



PicoMuon Detector Setting up a Raspberry Pi 4/5

Pico^μ

<https://ukraa.com/>

The UK Radio Astronomy Association

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Table of Contents

UKRAA logo.....	2
Set-up instructions.....	4
Raspberry Pi OS.....	5
RPi4 first boot and initial configuration	14
Headless access to RPi via VNC	21
License	24
Contact us	24

Set-up instructions

These instructions cover setting up your Raspberry Pi4 or Raspberry Pi 5 with a suitable operating system and ability to be remotely access via VNC.

It is recommended that you use a Raspberry Pi 4/5 with at least 2GB memory.

When using the Raspberry Pi Imager, remember to write down the **hostname** you use – this is used to view the web page with the results from your UKRAA PicoMuon detector.

Please keep the username as **pi** when using OS customisation within the Raspberry Pi Imager.

The instructions for accessing your Raspberry Pi heedlessly assume use of Windows PC and that the following two applications are preinstalled on that PC.

- PuTTY
- RealVNC Viewer

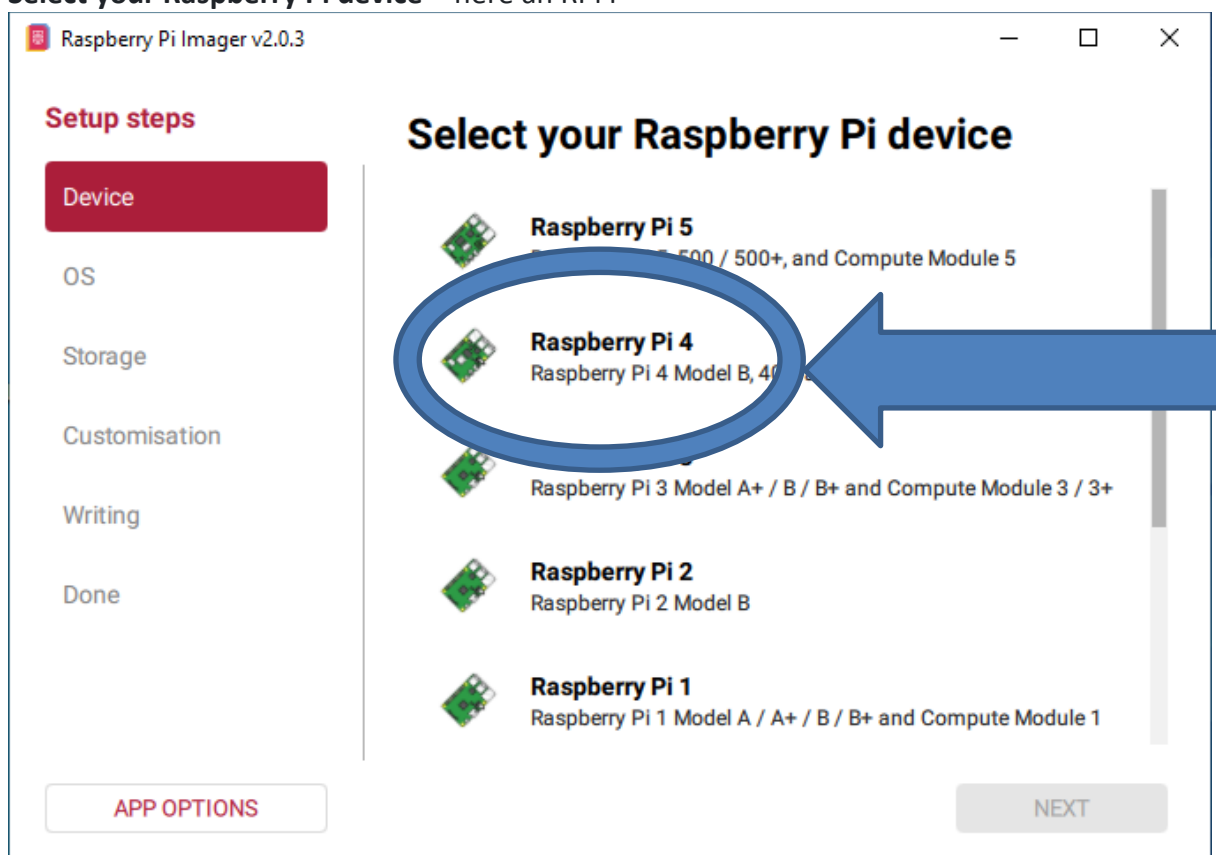
No information on installing these two applications is given in this text – there are numerous guides available on the internet.

Raspberry Pi OS

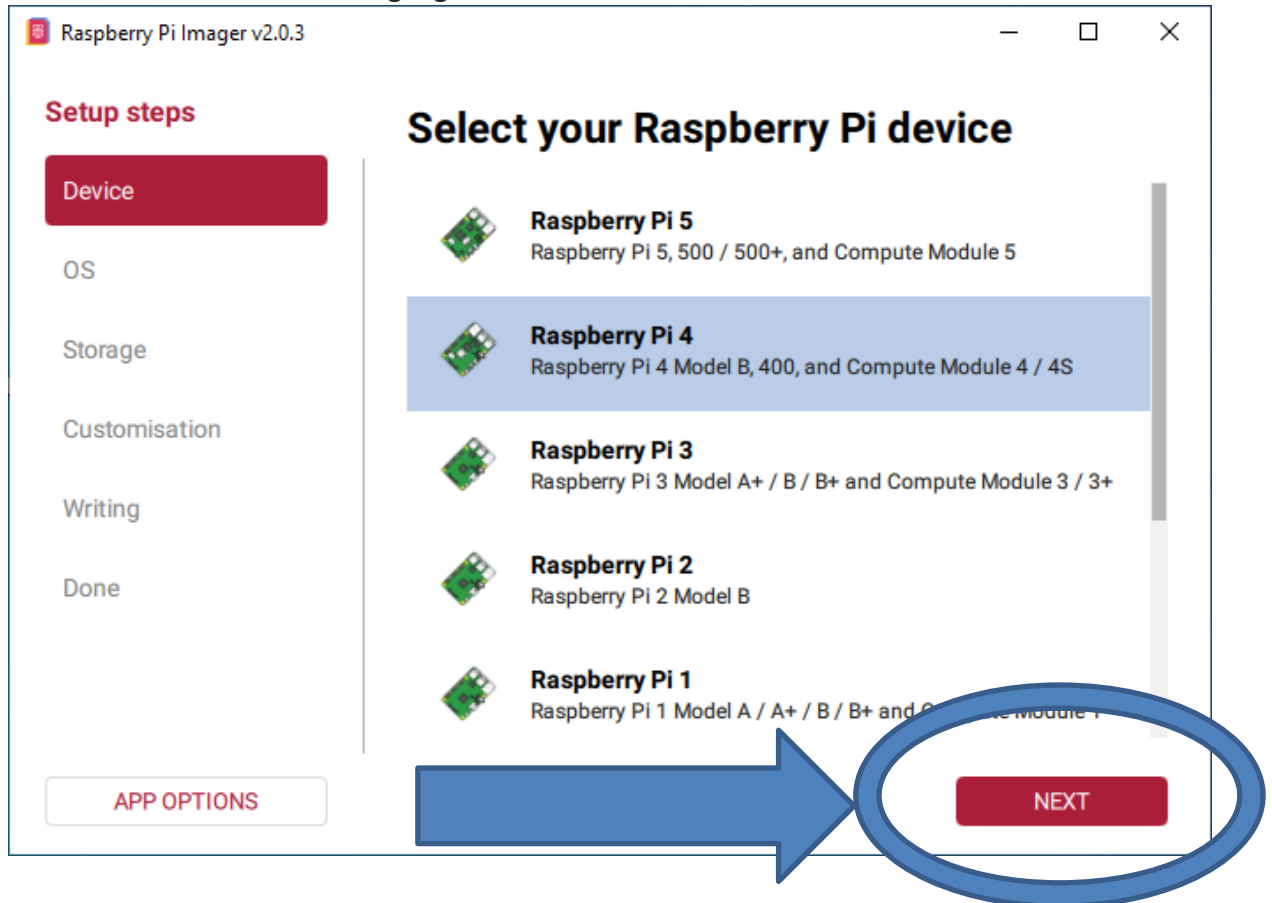
1. Download [Raspberry Pi Imager](#) for your operating system.



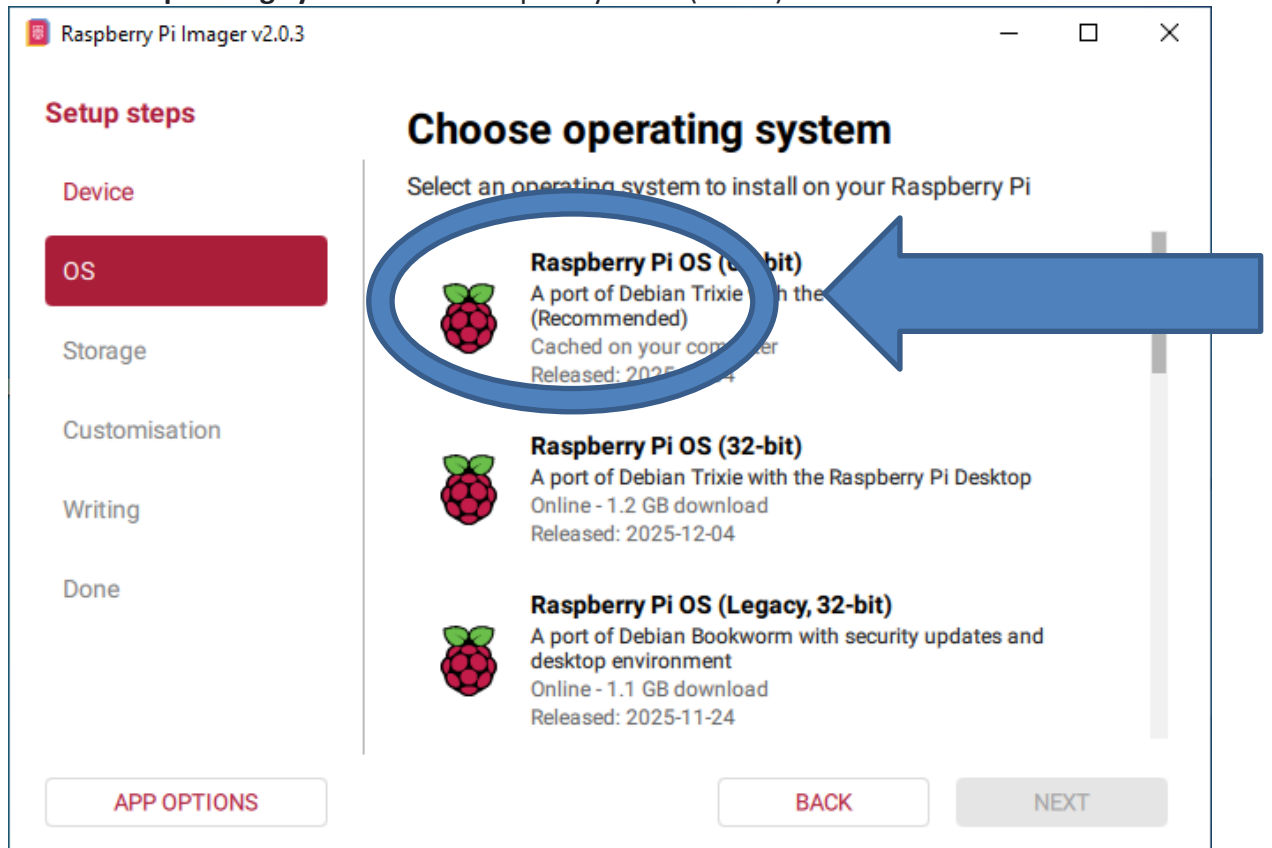
2. Run Raspberry Pi Imager.
3. These instructions are written for **Raspberry Pi Imager v2.0.3** and **Debian Trixie**
3. **Select your Raspberry Pi device** – here an RPi4



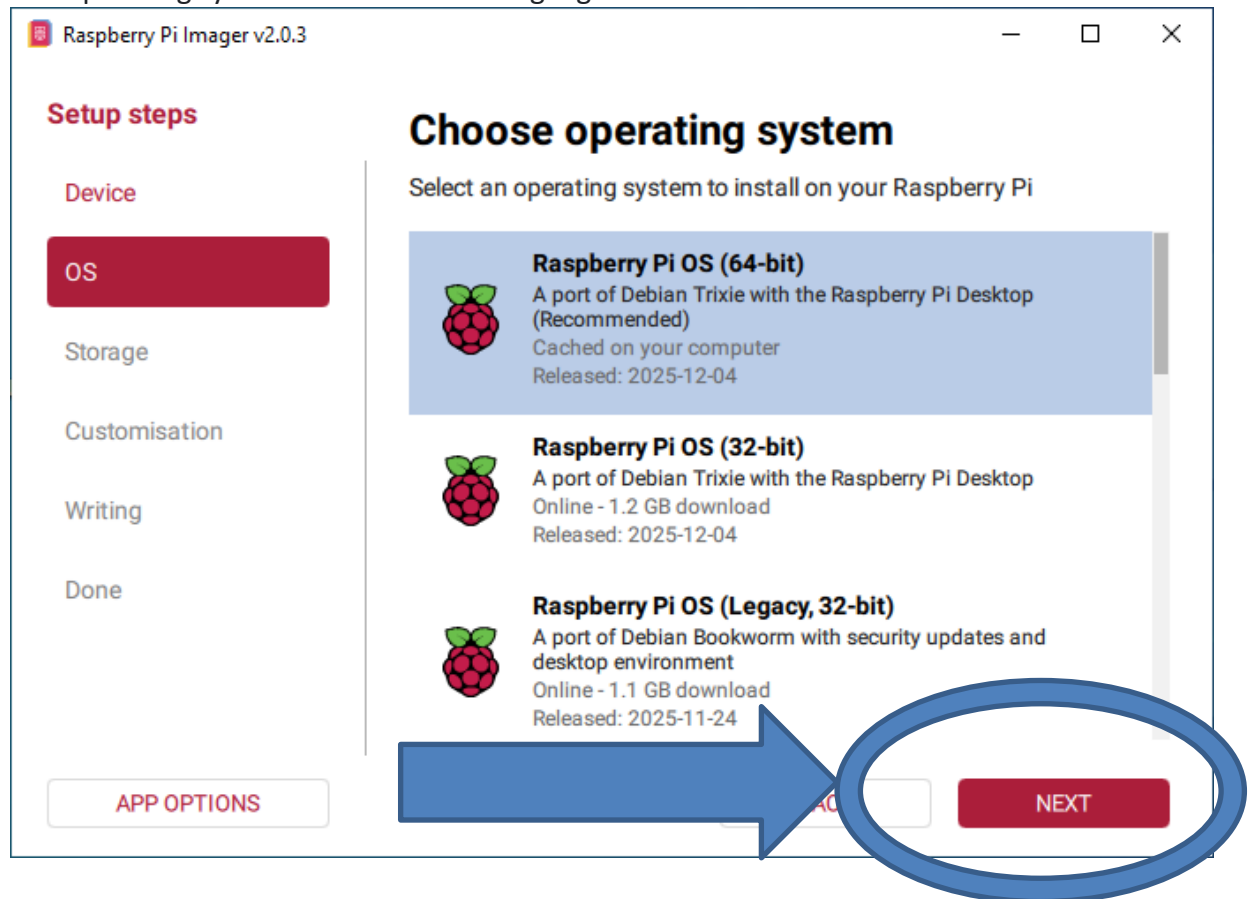
4. The device selected will be highlighter. Then select **NEXT**.



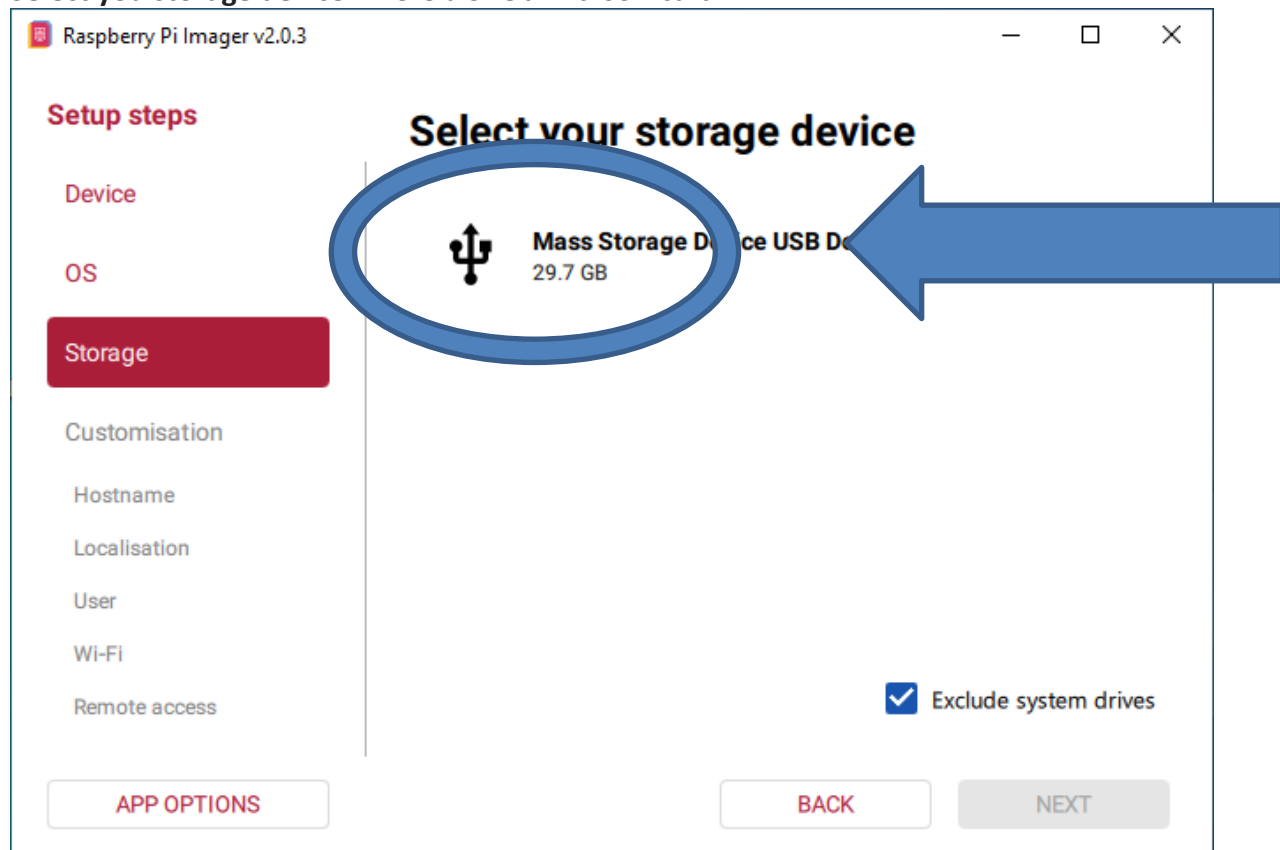
5. **Select the operating system** – here Raspberry Pi OS (64-bit).



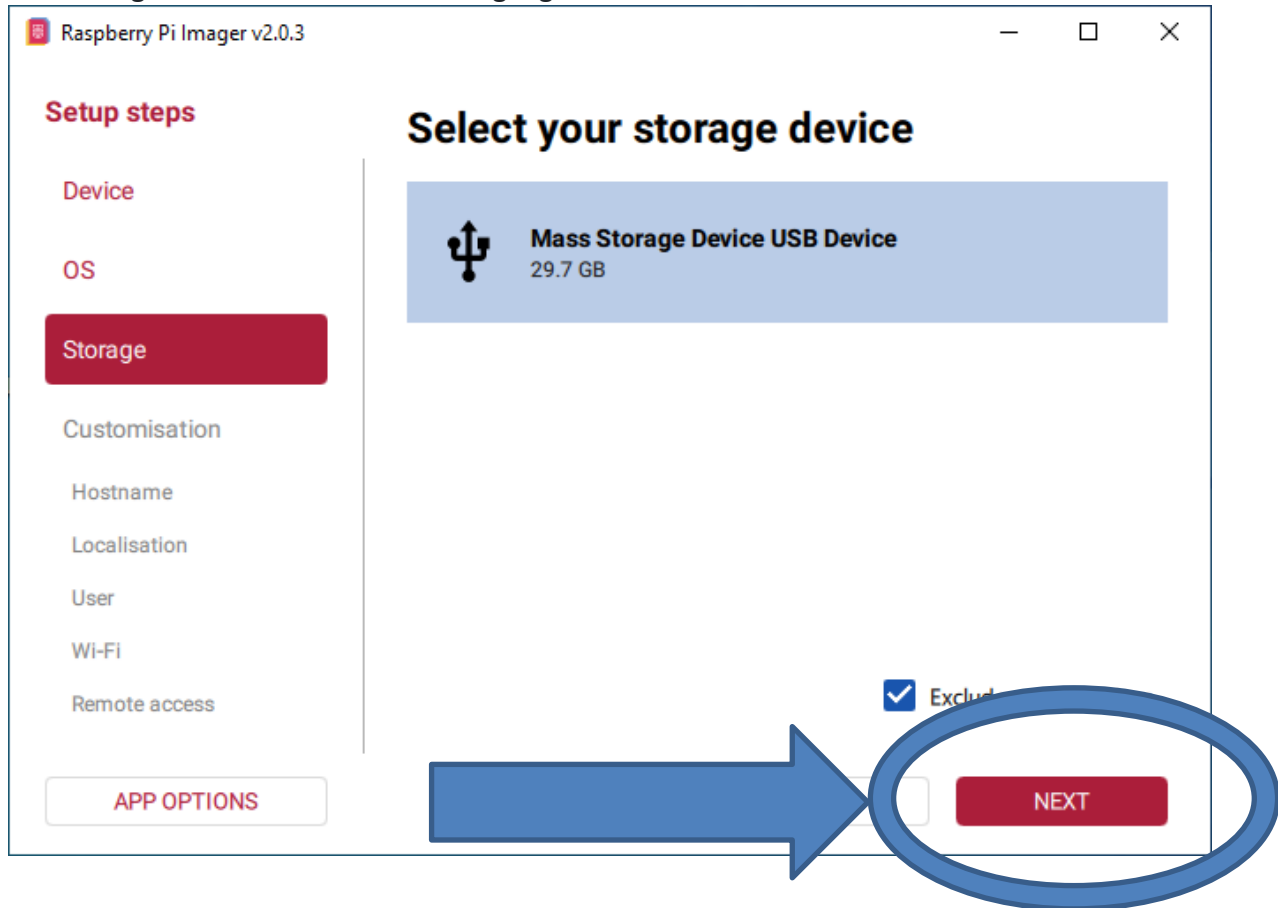
6. The operating system selected will be highlighted – then select **NEXT**.



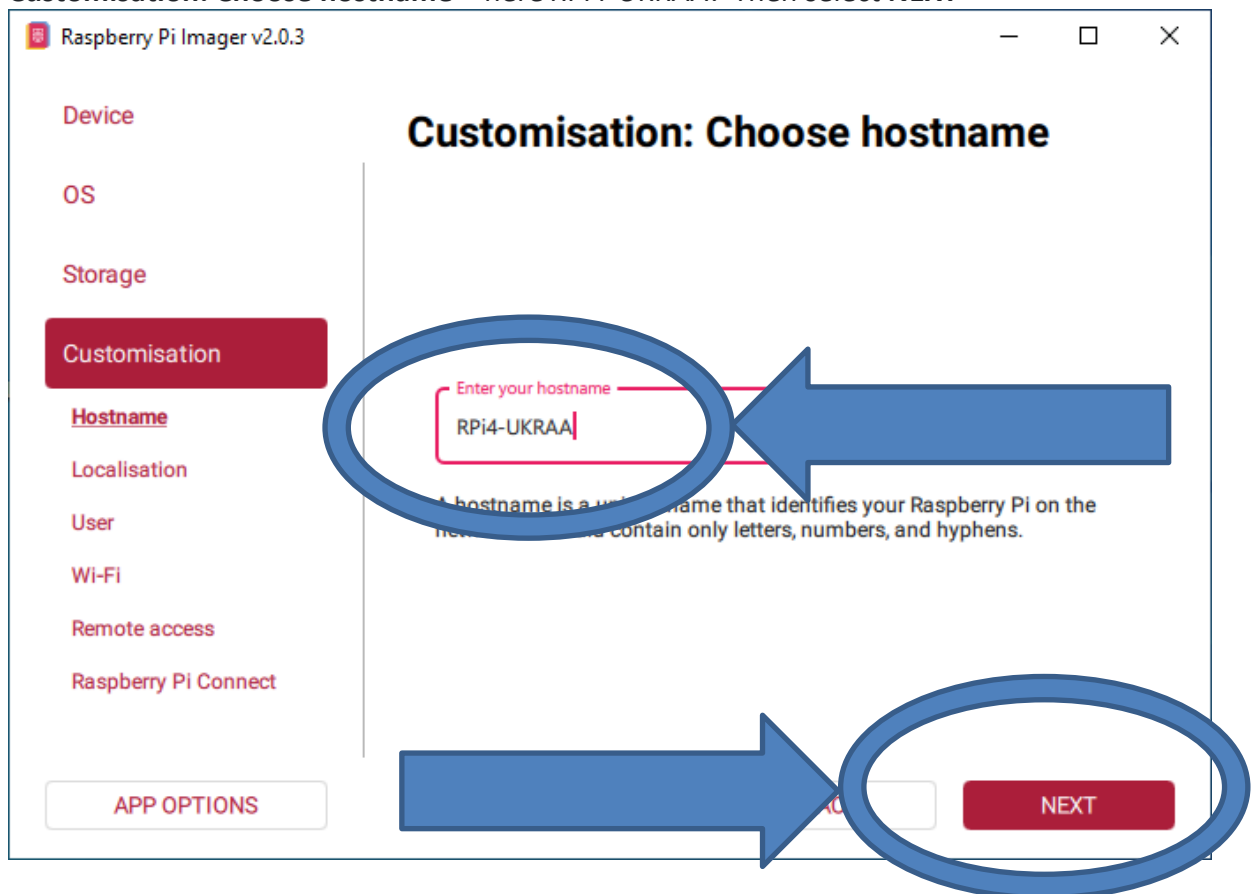
7. Select your storage device – here a 32Gb microSD card.



8. The storage device selected will be highlighted – then select **NEXT**.



9. **Customisation: Choose hostname** – here *RPi4-UKRAA*. Then select **NEXT**



10. **Customisation: Localisation** – change for your specific location. Then select **NEXT**

Raspberry Pi Imager v2.0.3

Customisation: Localisation

Select your location for suggested time zone and keyboard layout

Capital city: London (United Kingdom)

Time zone: Europe/London

Keyboard layout: gb

APP OPTIONS

NEXT

11. **Customisation: Choose username** – leave as **pi**, create password. Then select **NEXT**

Raspberry Pi Imager v2.0.3

Customisation: Choose username

Create a user account for your Raspberry Pi

Enter your username: pi

Password: Saved (hidden) — leave blank to keep

Confirm password: Re-enter to change password

The username must be lowercase and contain only letters, numbers, underscores, and hyphens.

APP OPTIONS

NEXT

12. **Customisation: Choose Wi-Fi** – enter your Wi-Fi details. Then select **NEXT**.

Raspberry Pi Imager v2.0.3

Customisation: Choose Wi-Fi

Storage

Customisation

Hostname

Localisation

User

Wi-Fi

Remote access

Raspberry Pi Connect

Writing

Done

APP OPTIONS

SECURE NETWORK OPEN NETWORK

SSID: Network name Your_wireless_name

Password: Network password Your_wireless_password

Confirm password: Re-enter password

☐ Hidden SSID

NEXT

13. **Customisation: SSH authentication** – enable SSH. Then select **NEXT**.

Raspberry Pi Imager v2.0.3

Customisation: SSH authentication

Storage

Customisation

Hostname

Localisation

User

Wi-Fi

Remote access

Raspberry Pi Connect

Writing

Done

APP OPTIONS

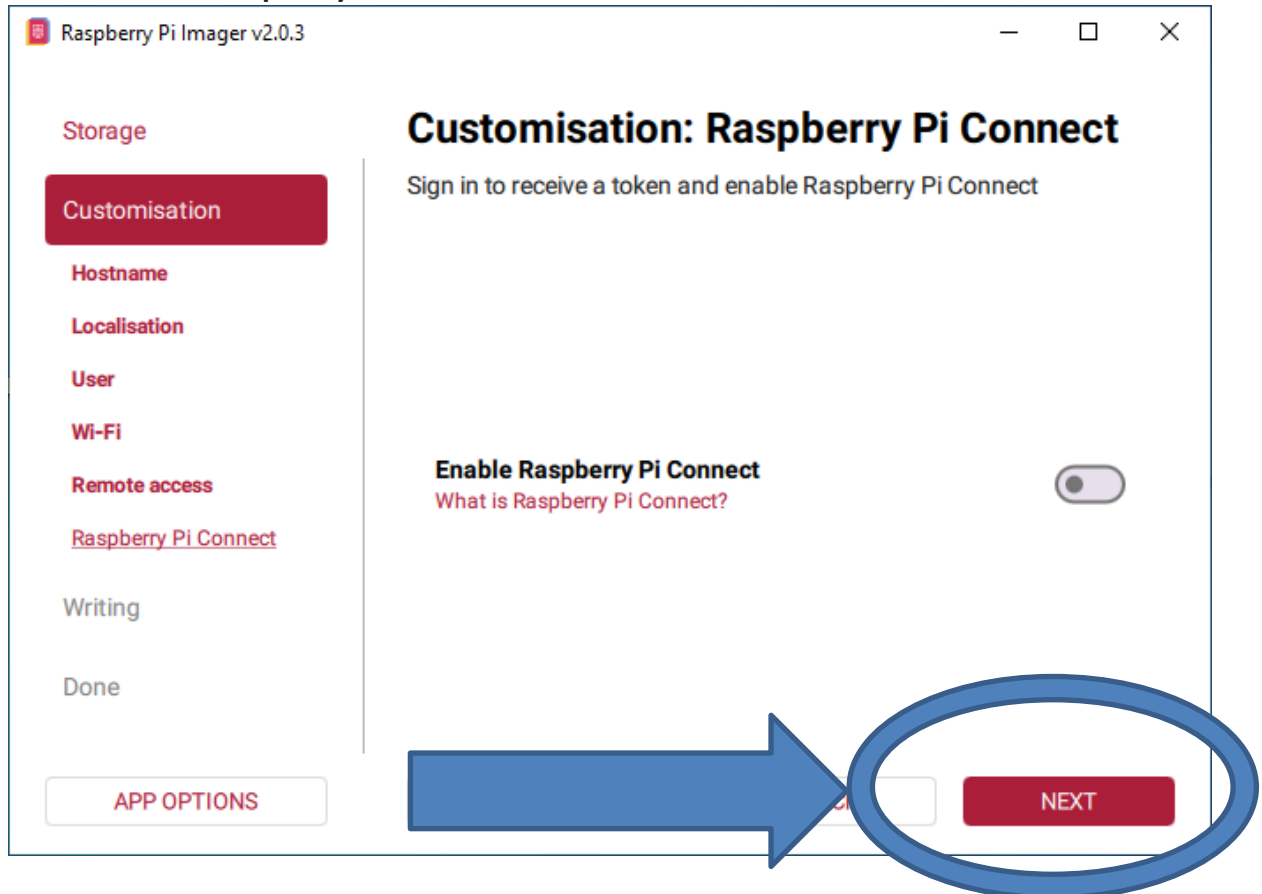
Configure SSH access

Authentication mechanism:

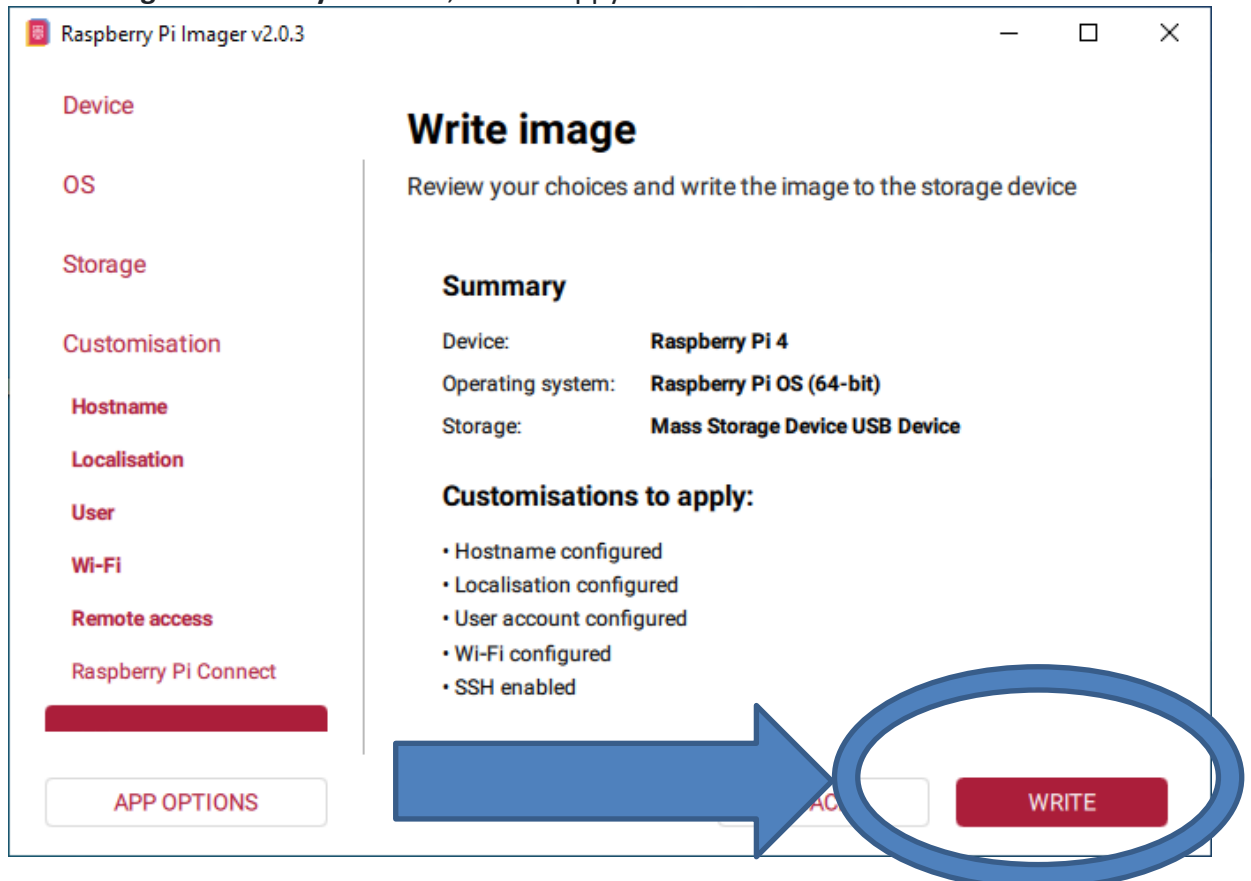
Use password Use public key authentication

NEXT

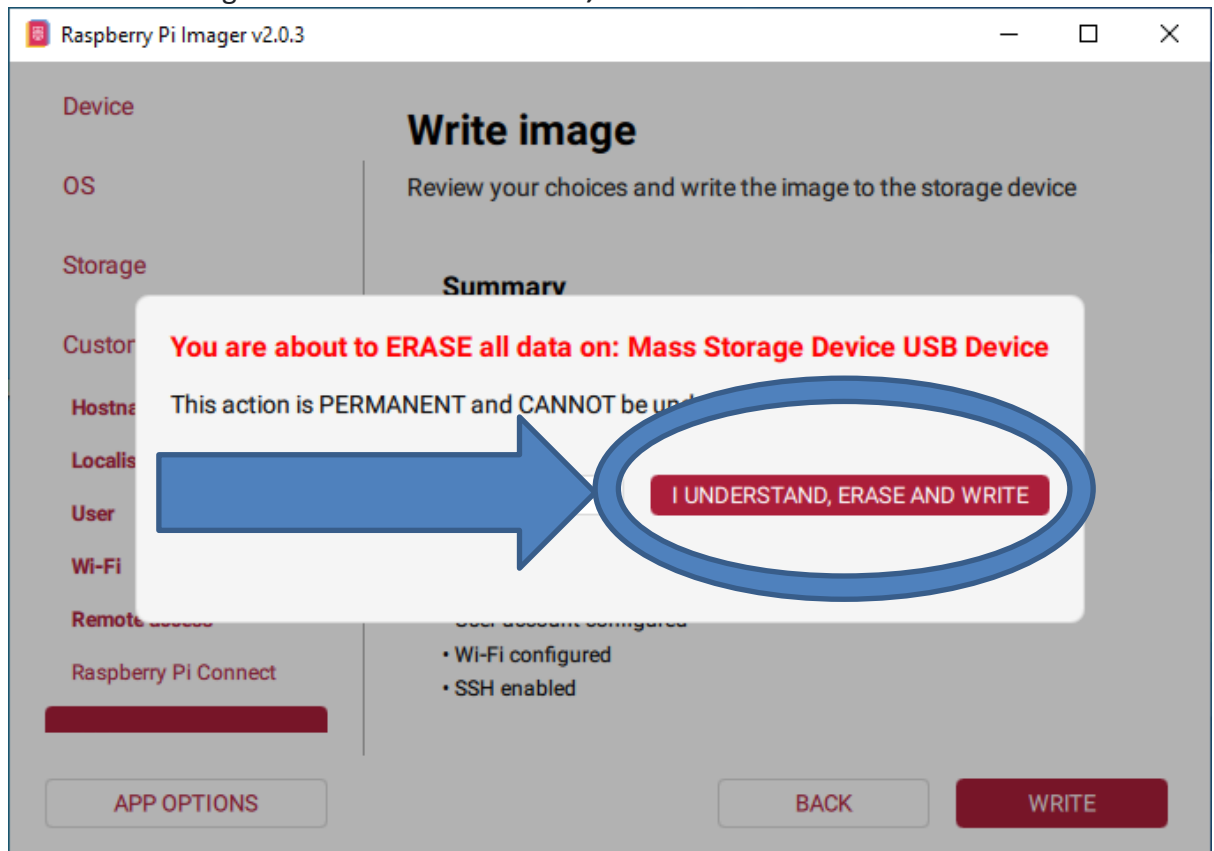
14. **Customisation: Raspberry Pi Connect** – enable if wanted. Then select **NEXT**.



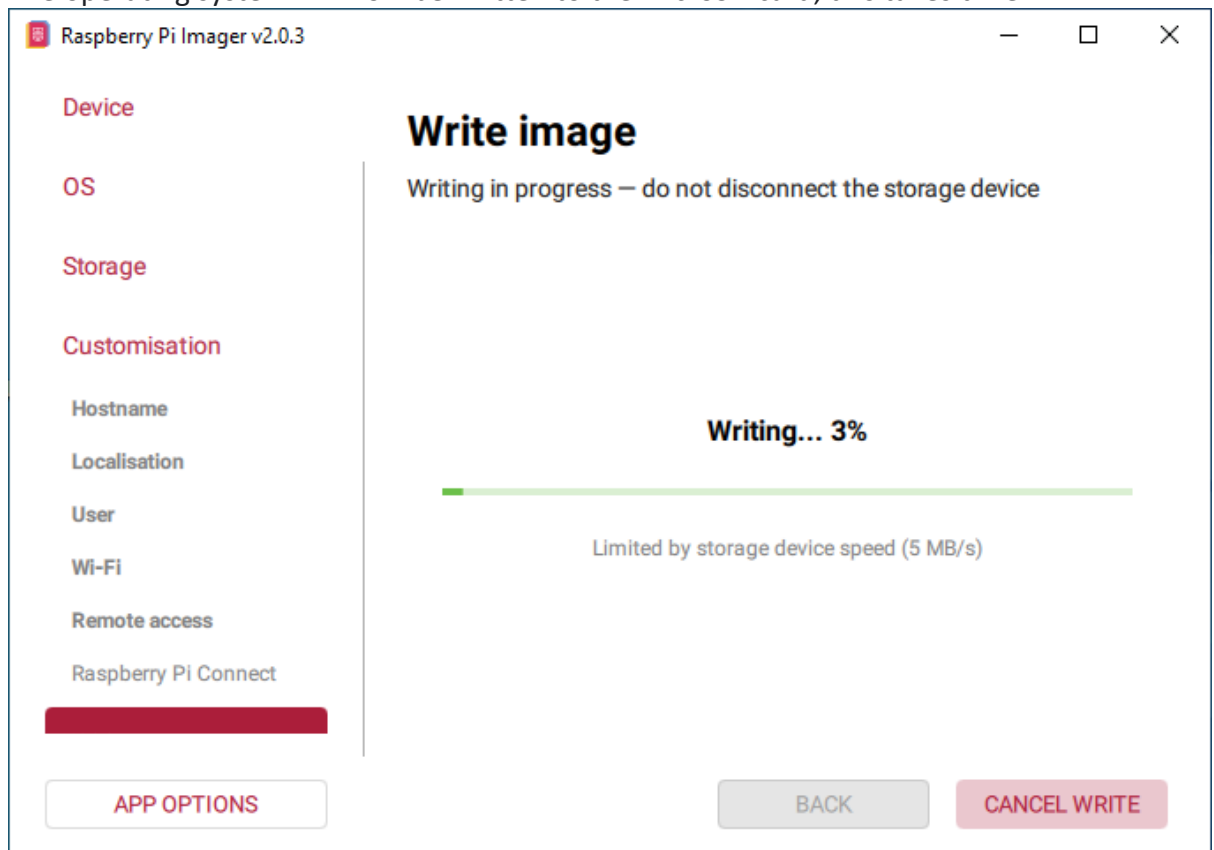
15. **Write image – Summary** – review, when happy select **WRITE**.



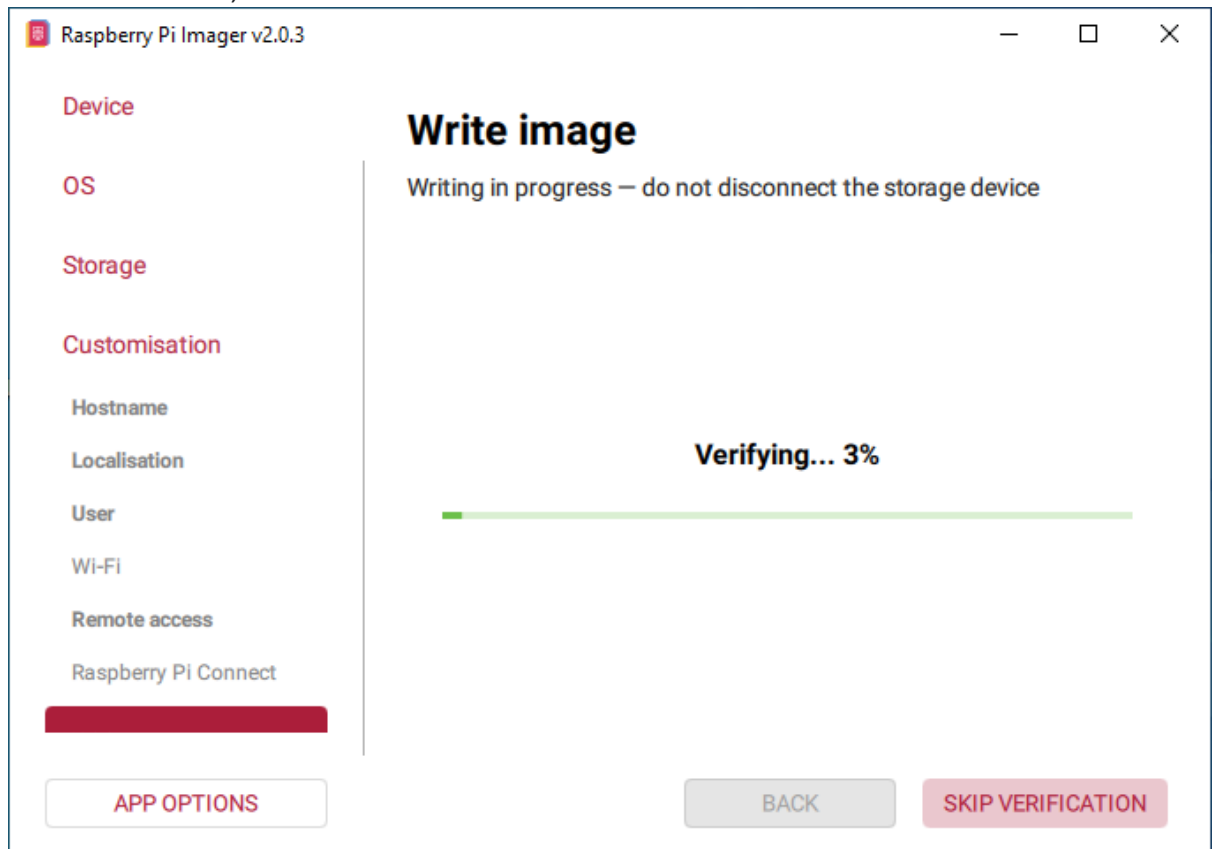
16. Read the warning and select **I UNDERSTAND, ERASE AND WRITE**.



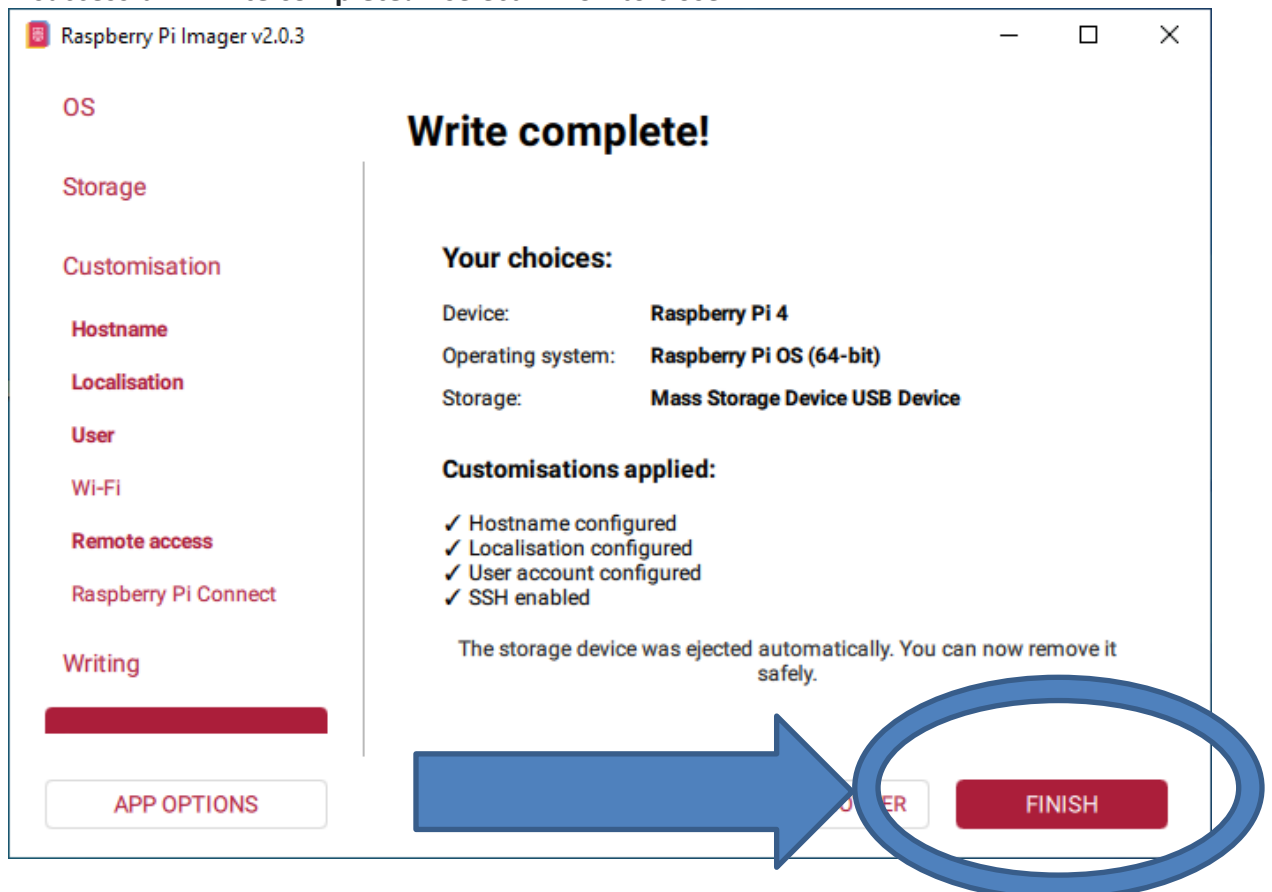
17. The operating system will now be written to the microSD card, this takes time...



18. and then verified, this take a bit more time...



19. If successful – **Write complete!** – select FINISH to close.

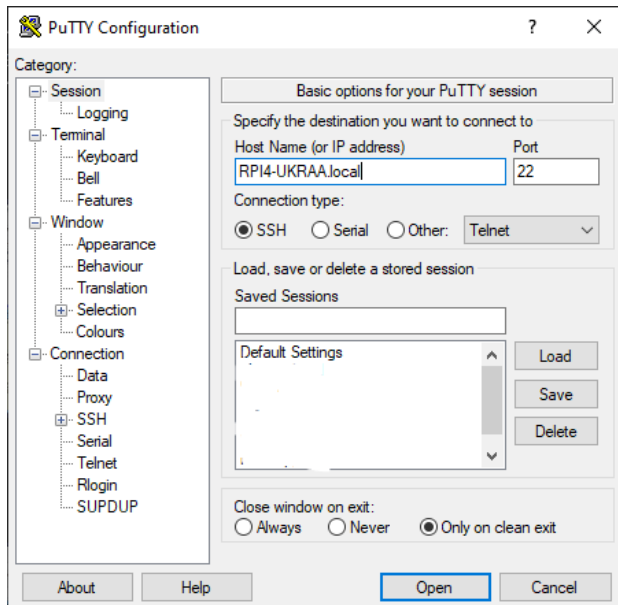


RPi4 first boot and initial configuration

Put the microSD card you have just created into your RPi4, connect the RPi to your LAN if necessary, insert the power cable and turn on.

Using PuTTY (<https://www.putty.org/>)

1. In **Host Name (or IP address)**, type the host name of your RPi that you wrote down earlier... and select **Open**

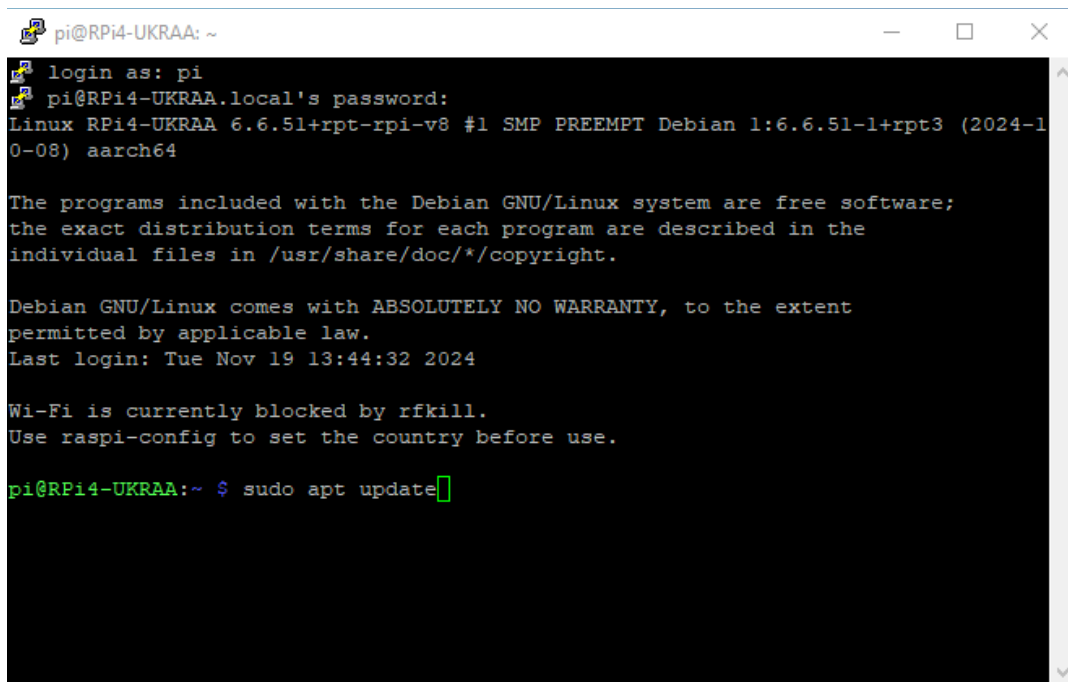


2. You will be presented with a PuTTY Security Alert - select **Accept**. You will now have a PuTTY terminal window.



3. Login as **pi** and enter your **password**
4. Now type the command below and press **enter**. This will update the RPi OS

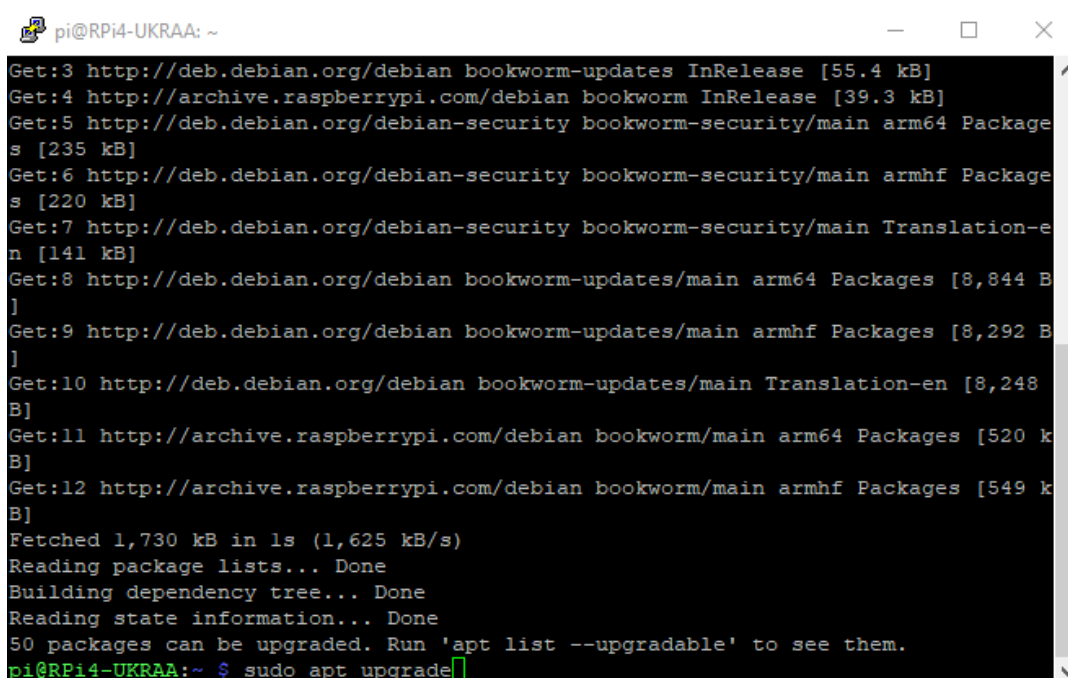
sudo apt update



```
pi@RPi4-UKRAA: ~  
login as: pi  
pi@RPi4-UKRAA.local's password:  
Linux RPi4-UKRAA 6.6.51+rpt-rpi-v8 #1 SMP PREEMPT Debian 1:6.6.51-1+rpt3 (2024-10-08) aarch64  
  
The programs included with the Debian GNU/Linux system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent  
permitted by applicable law.  
Last login: Tue Nov 19 13:44:32 2024  
  
Wi-Fi is currently blocked by rfkill.  
Use raspi-config to set the country before use.  
pi@RPi4-UKRAA:~ $ sudo apt update
```

5. Now type the command below and press **enter**. This will update any preinstalled software packages. You will be asked to type **y** and press **enter** to proceed.

sudo apt upgrade



```
pi@RPi4-UKRAA: ~  
Get:3 http://deb.debian.org/debian bookworm-updates InRelease [55.4 kB]  
Get:4 http://archive.raspberrypi.com/debian bookworm InRelease [39.3 kB]  
Get:5 http://deb.debian.org/debian-security bookworm-security/main arm64 Packages [235 kB]  
Get:6 http://deb.debian.org/debian-security bookworm-security/main armhf Packages [220 kB]  
Get:7 http://deb.debian.org/debian-security bookworm-security/main Translation-en [141 kB]  
Get:8 http://deb.debian.org/debian bookworm-updates/main arm64 Packages [8,844 B]  
Get:9 http://deb.debian.org/debian bookworm-updates/main armhf Packages [8,292 B]  
Get:10 http://deb.debian.org/debian bookworm-updates/main Translation-en [8,248 B]  
Get:11 http://archive.raspberrypi.com/debian bookworm/main arm64 Packages [520 kB]  
Get:12 http://archive.raspberrypi.com/debian bookworm/main armhf Packages [549 kB]  
Fetched 1,730 kB in 1s (1,625 kB/s)  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
50 packages can be upgraded. Run 'apt list --upgradable' to see them.  
pi@RPi4-UKRAA:~ $ sudo apt upgrade
```

6. You may be advised that you can remove **no longer required** packages. You can type the command below and press **enter**. Again, you will be asked to type **y** and press **enter** to proceed.

sudo apt autoremove

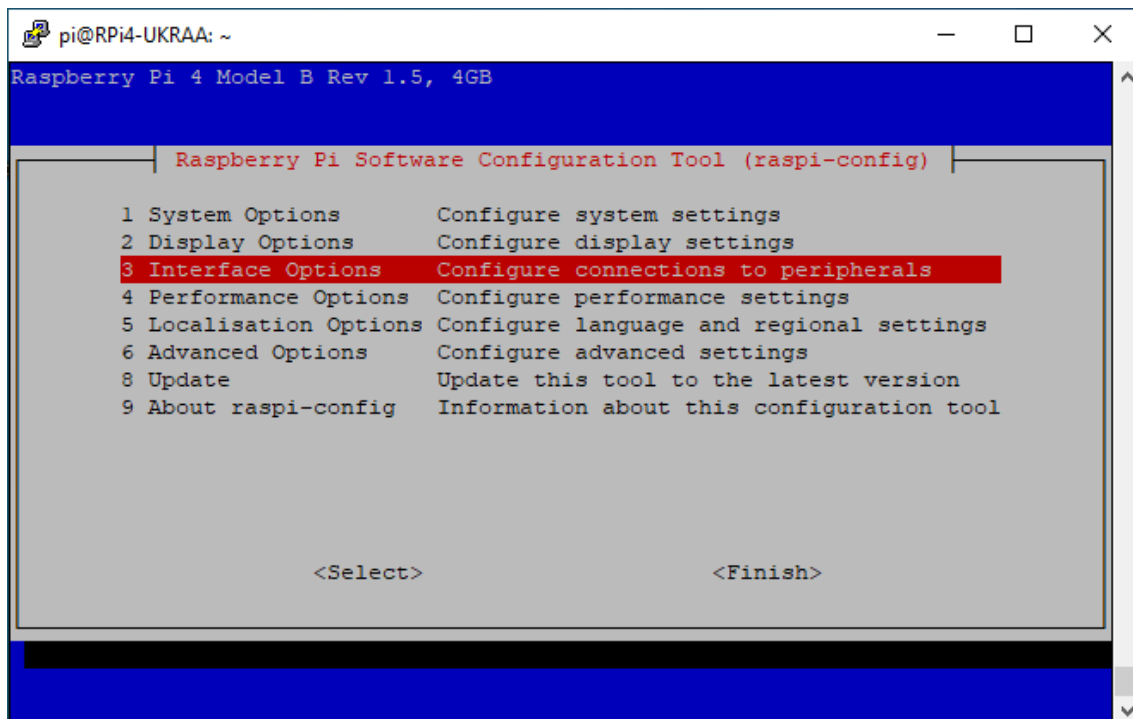
```
pi@RPi4-UKRAA: ~  
'/boot/initrd.img-6.6.62+rpt-rpi-v8' -> '/boot/firmware/initramfs8'  
update-initramfs: Generating /boot/initrd.img-6.6.62+rpt-rpi-2712  
'/boot/initrd.img-6.6.62+rpt-rpi-2712' -> '/boot/firmware/initramfs_2712'  
pi@RPi4-UKRAA:~$ sudo apt update  
Hit:1 http://deb.debian.org/debian bookworm InRelease  
Hit:2 http://deb.debian.org/debian-security bookworm-security InRelease  
Hit:3 http://deb.debian.org/debian bookworm-updates InRelease  
Hit:4 http://archive.raspberrypi.com/debian bookworm InRelease  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
1 package can be upgraded. Run 'apt list --upgradable' to see it.  
pi@RPi4-UKRAA:~$ sudo apt upgrade  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
Calculating upgrade... Done  
The following package was automatically installed and is no longer required:  
  libwlrroots12  
Use 'sudo apt autoremove' to remove it.  
The following packages have been kept back:  
  raspberrypi-ui-mods  
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.  
pi@RPi4-UKRAA:~$ sudo apt autoremove
```

7. We can now set up VNC to access the RPi from our desktop PC. Type the command below and press **enter**. We will be presented with the RPi configuration tool.

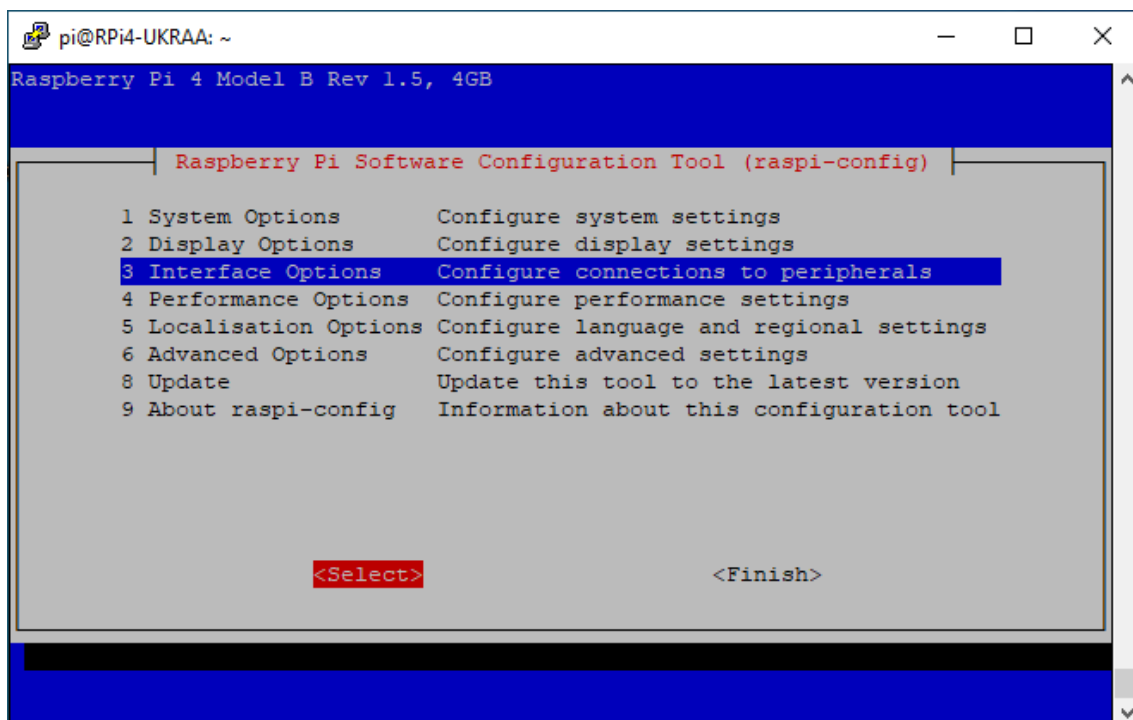
sudo raspi-config

```
pi@RPi4-PicoMuon: ~  
Wi-Fi is currently blocked by rfkill.  
Use raspi-config to set the country before use.  
pi@RPi4-PicoMuon:~$ sudo apt update  
Hit:1 http://archive.raspberrypi.com/debian bookworm InRelease  
Hit:2 http://deb.debian.org/debian bookworm InRelease  
Hit:3 http://deb.debian.org/debian-security bookworm-security InRelease  
Hit:4 http://deb.debian.org/debian bookworm-updates InRelease  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
All packages are up to date.  
pi@RPi4-PicoMuon:~$ sudo apt upgrade  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
Calculating upgrade... Done  
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.  
pi@RPi4-PicoMuon:~$ sudo apt autoremove  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.  
pi@RPi4-PicoMuon:~$ sudo raspi-config
```

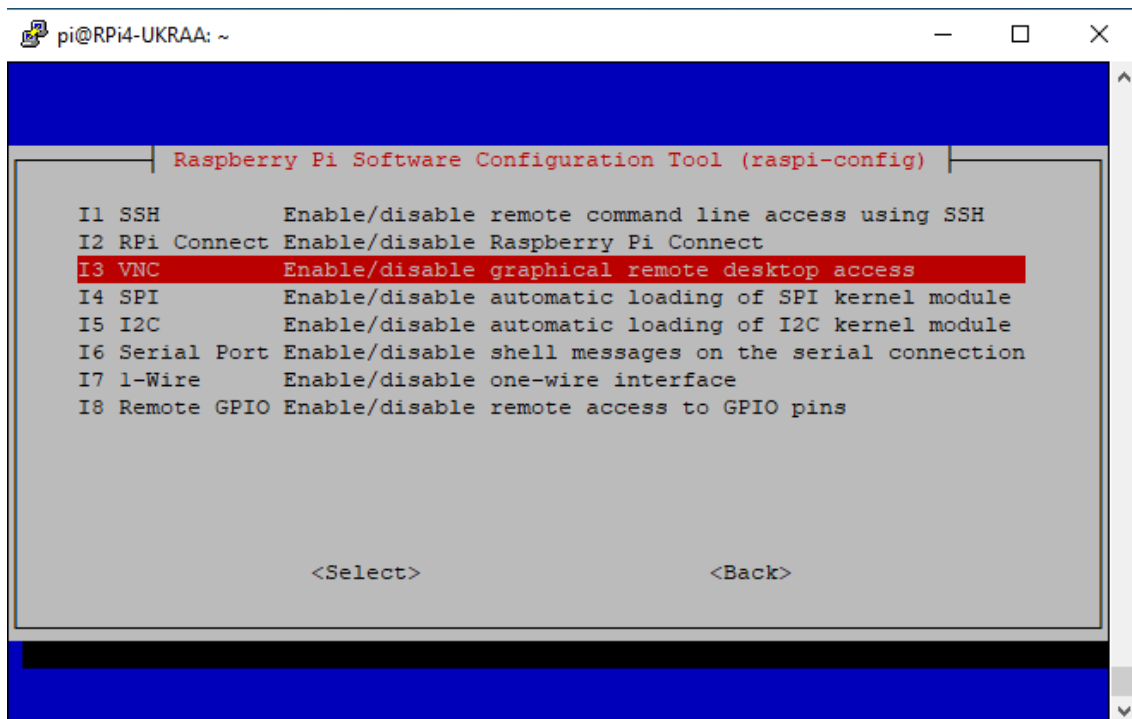

8. Select **3 Interface Options**



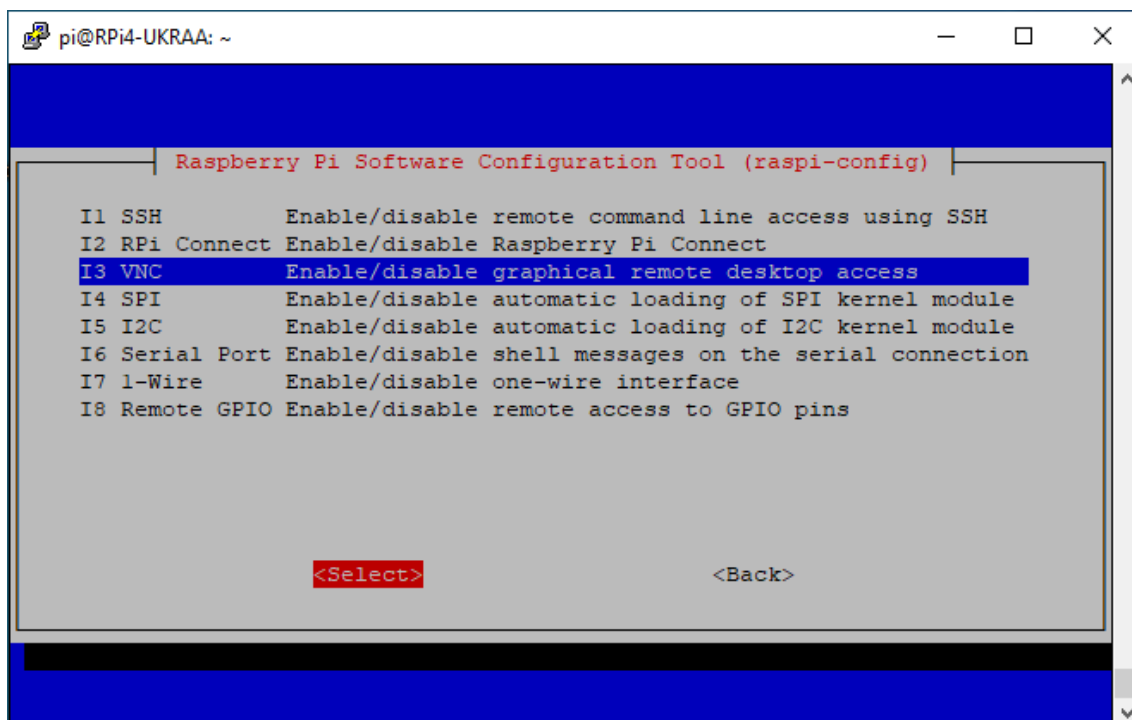
9. Navigate to **Select** and press **enter**.



10. Now navigate down to **I3 VNC** and selecting **Select** and press **enter**.



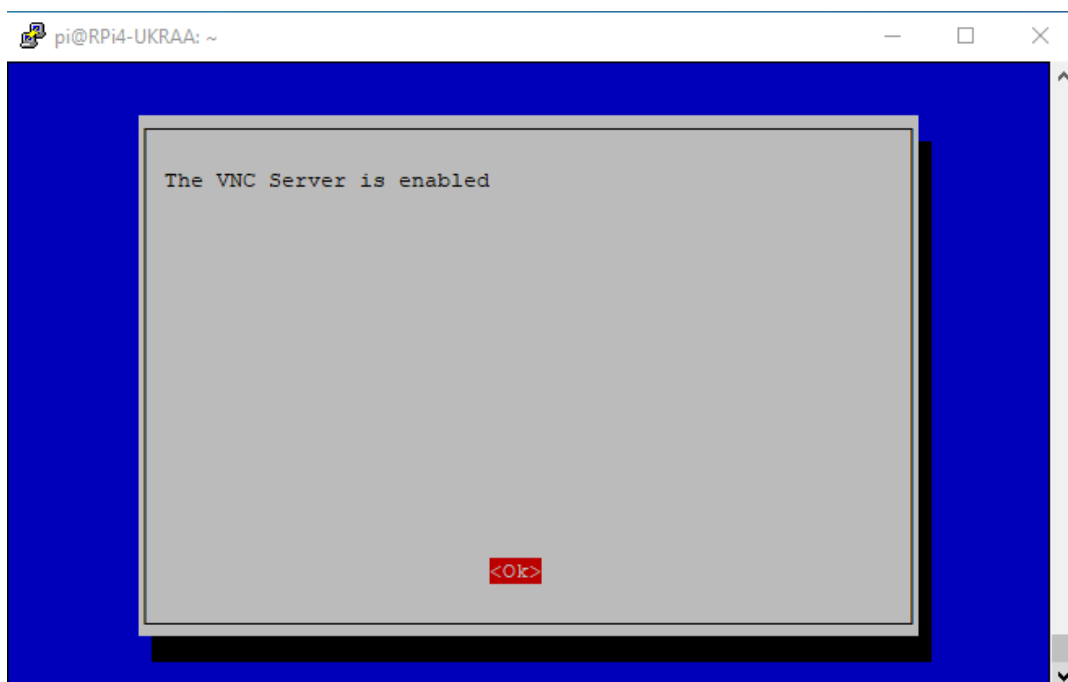
11. Navigate to **Select** and press **enter**.



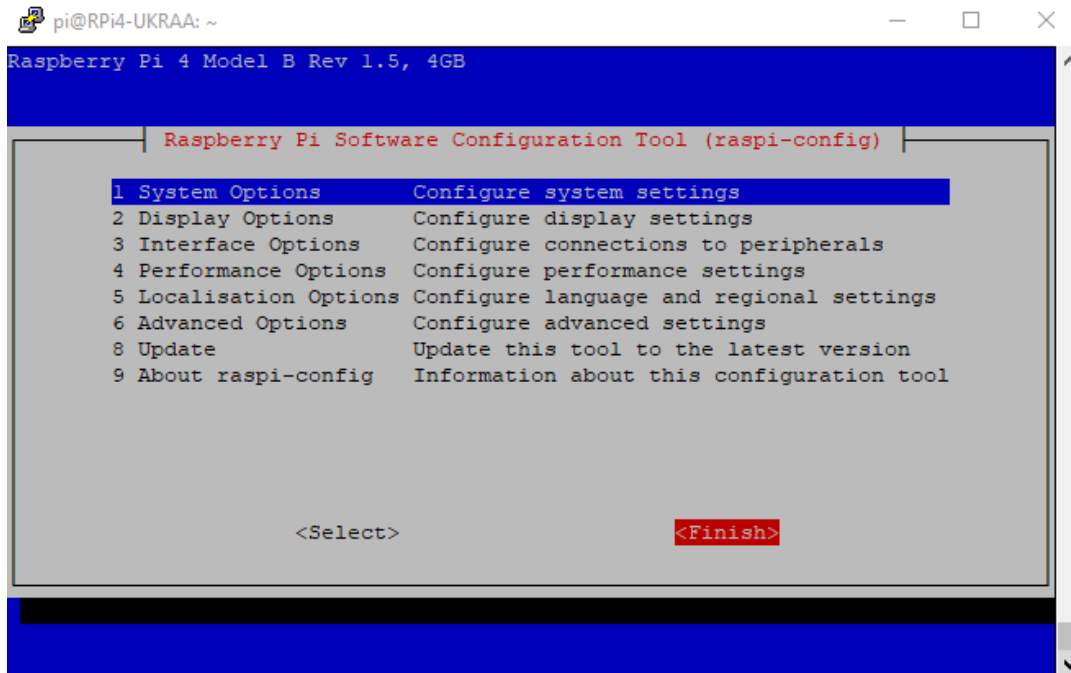
10. Select **Yes** and press **enter** to enable the VNC Server.



11. VNC server will now be enabled, press **enter**.



12. Finish with the Configuration Tool by selecting **Finish** and press **enter**.



```
pi@RPi4-UKRAA: ~
Raspberry Pi 4 Model B Rev 1.5, 4GB

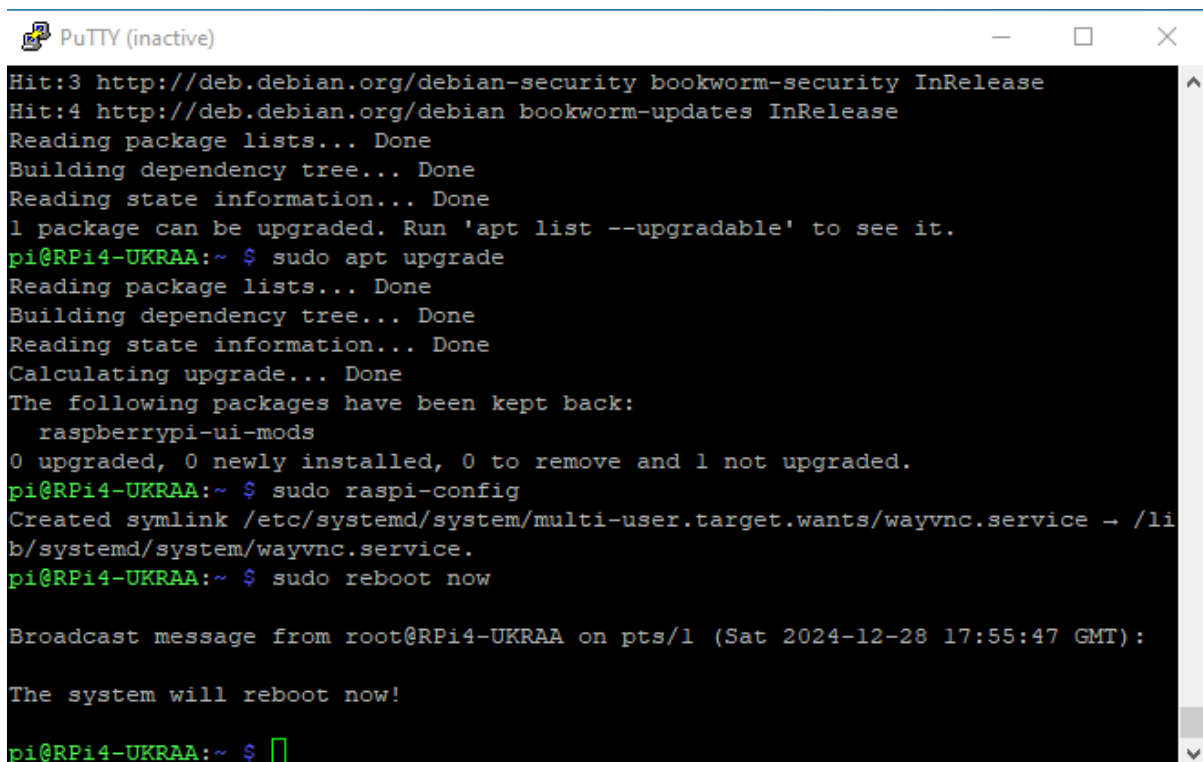
Raspberry Pi Software Configuration Tool (raspi-config)

1 System Options      Configure system settings
2 Display Options     Configure display settings
3 Interface Options   Configure connections to peripherals
4 Performance Options Configure performance settings
5 Localisation Options Configure language and regional settings
6 Advanced Options    Configure advanced settings
8 Update              Update this tool to the latest version
9 About raspi-config  Information about this configuration tool

<Select>                <Finish>
```

13. Reboot the RPi, type the command below and press **enter**. This will close the PuTTY connection. You can close the Putty window.

sudo reboot



```
PuTTY (inactive)

Hit:3 http://deb.debian.org/debian-security bookworm-security InRelease
Hit:4 http://deb.debian.org/debian bookworm-updates InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
pi@RPi4-UKRAA:~ $ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
  raspberrypi-ui-mods
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
pi@RPi4-UKRAA:~ $ sudo raspi-config
Created symlink /etc/systemd/system/multi-user.target.wants/wayvnc.service → /lib/systemd/system/wayvnc.service.
pi@RPi4-UKRAA:~ $ sudo reboot now

Broadcast message from root@RPi4-UKRAA on pts/1 (Sat 2024-12-28 17:55:47 GMT):

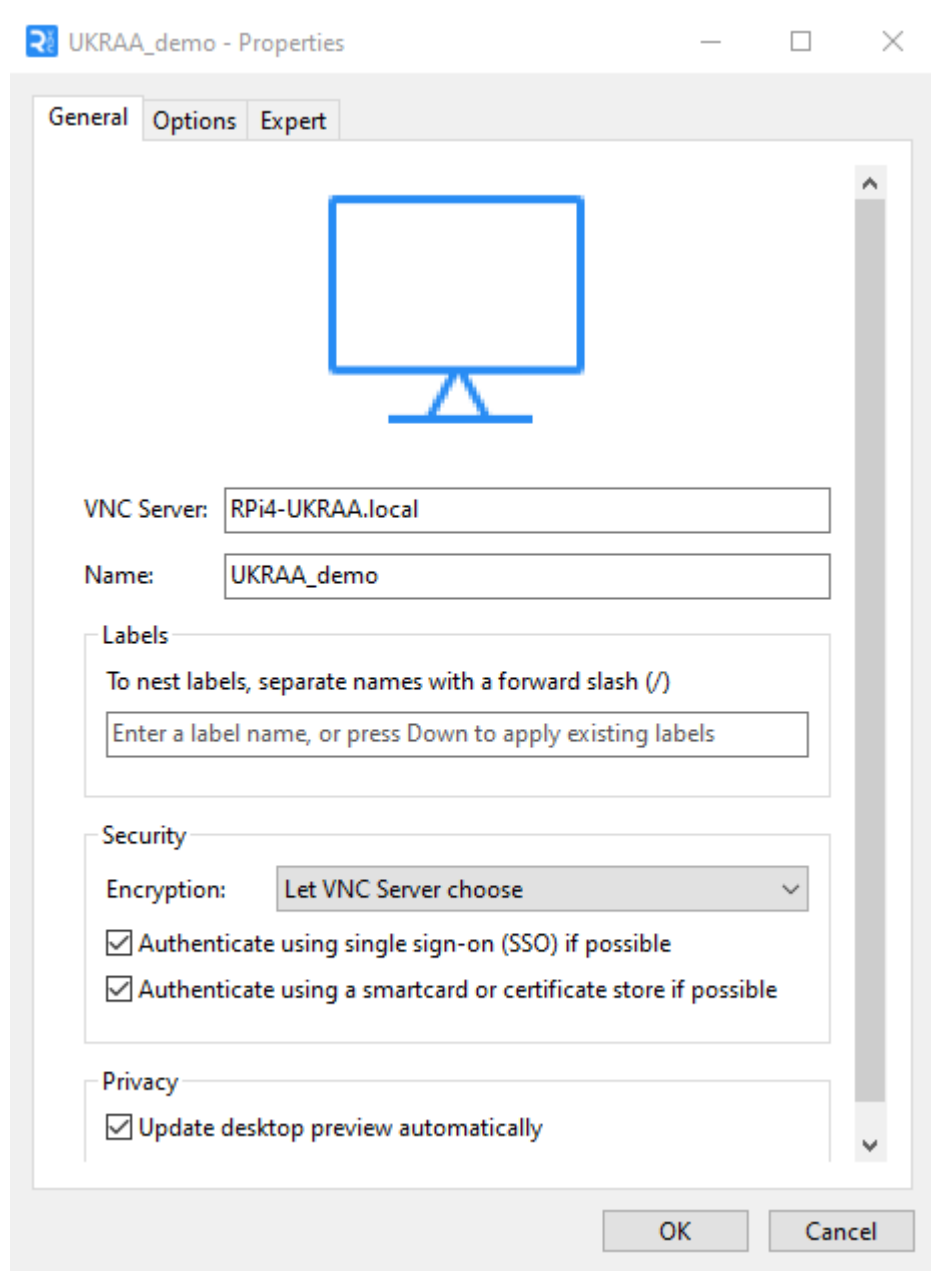
The system will reboot now!

pi@RPi4-UKRAA:~ $
```

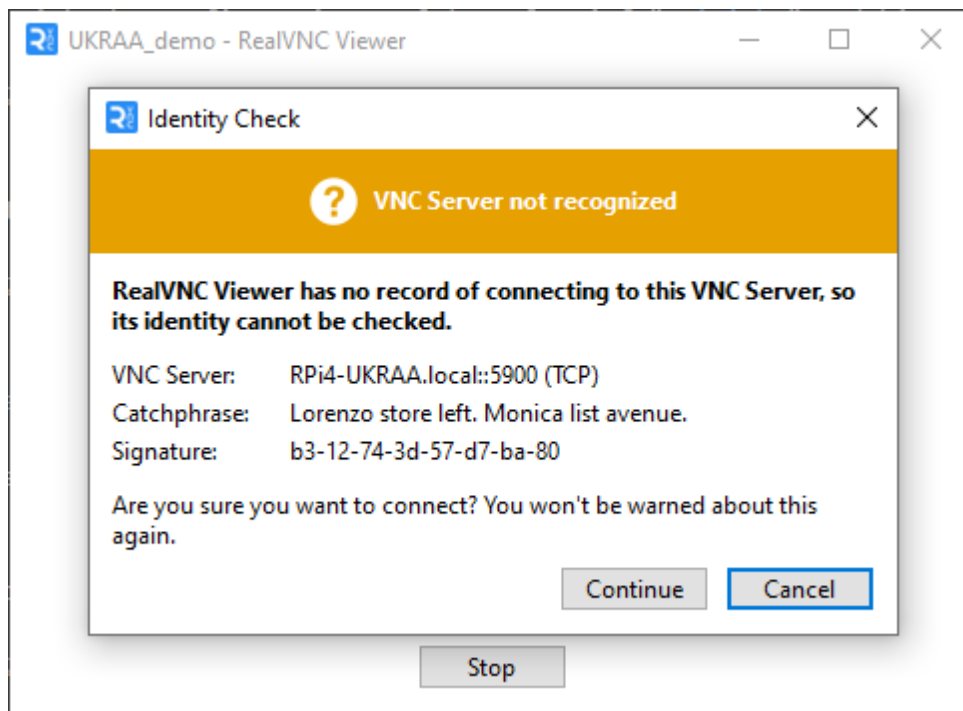
Headless access to RPi via VNC

Using a VNC program like RealVNC (<https://www.realvnc.com/en/>), connect to your RPi using your desktop PC...

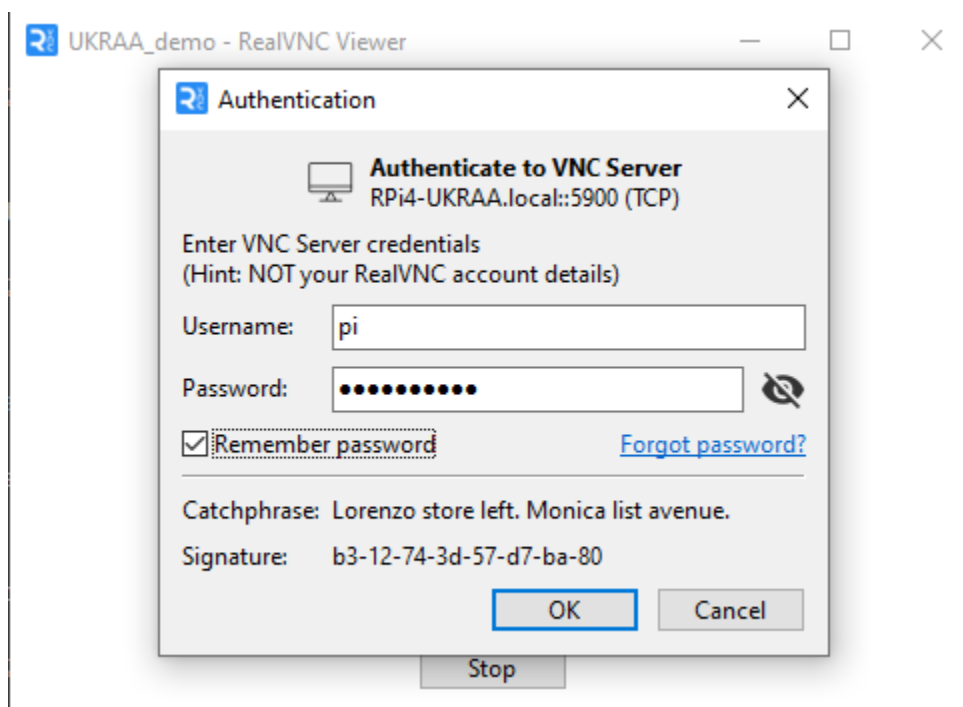
1. Create a **New connections** (CTRL-N) and enter the hostname into the **VNC Server:** box, add friendly name in the **Name** box and select **OK**.



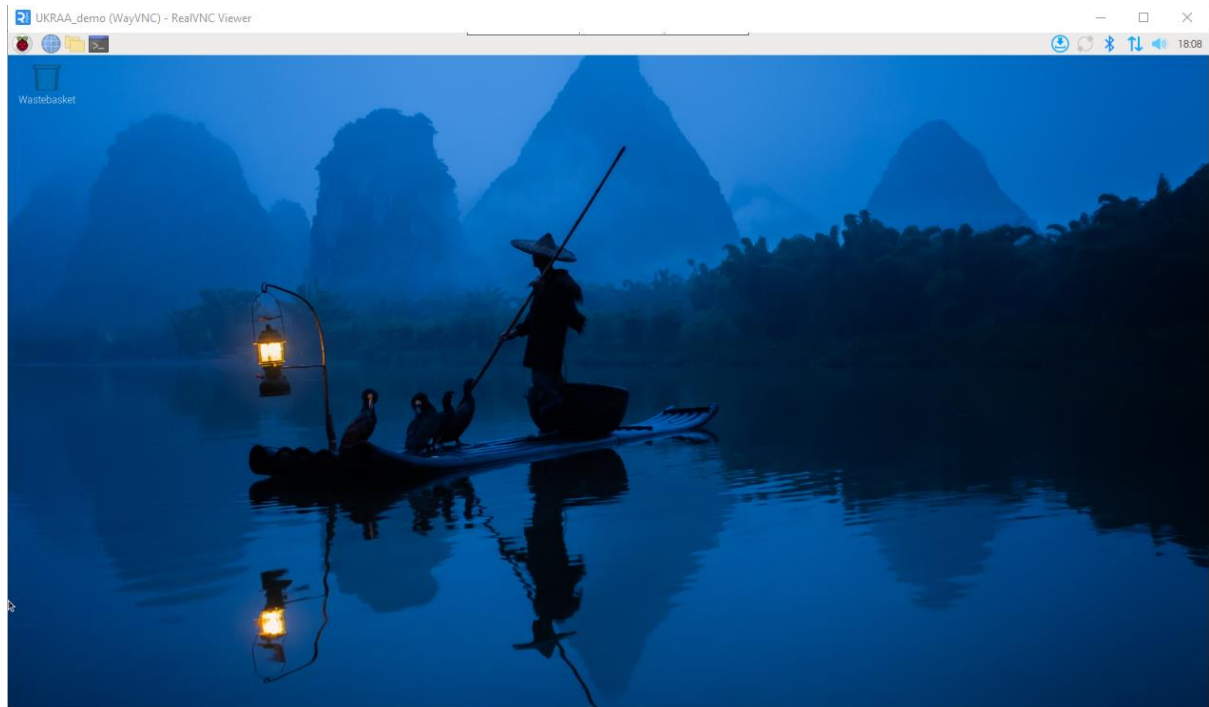
2. Open this VNC connection to your RPi; you will get a **VNC server not recognised** window from RealVNC. Select **Continue**



3. You will now get an **Authentication** window from RealVNC, enter your **Username** and **Password** details and select **Remember password** to make it easier to login in future.



4. You are now remotely accessing your RPi from your desktop PC...



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Contact us

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