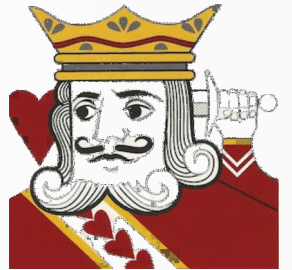
- OpenJDK Versions 7 Through 18 are Available
- To Install OpenJDK with its Dependencies:
 - `$ sudo pacman -S jdk#-openjdk`
 - Where # is the version number of Java from 7 to 18
- Example Install of Open JDK 8 (Used in This Presentation)
 - `$ sudo pacman -S jdk8-openjdk`
- To Verify Install, Check The Version of the Java Compiler:
 - `$ javac -version`
 - Returns => `javac 1.8_0_312`

Installing Java on Endeavour OS

- Add The Following Entries to the `$HOME/.bashrc` File To Make the OpenJDK 8 Java Runtime Extensions Visible to the Current Logged In User's BASH Shell Environment:
- Using nano to Edit The File
 - `$ nano $HOME/.bashrc`
- **Append** The Following Entries to The `.bashrc` File
 - `export JAVA_HOME=/usr/lib/jvm/java-8-openjdk`
 - `export PATH=$JAVA_HOME/bin:$PATH`
- To **Save**:
 - **Ctrl-O** <Enter>
- To **Exit** nano:
 - **Ctrl-X**
- To **Verify The Environment Settings**:
 - From The Terminal Shell:
 - `$ echo $JAVA_HOME`
 - `$ echo $PATH`

Installing NetRexx on Endeavour OS

- In This Presentation I will add NetRexx v4.03 GA To The /opt Directory:
 - `$ cd /opt`
 - `$ sudo mkdir netrexx`
 - `$ cd netrexx`
 - `$ sudo cp $HOME/Downloads/NetRexx-4.03-GA.zip .`
 - `$ sudo unzip NetRexx-4.03-GA.zip`
 - `$ sudo rm NetRexx-4.03-GA.zip`
- To Add The NetRexx JAR Libraries to the OpenJDK 8 JRE Extensions:
 - `$ sudo cp ./lib/*.jar $JAVA_HOME/jre/lib/ext`
 - `$ sudo cp ./runlib/*.jar $JAVA_HOME/jre/lib/ext`



Installing the ooRexx 5 Beta on Endeavour OS

- Since I am a Newbie to pacman I will **opt to Build the ooRexx 5 Beta from source**
- Install **Pre-Requirement pacman Packages** with Dependencies for Check Out and Build of ooRexx 5:
 - `$ sudo pacman -S subversion cmake ncurses`
- Create a Build Directory for ooRexx (`$HOME/objrexx/build`):
 - `$ cd $HOME`
 - `$ mkdir objrexx`
 - `$ cd objrexx`
 - `$ mkdir build`
 - `$ cd build`



Installing the ooRexx 5 Beta on Endeavour OS

- From \$HOME/objrexx/build - **Check Out The Latest Subversion Source:**
 - \$ 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 Successful Build of ooRexx Interpreter:**
 - \$ rexx -V
- **Sample Output:**
 - Open Object Rexx Version 5.0.0 r12472 – Internal Test Version
 - Build date: jul 15 2022
 - Addressing mode: 64
 - Copyright (c) 1995, 2004 IBM Corporation. All rights reserved.
 - Copyright (c) 2005-2022 Rexx Language Association. All rights reserved.
 - This program and the accompanying materials are made available under the terms
 - of the Common Public License v1.0 which accompanies this distribution or at
 - <https://www.ooRexx.org/license.html>



Installing BSF4ooRexx GA on Endeavour OS

- To Install The Current BSF4ooRexx v641 GA Package
- Download From BSF4ooRexx Source Forge Site Using a Web Browser (Firefox)
- **Unzip The Downloaded Zip Archive:**
 - `$ unzip $HOME/Downloads/BSF4ooRExx_install_v641-20220131-ga.zip`
- Copy the bsf4oorexx Folder to a \$HOME Install Directory (For Example: \$HOME/bsf4oorexx):
 - `$ cp -R -f $HOME/Downloads/bsf4oorexx $HOME`
- **Change to Linux Installation Directory:**
 - `$ cd $HOME/bsf4oorexx/install/linux`
- **Run the Install Shell Script:**
 - `$ sh ./install.sh`



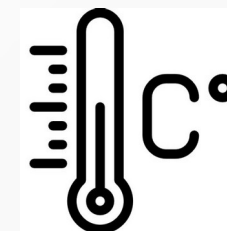
Installing BSF4ooRexx GA on Endeavour OS

- Make BSF Jar File Available to Open JDK 8:
 - `$ sudo cp /opt/BSF4ooREXX/bsf4ooREXX-v641-20220131-bin.jar $JAVA_HOME/jre/lib/ext`
- Run a Sample BSF4ooRexx Program to Verify The Java and BSF Environment
- Good Classic Rexx Example:
 - **Directory:** `$HOME/bsf4ooREXX/samples/ClassicRexxSamples/`
 - **Program:** `GetJavaSystemProperties.rxj`



Fixing The vcgencmd VCHI Initialization Error

- On Most Linux Distros for the Raspberry Pi 3 and 4 Series, the CPU Temperature of the Rpi Can Be Measured with the Following Command:
 - \$ **vcgencmd measure_temp**
- On Endeavour OS The Initial Attempt to Run This Resulted in a VCHI Initialization Error
- To Resolve This Error, Add The Current User to The **video** Linux User Group:
 - \$ **sudo usermod -aG video \$USER**
- Then Reboot The R Pi for The Change to Take Effect
- Sample Output of vcgencmd measure_temp:
 - temp=41.8°C (< 50.0°C is Great! At 80.0°C CPU Throttling will Occur)



Findings and Recommendations

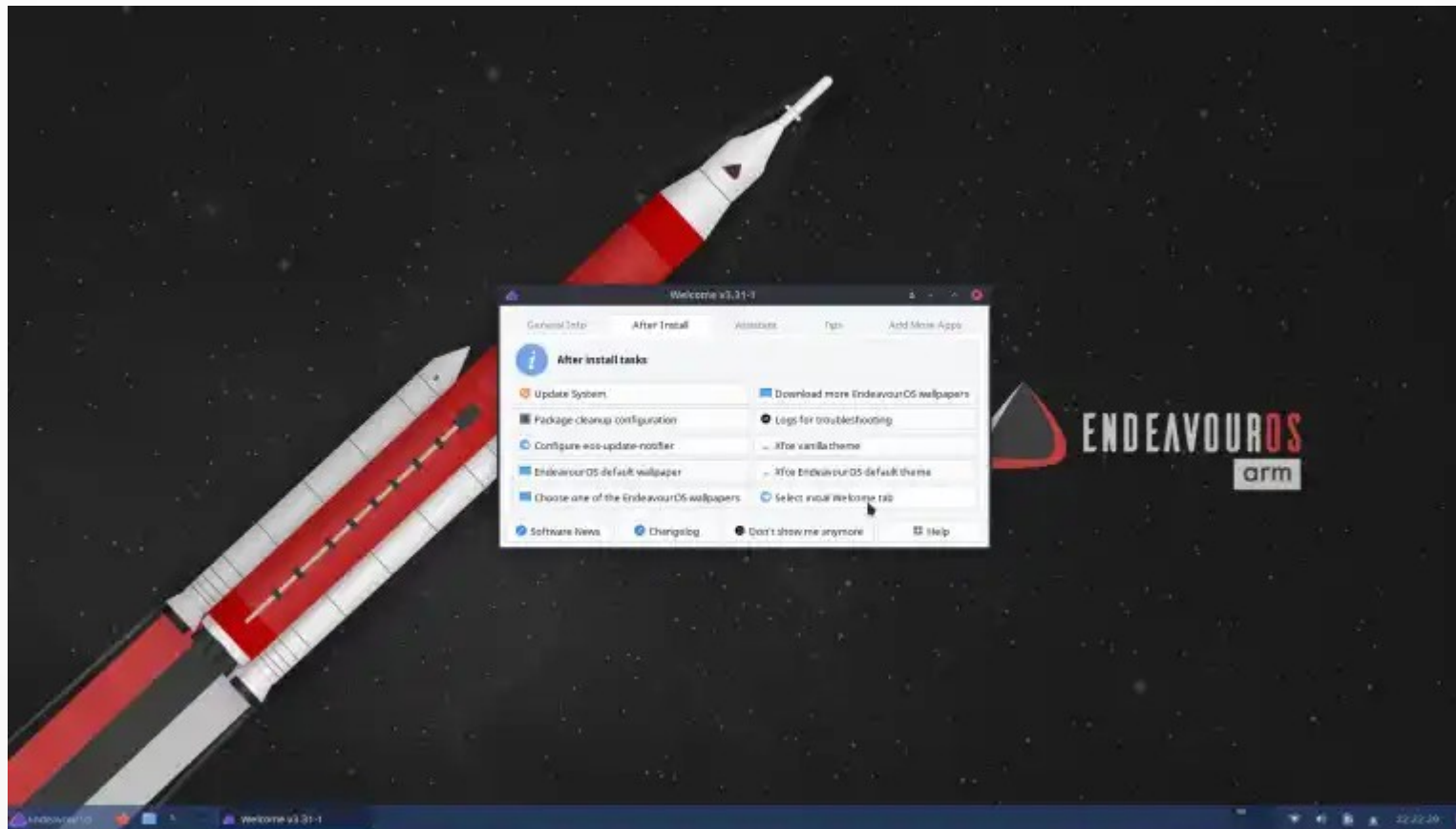
- With the Artemis Edition of Endeavour OS The **Install Process is Vastly Improved** over its Predecessor Release
- The **Library of Installable Packages is Sufficient**, but the Ubuntu, Debian, openSUSE and Fedora Repositories Offer More in the Selection of Linux Packages
- **Open JDK** Development Versions are Quite Comprehensive for Endeavour OS ARM 64
- Although **No Rexx Based Pacman Packages Exist** Currently, ooRexx, NetRexx and BSF4ooRexx Are Quite Easy to Install on Endeavour OS with the Use of the Open JDK 8 Pacman Package
- Recommend Use of a microSDXC Card of Good Quality with a **Capacity of \geq 64GB** for any significant development and added packages
- It is Important to Properly **Format the microSDXC Card (exfat)** and to Properly **Unmount** it to Create a Successfully Bootable Environment for the Second Phase of The Installation

...Findings and Recommendations

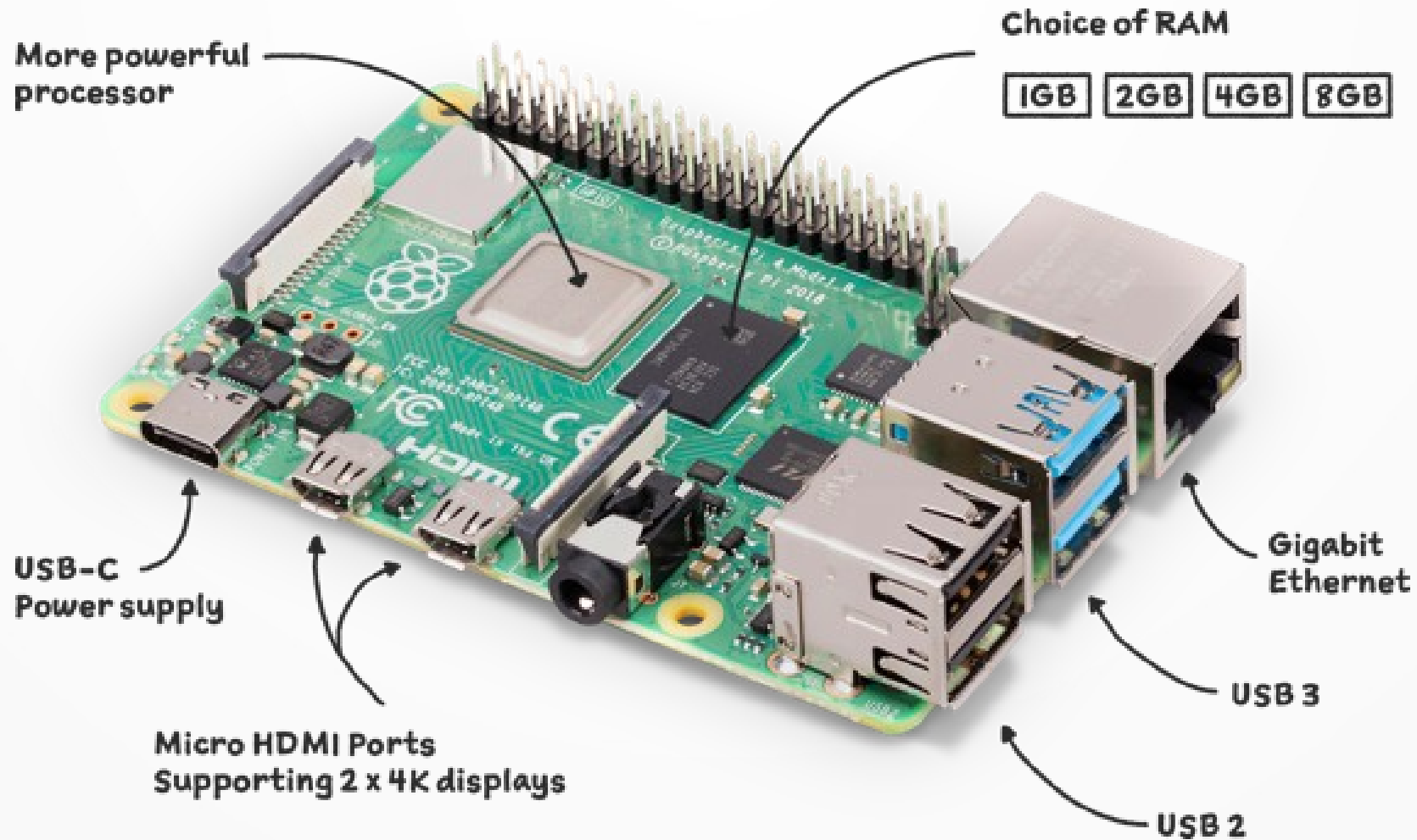
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Sample Endeavour Xfce Screenshot

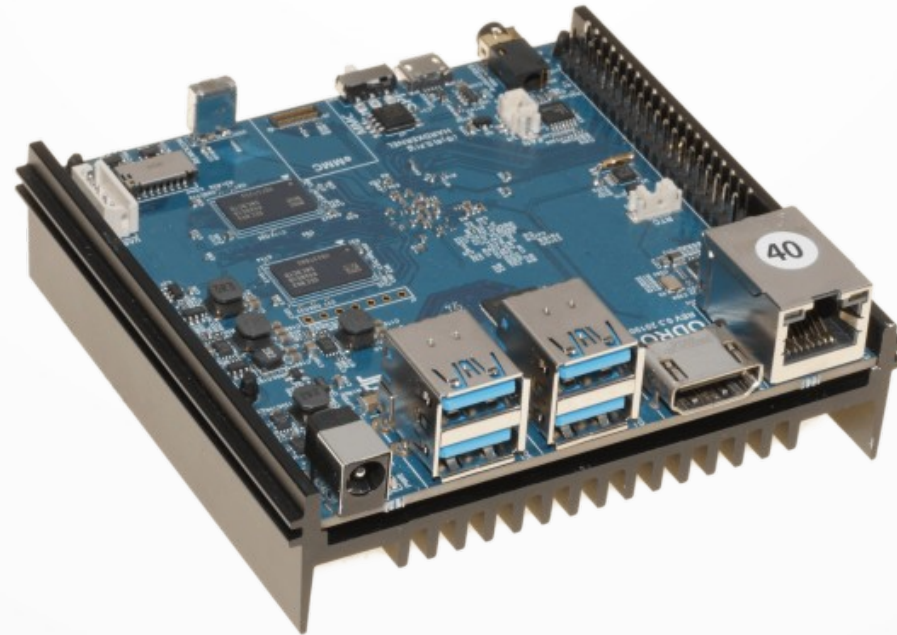
- Xfce Welcome Screen



Raspberry Pi4 SBC Screenshot



Odroid N2 SBC Screenshot



List of Technical References

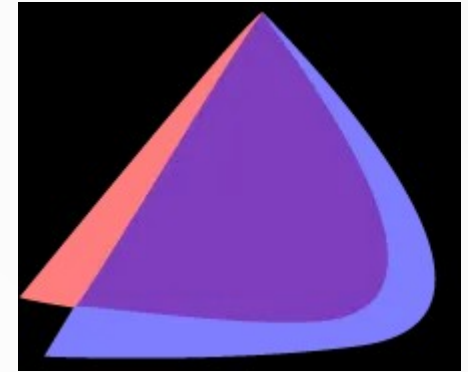
Reference	URL
Endeavour OS Artemis Version for ARM Installation Guide	https://arm.endeavourous.com/2022/06/24/artemis-with-new-endeavourous-arm-install/
Endeavour OS Artemis Live DVD ISO Download GitHub Site	https://github.com/endeavourous-team/ISO/releases/download/1-EndeavourOS-ISO-releases-archive/EndeavourOS_Artemis-22_6.iso
NetRexx v4.03 GA Download	https://www.netrexx.org/files/NetRexx-4.03-GA.zip
BSF4ooRexx v641 GA Download	https://sourceforge.net/projects/bsf4oorexx/files/latest/download
JEdit Programmer's Editor Sourceforge Download Site – Files Tab	https://sourceforge.net/projects/jedit/files/jedit/

... List of Technical References

Reference	URL
Distrowatch.Com Information on Endeavour OS	https://distrowatch.com/table.php?distribution=endeavour
Arch Linux Wiki – Info on Pacman Package Manager	https://wiki.archlinux.org/title/Pacman
Itsfoss – Using Pacman Commands in Linux [Beginner’s Guide]	https://itsfoss.com/pacman-command/
Odroid Wiki – Odroid N2/N2+ Info	https://wiki.odroid.com/odroid-n2/odroid-n2
Raspberry Pi Stack Exchange – VCHI Initialization Error Fix Info	https://raspberrypi.stackexchange.com/questions/7546/munin-node-plugin-s-vchi-initialization-failed

Acknowledgements

- Thanks to **Rene` Jansen** for his Information on Building the ooRexx 5 Beta from Subversion Source
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- Thank You **bryanpwo** for The Updated Documentation Regarding the Installation of Endeavour OS for the ARM published on June 24, 2022



**End of Presentation
Questions?
Comments?**