

STUDY GUIDE FOR MODULE NO. LAB M09

Virtual Desktop Using VNC



MODULE OVERVIEW

Remote Desktop and VNC (Virtual Network Computing) are both technologies that allow you to access and control a computer from another device over a network. While they serve a similar purpose, they use different protocols.



MODULE LEARNING OUTCOMES

By the end of this module, participants should be able to access Raspberry Pi in the network using VNC specifically as follows:

1. Understanding of VNC Technology:
 - a. Define VNC and explain how it works.
 - b. Differentiate between server and viewer components in VNC.
 - c. Identify the advantages and limitations of using VNC for remote desktop.
2. Installation and Configuration:
 - a. Install and configure a VNC server on a host machine.
 - b. Set up a VNC viewer on a client machine.
 - c. Troubleshoot common installation and configuration issues.
3. Security Measures:
 - a. Explain the security risks associated with VNC.
 - b. Implement secure practices for VNC, such as password protection and encryption.
 - c. Explore and implement additional security features, like using SSH tunnels with VNC.
4. Connection Management:
 - a. Establish a remote desktop connection using VNC.
 - b. Understand the different authentication methods available in VNC.
 - c. Explore options for connecting over local networks and the internet.
5. Performance Optimization:
 - a. Optimize VNC settings for better performance.
 - b. Discuss bandwidth considerations and strategies to enhance speed.
 - c. Troubleshoot and address common performance issues.
6. Advanced Features:
 - a. Explore and utilize advanced features of VNC, such as file transfer and clipboard sharing.
 - b. Understand how to configure multiple user sessions and access control in VNC.
 - c. Implement specific features offered by the chosen VNC server software.
7. Compatibility and Cross-Platform Usage:
 - a. Ensure compatibility between different VNC server and viewer implementations.
 - b. Use VNC across various operating systems, such as Windows, Linux, and macOS.
 - c. Troubleshoot compatibility issues between different platforms.
8. Remote Desktop Best Practices:
 - a. Demonstrate effective remote desktop etiquette.
 - b. Discuss the scenarios where remote desktop access is appropriate.
 - c. Implement backup and recovery strategies for remote desktop configurations.
9. Documentation and Reporting:
 - a. Create documentation outlining the steps to set up and configure VNC.
 - b. Generate reports on VNC usage, security measures, and performance metrics.
 - c. Develop troubleshooting guides for common VNC issues.
10. Legal and Ethical Considerations:
 - a. Understand the legal and ethical aspects of remote desktop usage.
 - b. Respect privacy and confidentiality when accessing remote systems.
 - c. Adhere to relevant laws and regulations governing remote desktop access.





LEARNING CONTENT (Setting up Virtual Desktop for Raspberry Pi using VNC)

Hardware Requirement

- Raspberry Pi 3b+
- MicroSD card (8GB or larger recommended)
- MicroSD card reader
- Computer with an SD card reader
- Power supply
- Ethernet Cable
- Display/Monitor
- Keyboard and Mouse

Part I: Format the microSD Card using the downloaded Raspberry Pi Imager

For installing the Raspbian OS on your Raspberry Pi, it's essential to follow these procedures. Begin by collecting the necessary components including a suitable Raspberry Pi model, a microSD card with a recommended capacity of 8GB or higher, a dedicated microSD card reader, and a reliable internet connection. ^[30]

Step 1: Download and Install Raspberry Pi Imager

- Go to the official Raspberry Pi website (<https://www.raspberrypi.org/>).
- Download the Raspberry Pi Imager suitable for your operating system (Windows, macOS, Linux).
- Install Raspberry Pi Imager by following the on-screen instructions.

Step 2: Insert the microSD Card

- Insert the microSD card into your computer's card reader slot. Ensure you have a card reader adapter if your computer doesn't have a built-in slot.

Step 3: Launch Raspberry Pi Imager

- Open Raspberry Pi Imager on your computer.

Step 4: Select the OS (Raspbian)





	Raspberry Pi OS Full (32-bit) A port of Debian Bookworm with desktop environment and recommended applications Released: 2023-10-10 Online - 2.5 GB download
	Raspberry Pi OS Lite (64-bit) A port of Debian Bookworm with no desktop environment (Compatible with Raspberry Pi 3/4/400/5) Released: 2023-10-10 Online - 0.4 GB download
	Raspberry Pi OS Full (64-bit) A port of Debian Bookworm with desktop environment and recommended applications Released: 2023-10-10 Online - 2.7 GB download
	Raspberry Pi OS (Legacy) Lite A port of Debian Bullseye with security updates and no desktop environment Released: 2023-05-03 Online - 0.4 GB download

Figure 9.1.1 Selecting Raspberry Pi OS

- In Raspberry Pi Imager, click on "Choose OS" to select the operating system you want to install. In this case, select "Raspberry Pi OS (other)" and choose the Raspbian variant Raspberry Pi OS Full (64-bit).

Step 5: Choose the microSD Card

- Click on "Choose Storage" to select the microSD card you inserted earlier. Ensure you select the correct drive to avoid data loss.

Step 6: Format the microSD Card and Initial Setup

- Click the gear button (Raspberry Pi Configuration) to access the configuration menu.
- Set the desired hostname, username, and password according to your preferences.
- Click on the "Write" button to start the installation process. Raspberry Pi Imager will format the microSD card and write the Raspbian OS files onto it.

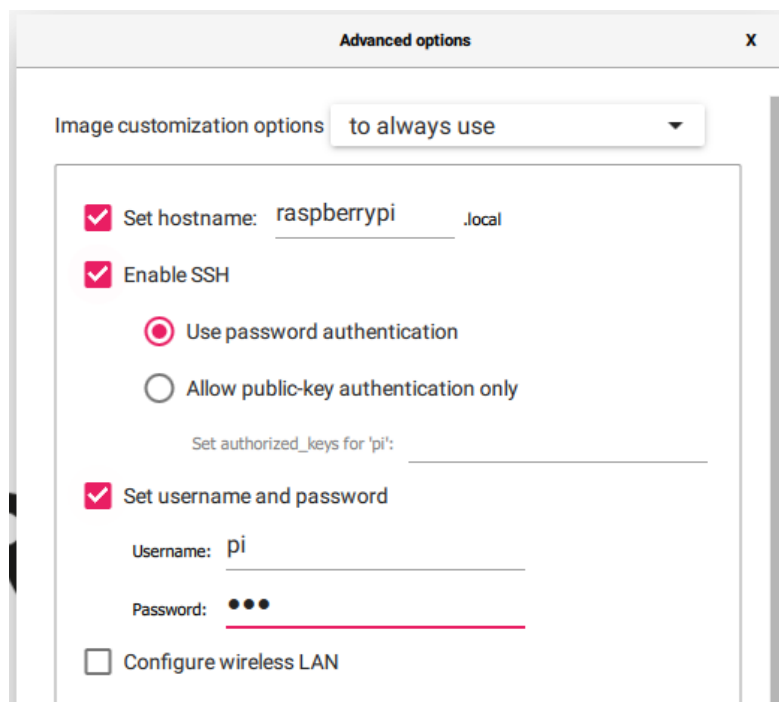


Figure 9.1.2 Setting Raspberry Pi Configuration

Step 7: Eject the microSD Card

- Once the installation is complete, safely eject the microSD card from your computer.
- Now, your microSD card is ready with the Raspbian OS installed.^[17]



Figure 9.1.3 Flashing the SD card

Part II: Activating SSH protocol

After ejecting the card reader or SD card, reinsert it. Then, open File Explorer and click on 'This PC' to confirm that the Raspberry Pi OS has been successfully flashed.

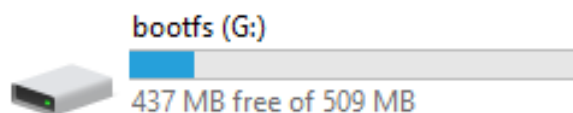


Figure 9.2.1 Raspberry Pi Boot Storage

Step 1: Create a blank text Document.

- Create a blank text document, name it 'SSH' and save it onto the microSD card. Ensure the file type is set to 'All Files' before saving it onto the microSD card. After saving, remove the SD card and insert it into the Raspberry Pi.

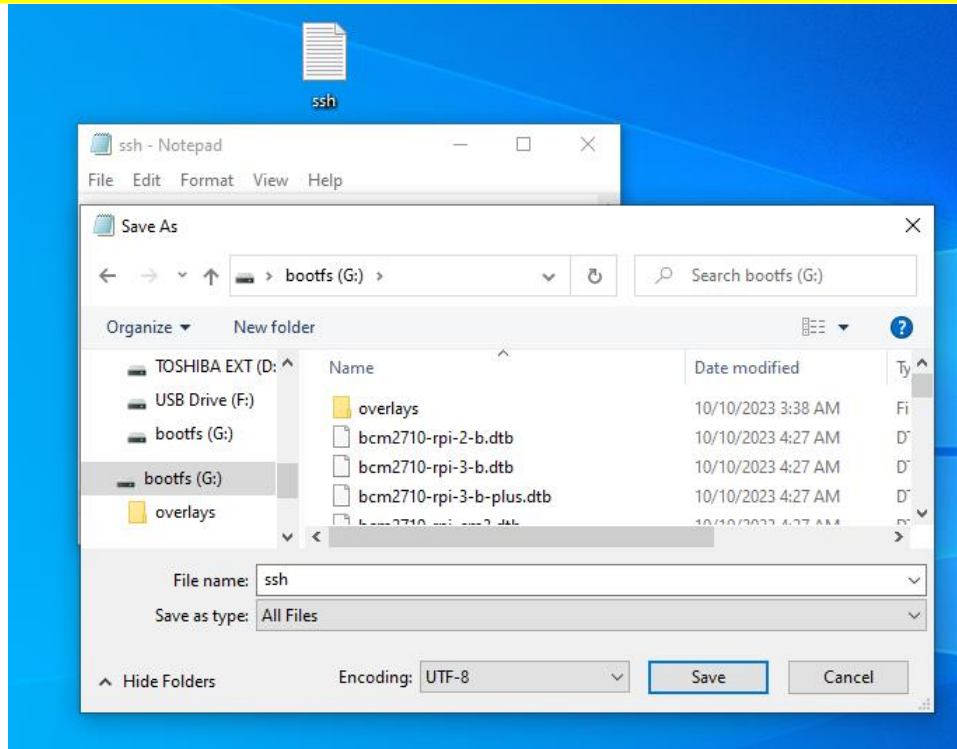


Figure 9.2.2 Saving SSH File

Step 2: Connect the host server devices with the ethernet cable.

Step 3: Power on the Raspberry Pi.

Step 4: Download and install the PuTTY application from the official website.

Step 5: Open PuTTY and configure the settings as follows:

- Host Name: "your hostname".local
- Port Numbe:22
- Connection Type: SSH

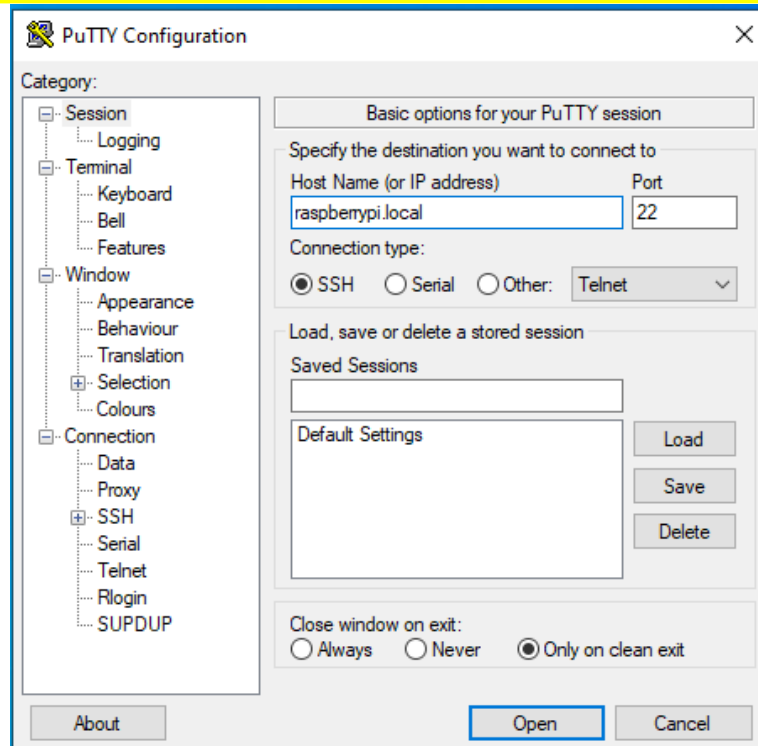


Figure 9.2.3 SSH using Putty

Step 5: Click "Open." This action will open a command prompt window. Enter the username and password that you previously created. Press "Enter." This step enables remote access to your Raspberry Pi from a host device. If you only need to access the Raspberry Pi internally, you can stop here.

Step 6: Enter the username and password that you previously created. Press "Enter." This step enables remote access to your Raspberry Pi from a host device. If you only need to access the Raspberry Pi internally, you can stop here.

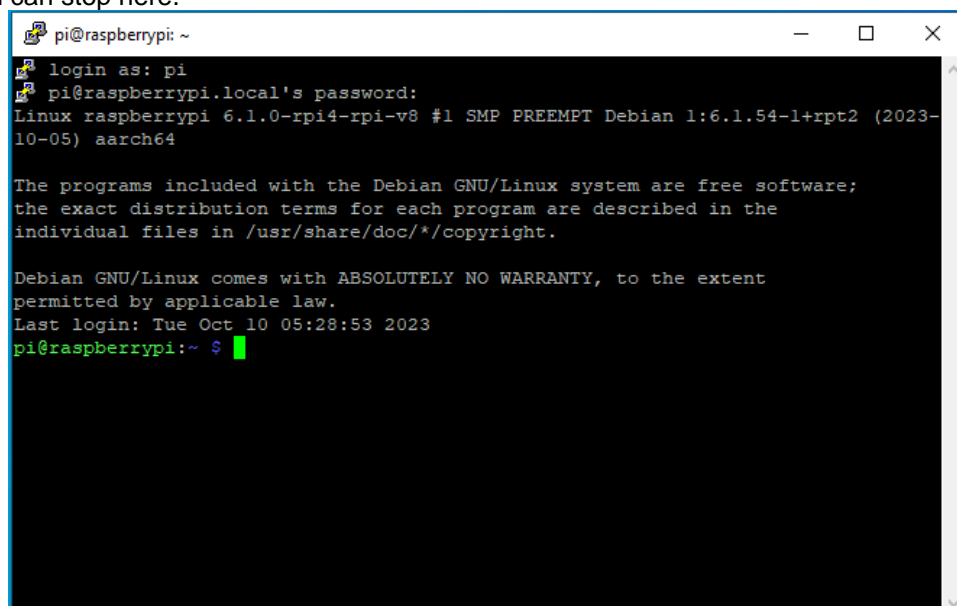


Figure 9.2.4 Raspberry Pi SSH Connection

Note: If you encounter any errors, ensure that the connected LAN cable is identified as an unknown network

in the network settings. If it shows "Network Identifying," please wait for some time for the network to establish the connection.

Part III: Enabling and Accessing VNC on Raspberry Pi

Step 1: Enabling VNC on Raspberry Pi.

- SSH into your Raspberry Pi or open a terminal window on the Pi.
- Type the following command and press Enter:
- `sudo raspi-config`

```
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Oct 10 05:28:53 2023
pi@raspberrypi:~ $ sudo raspi-config
```

Figure 9.3.1 Code for accessing Raspberry Pi Configuration

- In the Raspberry Pi Configuration menu, navigate to Interface Options.
- Select VNC and enable it.



Figure 9.3.2 Enabling VNC

- Navigate to Display Options, choose VNC Resolution, and set it to 1280x720 or HD.
- Press Finish to apply the changes.



Figure 9.3.3 Configuring VNC Screen Resolution

Step 2: Accessing Raspberry Pi Desktop via VNC.

Download and install the VNC Viewer application on your local computer from the provided link <https://www.realvnc.com/en/connect/download/viewer/>

- Open the VNC Viewer application.
- Enter the Raspberry Pi's hostname in the VNC Viewer search bar.

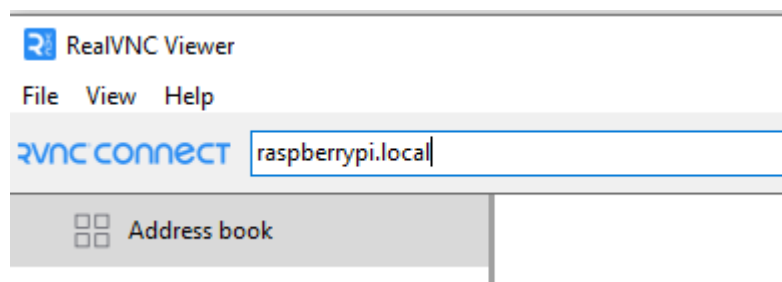


Figure 9.3.4 Entering Raspberry Pi Hostname

- Click Connect.
- Enter the username and password for your Raspberry Pi when prompted.

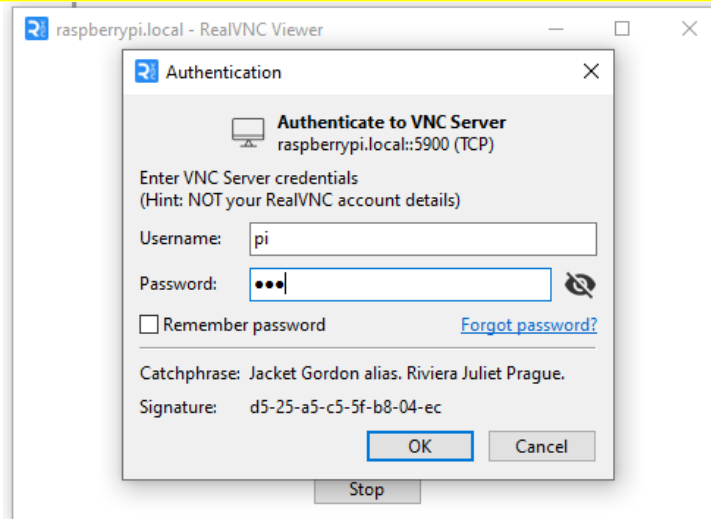


Figure 9.3.5 Entering Raspberry Pi Username and Password

- You should now be successfully connected to the Raspberry Pi's desktop using VNC.^[18]

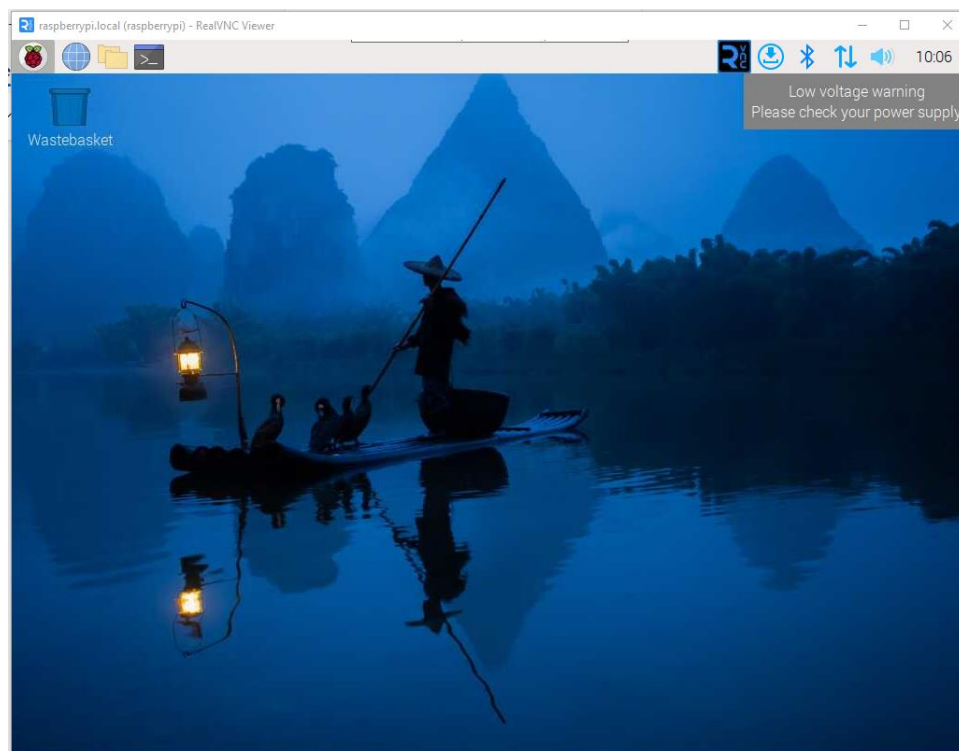


Figure 9.3.6 Remote Desktop of Raspberry Pi Using VNC Viewer



LEARNING ACTIVITY 1

Name: Cerujano, Erman Ace M.

Due date: April 1, 2024

Create a detailed step-by-step method with pictures and detailed description on how you setup a VNC remote desktop access to your Raspberry Pi.

Hardware Requirement

- Raspberry Pi 3b+
- MicroSD card (8GB or larger recommended)
- MicroSD card reader
- Computer with an SD card reader
- Power supply
- Ethernet Cable
- Display/Monitor
- Keyboard and Mouse

Procedure:

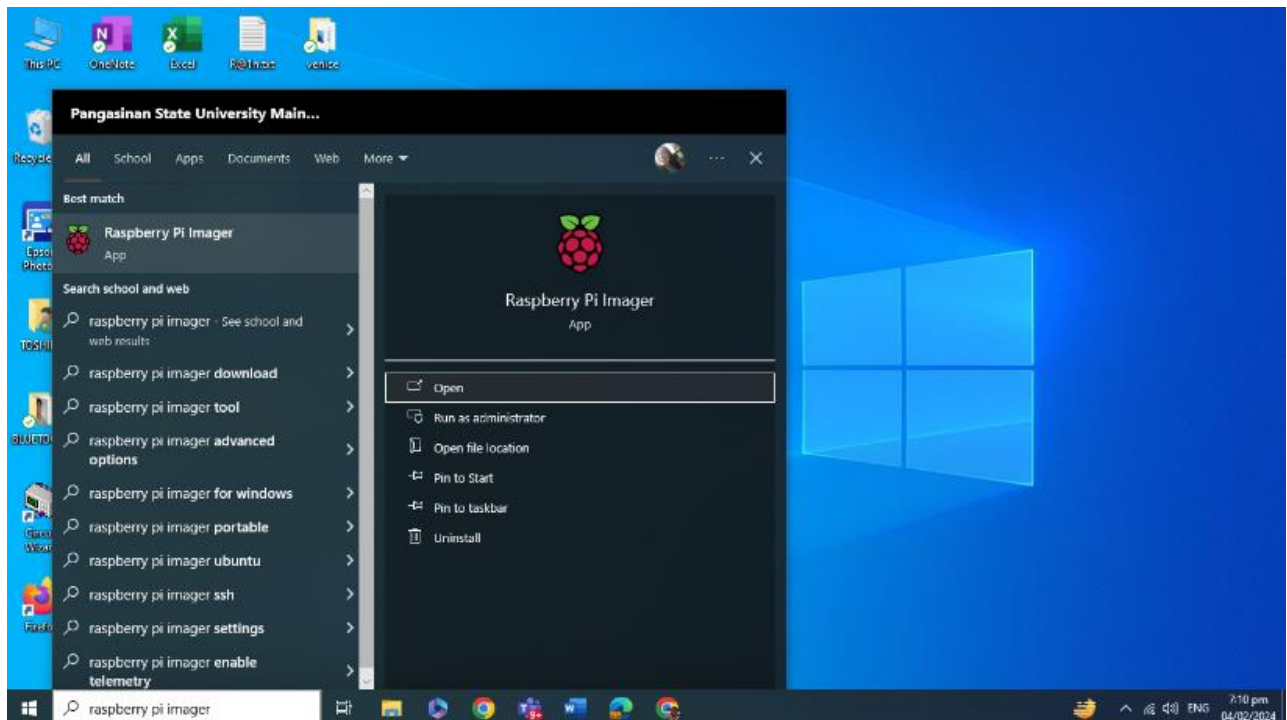
Step 1: Download and Install Raspberry Pi Imager

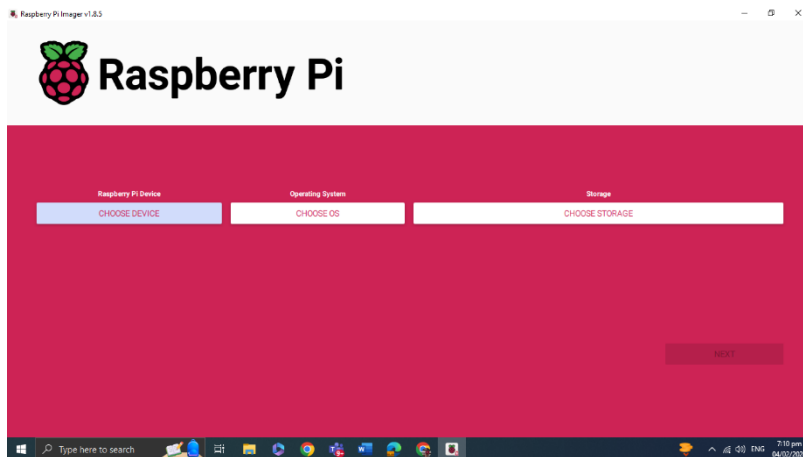
- Go to the official Raspberry Pi website (<https://www.raspberrypi.org/>).
- Download the Raspberry Pi Imager suitable for your operating system (Windows, macOS, Linux).
- Install Raspberry Pi Imager by following the on-screen instructions.

Step 2: Insert the microSD Card

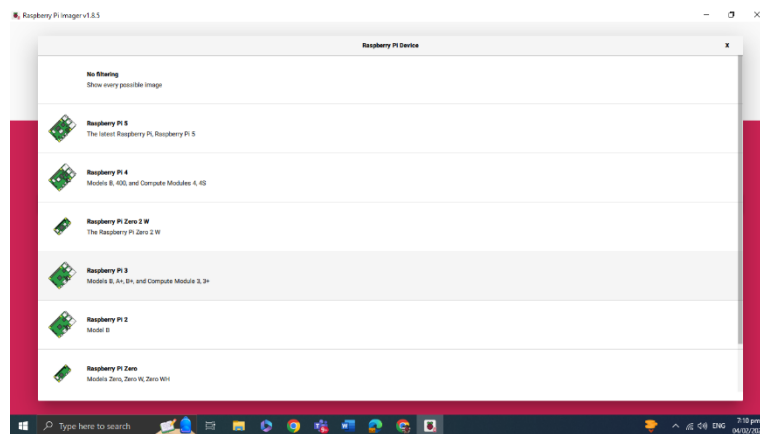
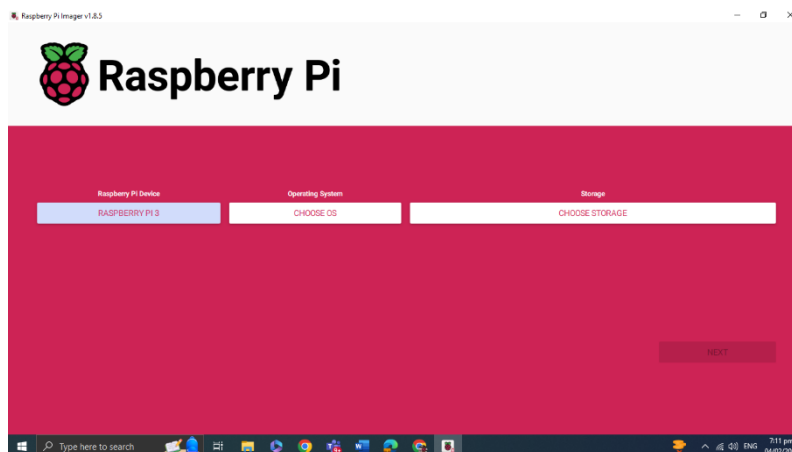
- Insert the microSD card into your computer's card reader slot. Ensure you have a card reader adapter if your computer doesn't have a built-in slot.

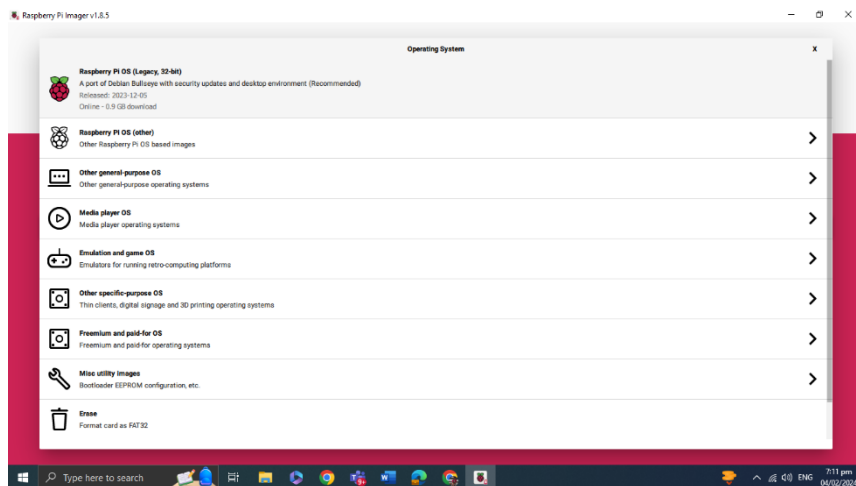
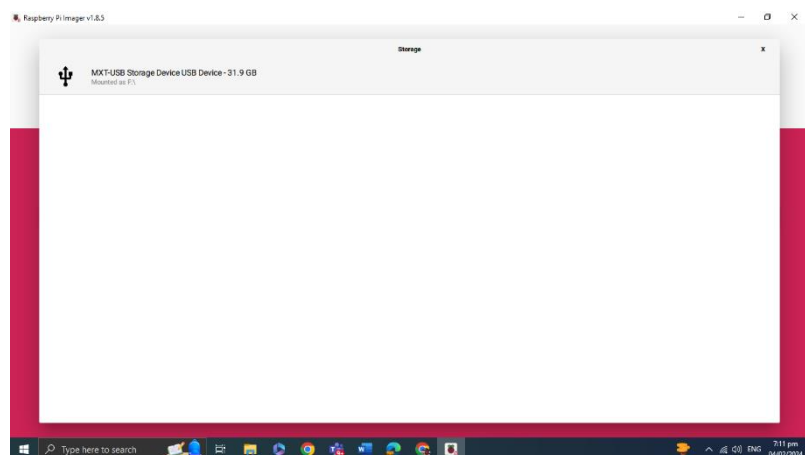
Step 3: Open your Raspberry Pi Imager.



Step 4: Click Choose Device

After you click the Choose Device, choose your Raspberry Pi Model.

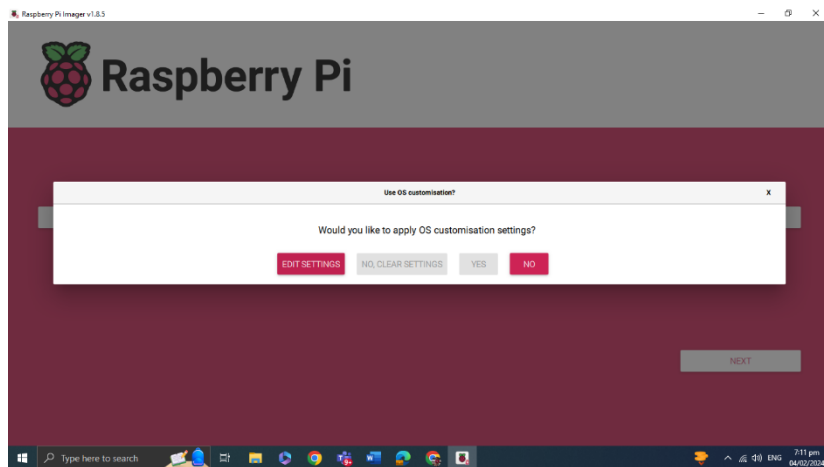
**Step 5: Next is click “Choose OS”.**

Step 6: Choose Raspberry Pi OS (Legacy, 32-bit)**Step 7: Next, Choose Storage.****Step 8: Choose your USB Device.**

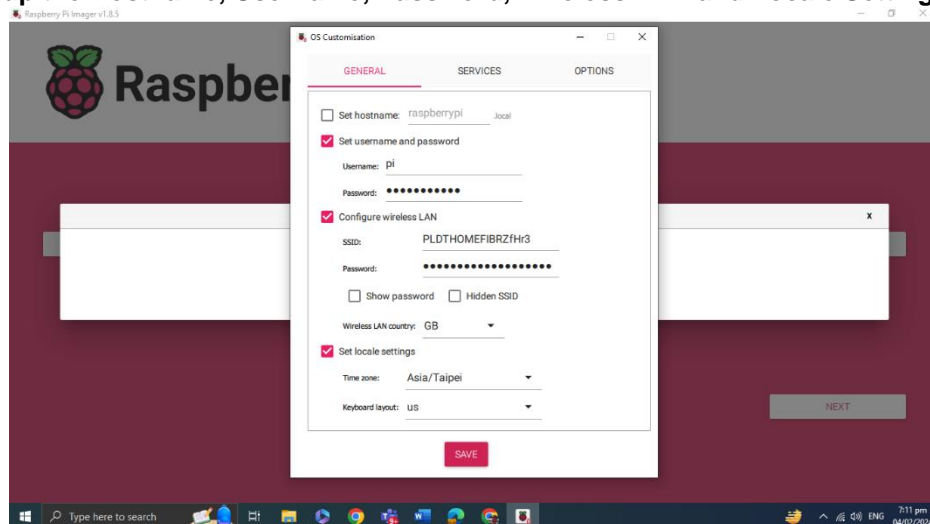
Step 9: Click Next.



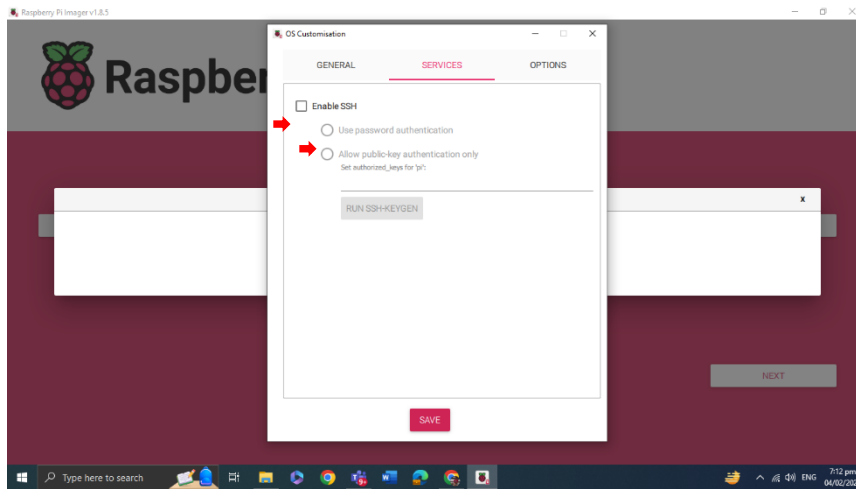
Step 10: Click “Edit Settings”.



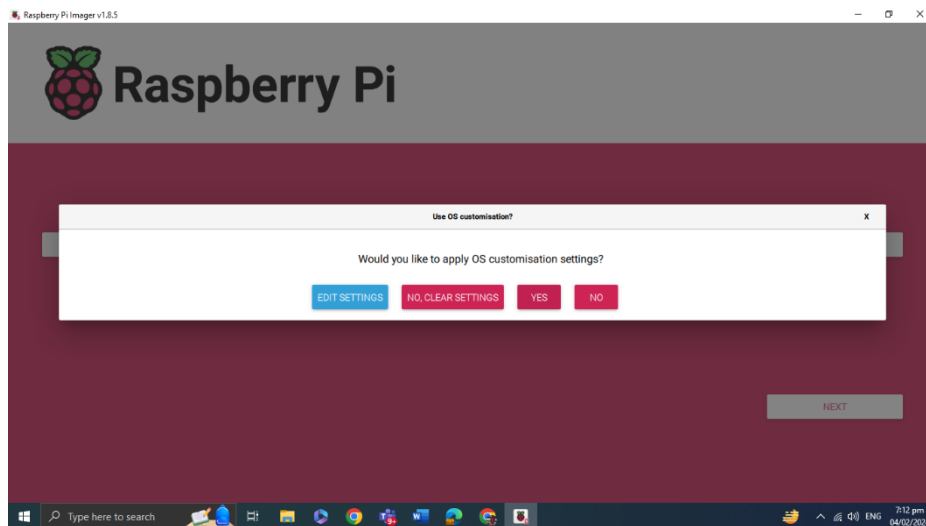
Step 11: Setup the Hostname, Username, Password, Wireless LAN and Locale Settings.



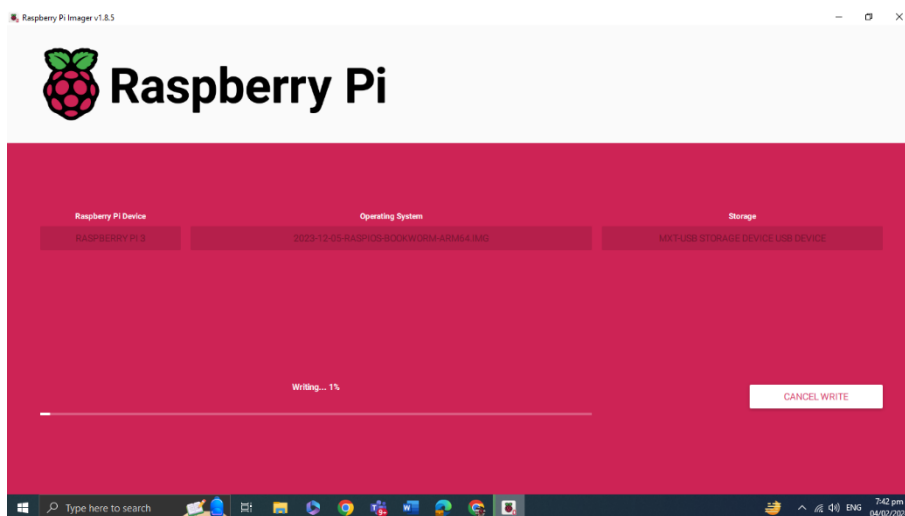
Step 12: Go to Services and click the box to Enable SSH and click the first circle to use password authentication. Then click Save.

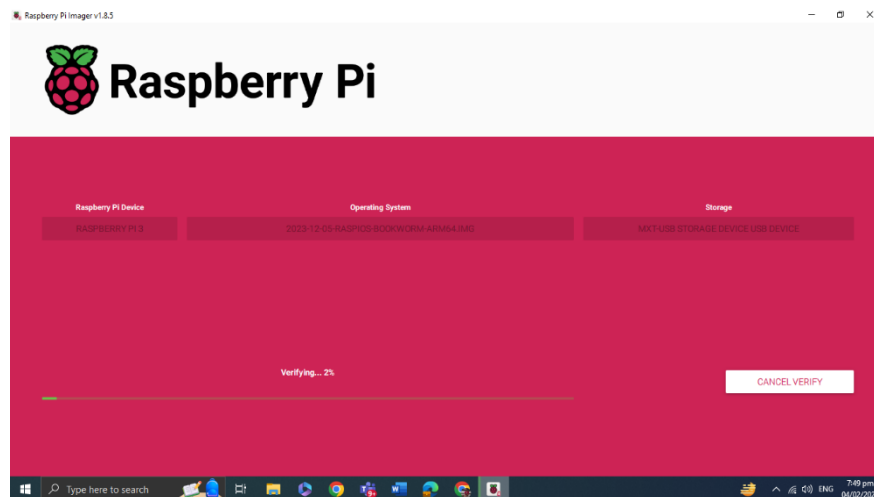
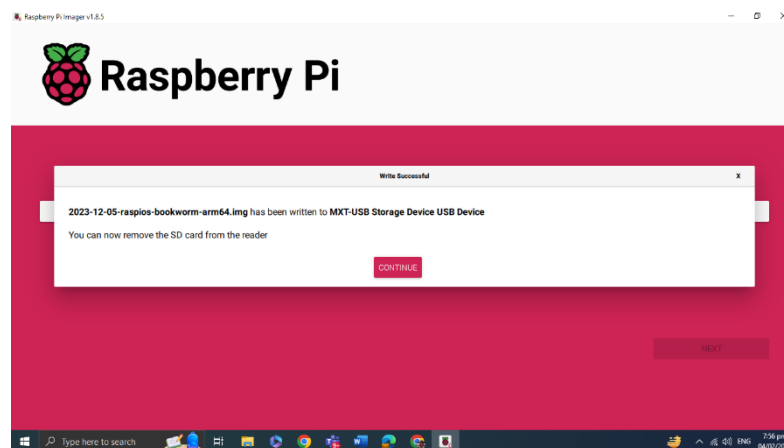
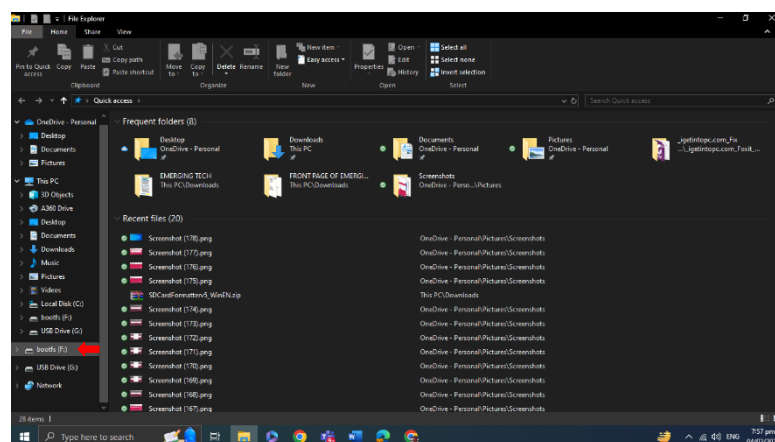


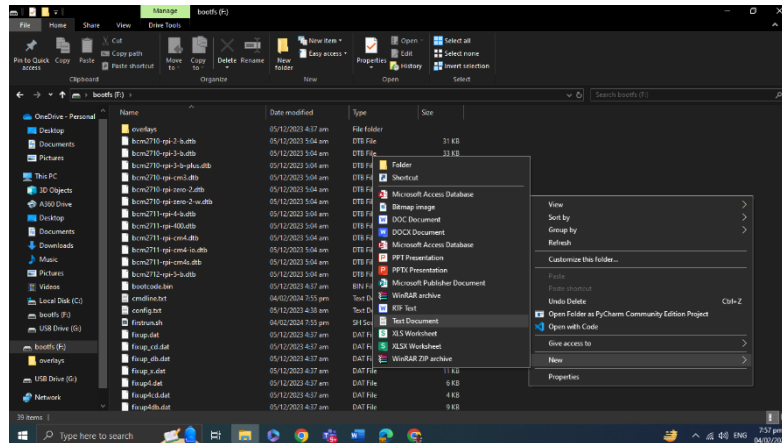
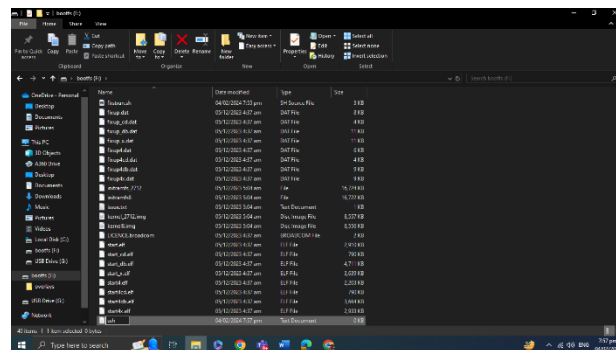
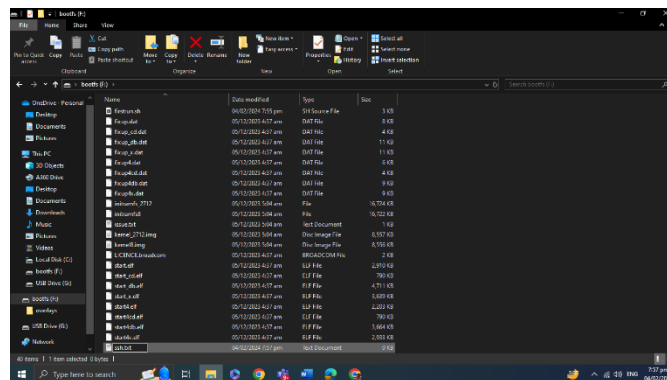
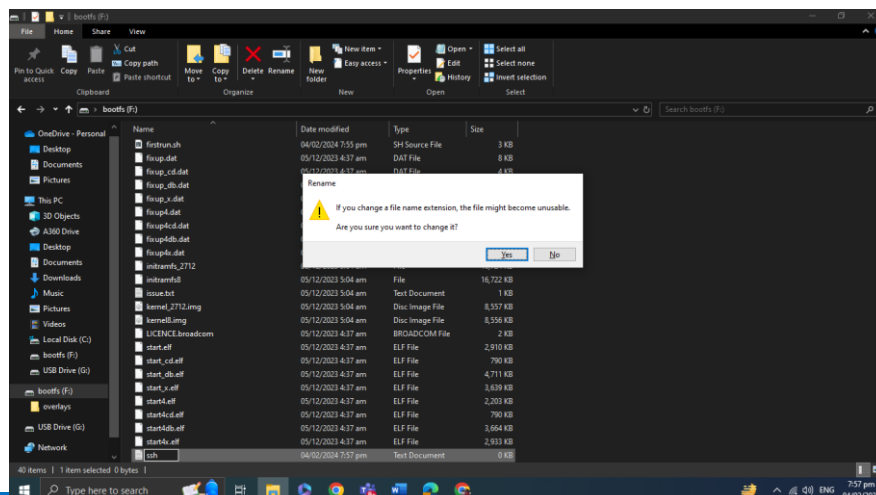
Step 13: After that, Click Yes.



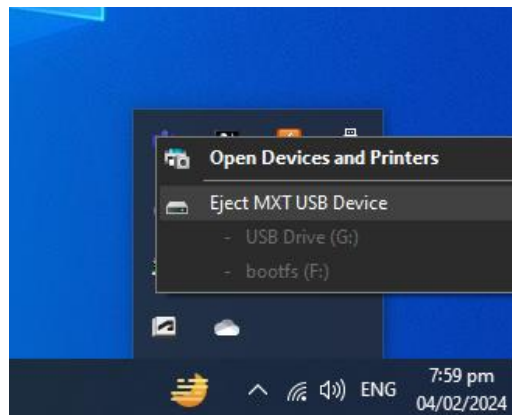
Step 14: Raspberry Pi Imager start Writing. Please Wait.



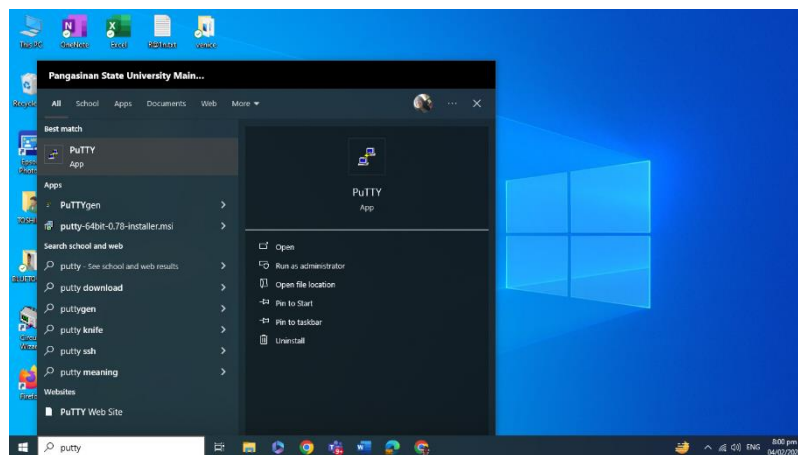
Step 15: Raspberry Pi Imager is Verifying. Please Wait.**Step 16: Write Successful! Click Continue. You can now remove the SD card from the card reader and plug in again.****Step 17: Click bootfs (F:)**

Step 18: Right Click, then click New and Click Text Document.**Step 19: Write ssh and remove its extension name, the Press Enter.****Click Yes.**

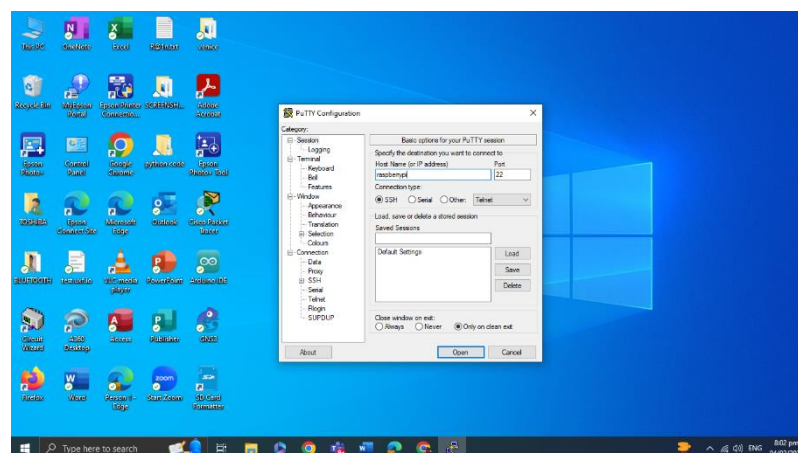
Step 20: Eject your USB, then insert the microSD card in Raspberry Pi.

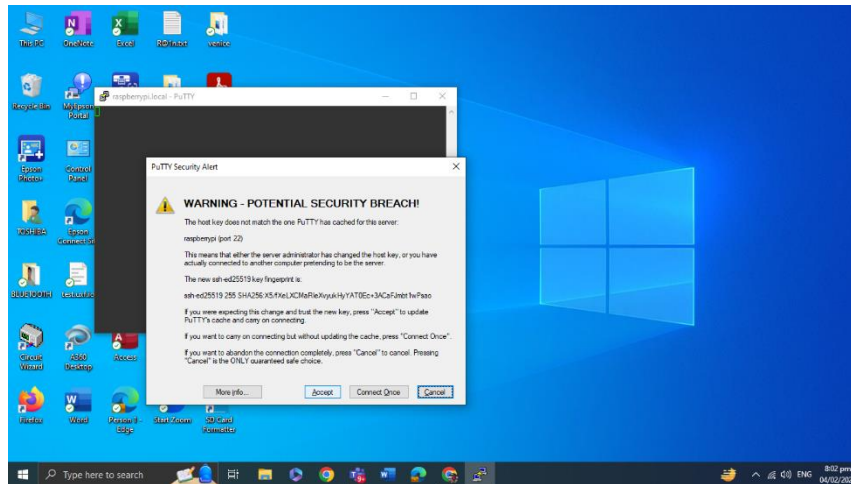
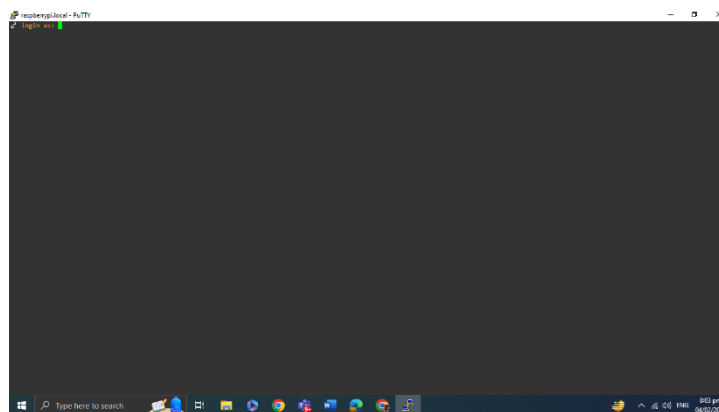
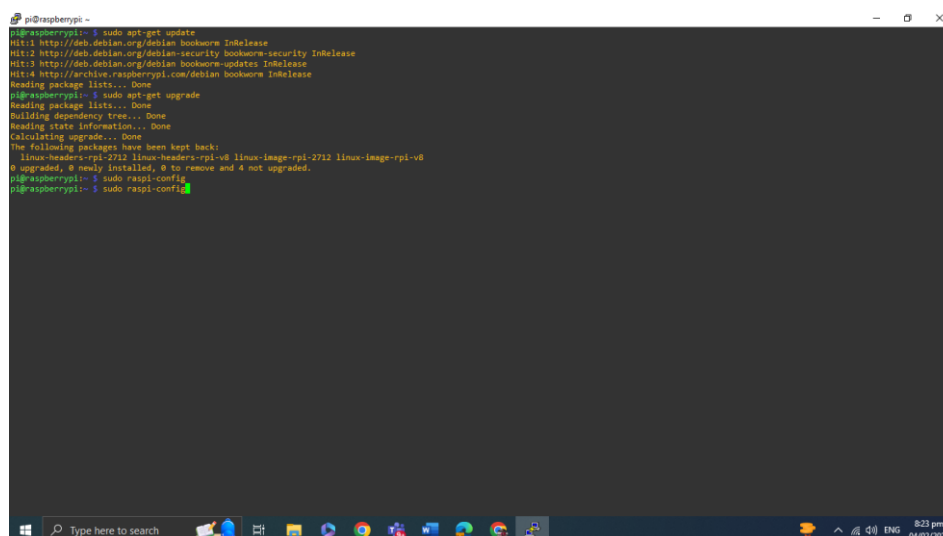


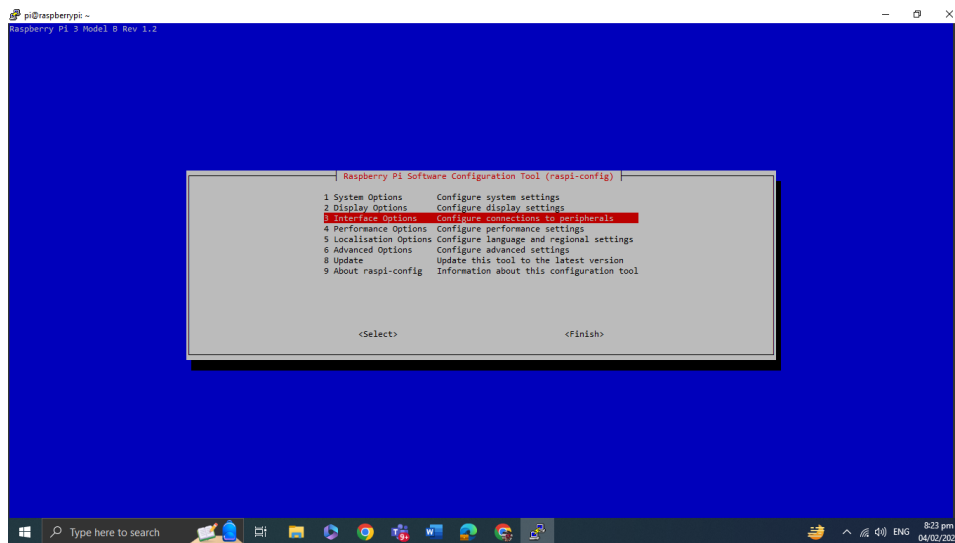
Step 21: Run your PuTTY.



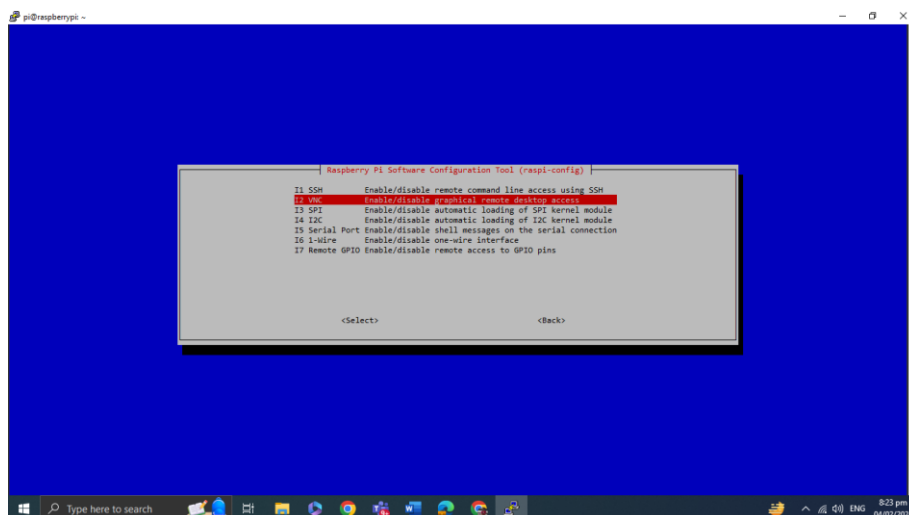
Step 22: Enter your Hostname to SSH your Raspberry Pi then click open. If you didn't know your hostname, go back to Step 11.



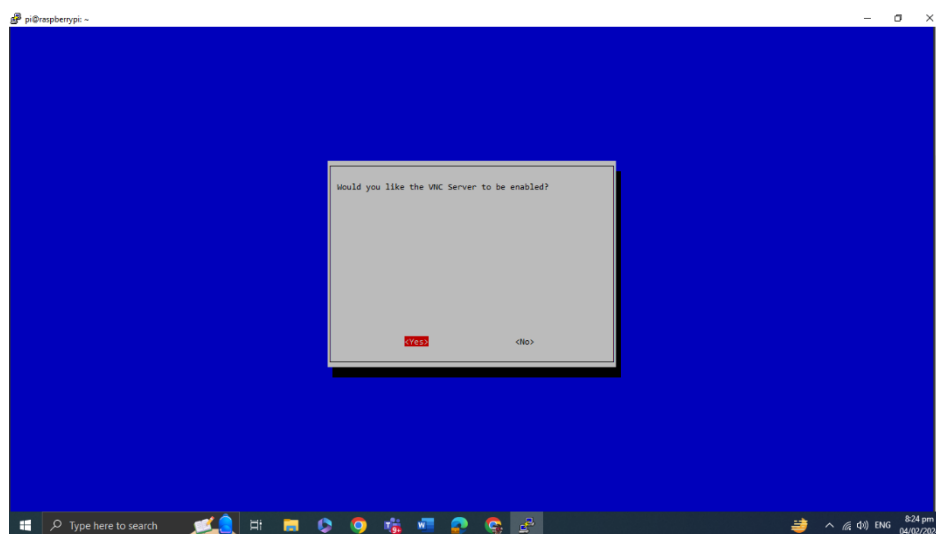
Step 23: Click Accept.**Step 24: Log in on your Raspberry Pi using your username and password that you create before.****Step 25: Type “sudo raspi-config” to go in Raspberry Pi Software Configuration Tool.**

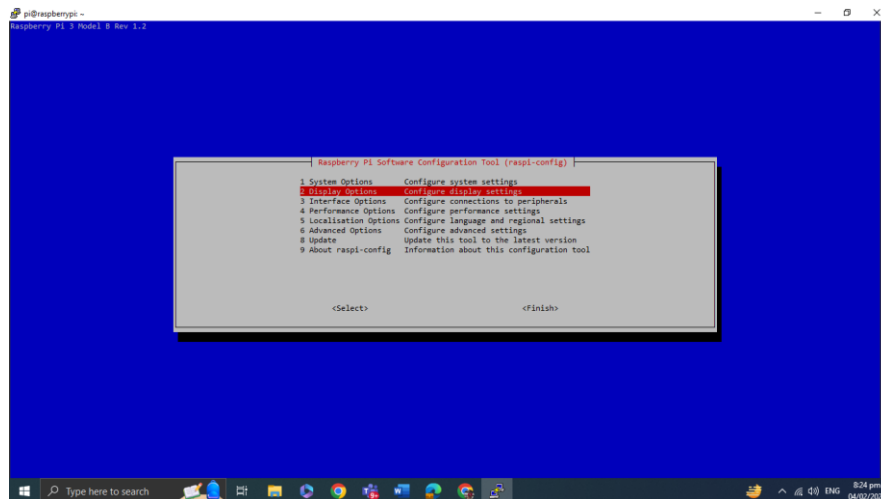
Step 26: Choose Interface Options then press Enter.

Choose VNC to enable the graphical remote desktop access.

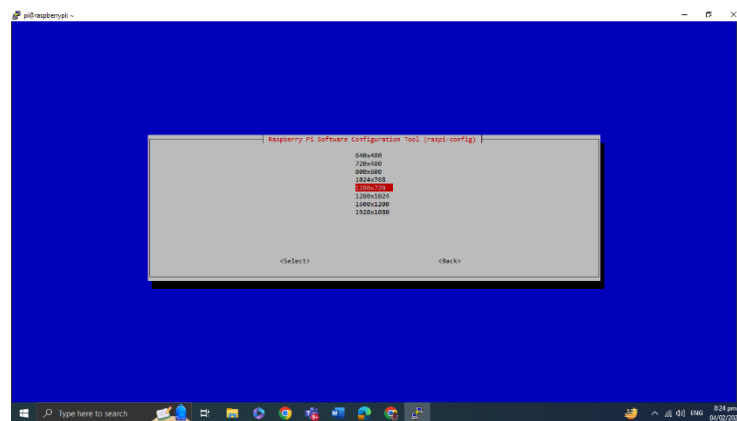


Click Yes to Enabled VNC Server.

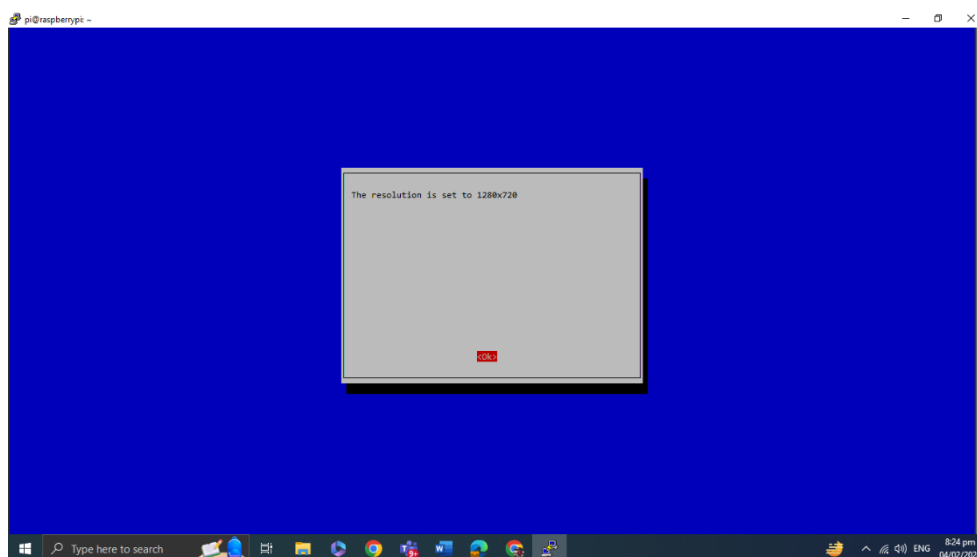


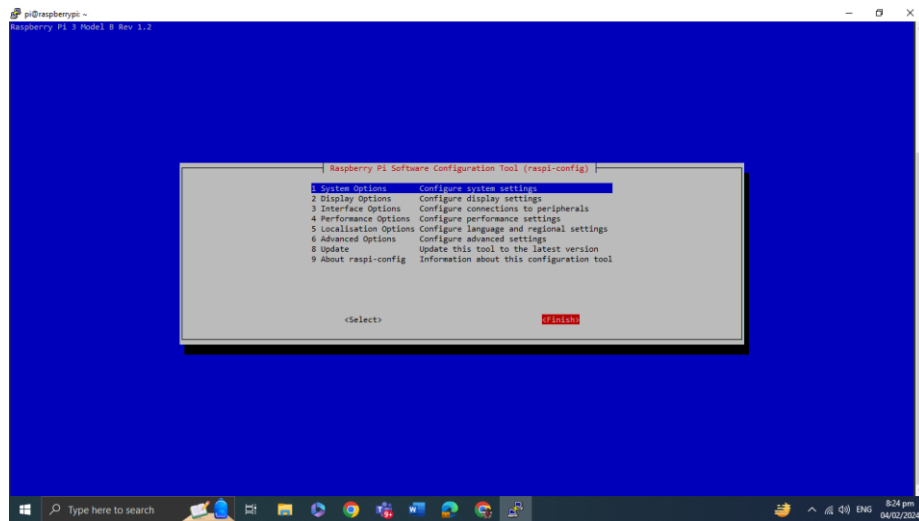
Step 27: Next, Choose Display Options then press Enter.

Choose your VNC Resolution

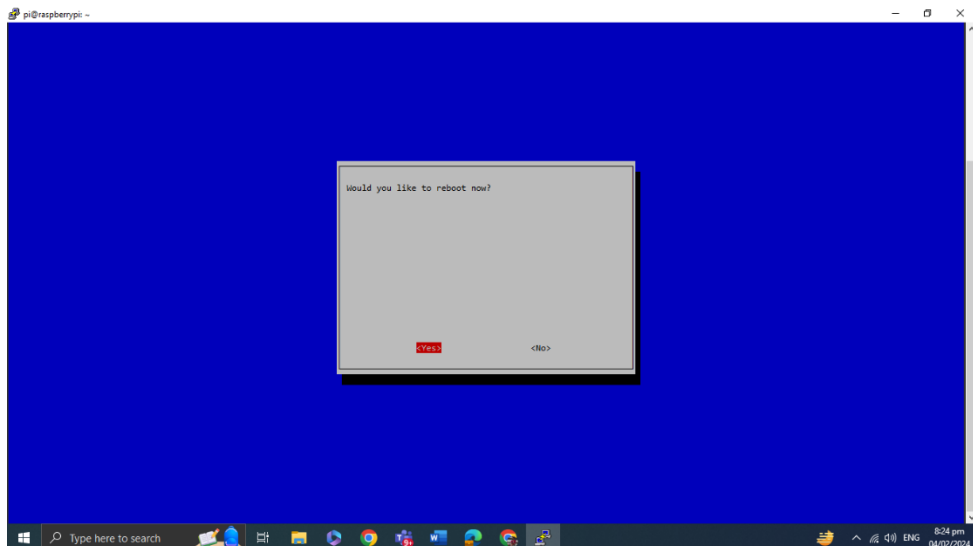
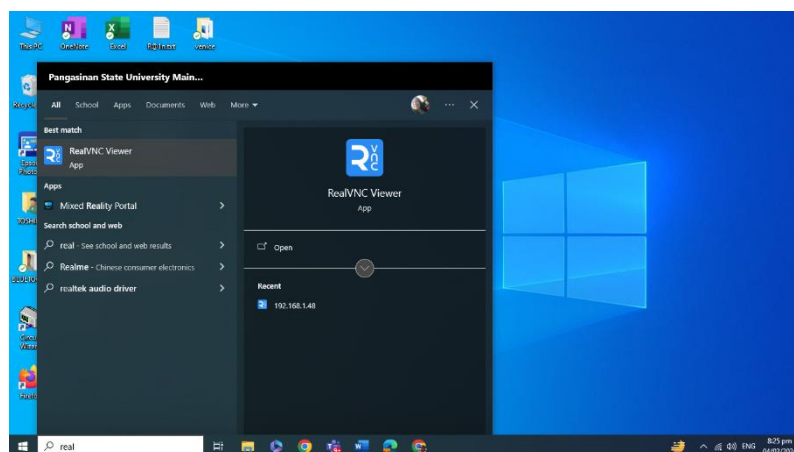


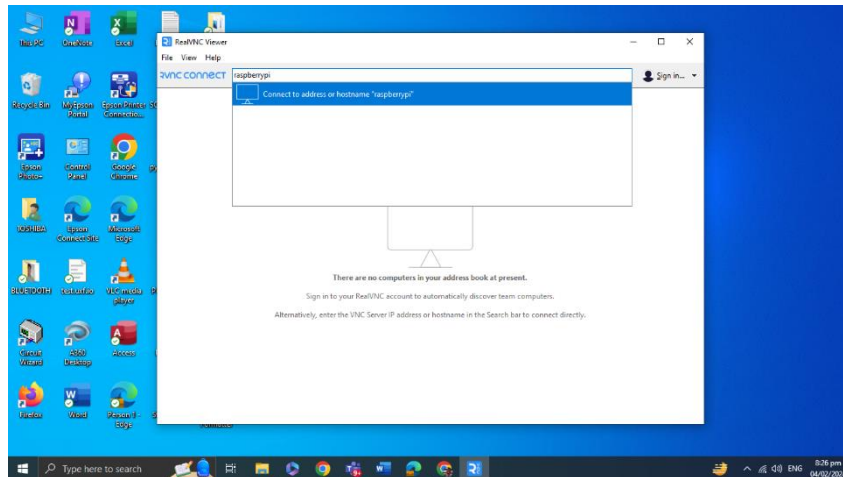
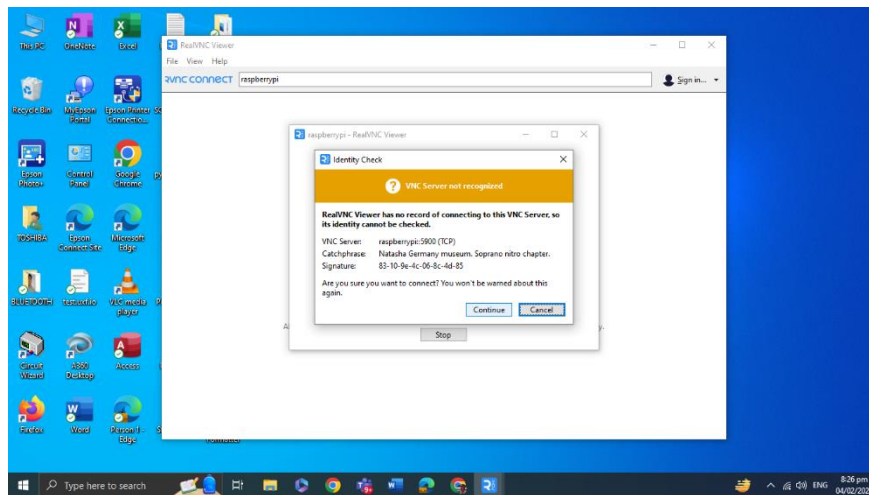
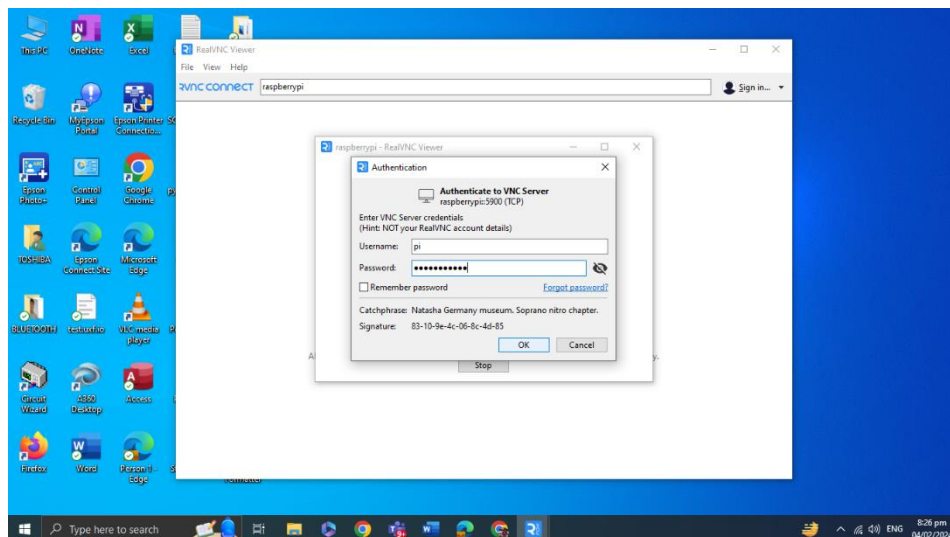
Click Ok.

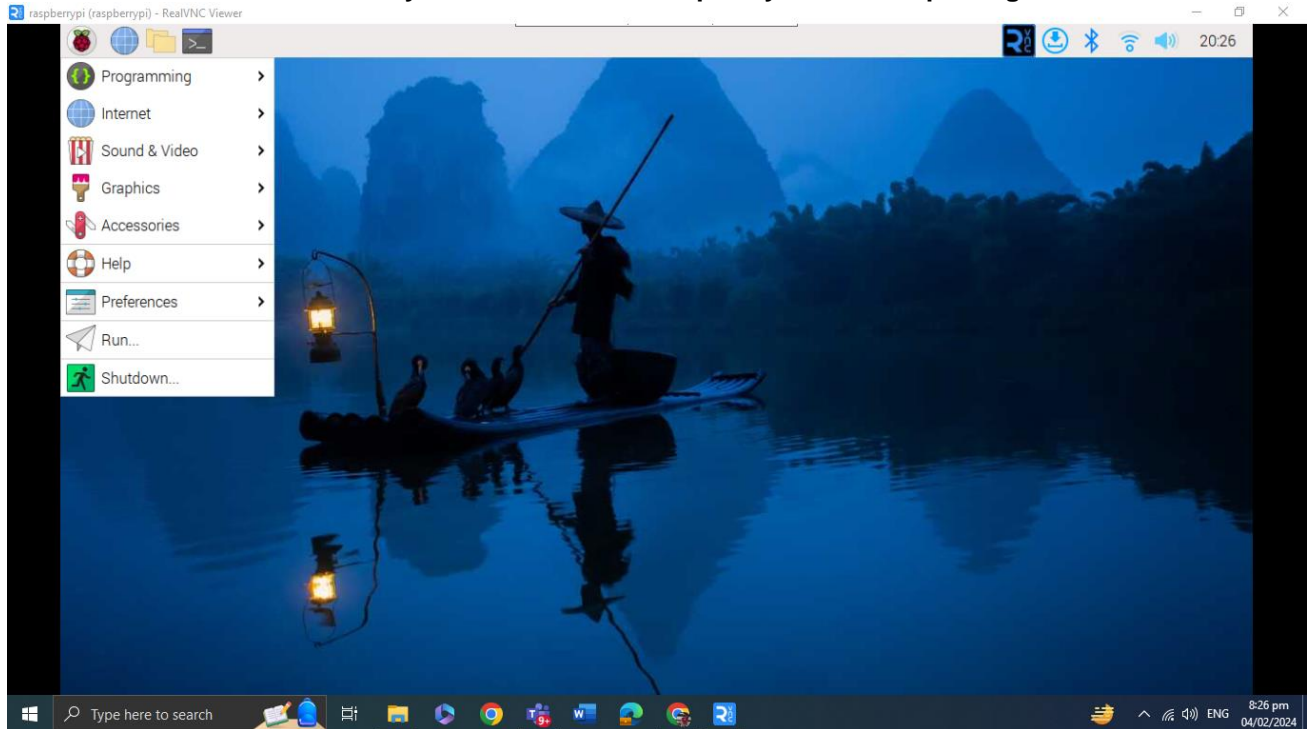


Step 28: Click Finish!

Click Yes to reboot your Raspberry Pi and to apply changes.

**Step 29: Run your RealVNC Viewer.**

Step 30: Type the hostname of your Raspberry Pi in the search bar of VNC Viewer.**Click Continue!****Enter VNC Server credentials.****Hint: Your username and your password in your raspberry Pi.**

You should now be successfully connected to the Raspberry Pi's desktop using VNC**SUMMARY / CONCLUSION**

Raspberry Pi's desktop, coupled with VNC (Virtual Network Computing), offers a powerful solution for remote access and control. Enabling users to interact with the Raspberry Pi graphical interface from any device facilitates seamless operation, particularly in headless setups without a connected monitor. Setting up VNC is user-friendly, with various server options like RealVNC and TightVNC, providing flexibility across different operating systems such as Windows, macOS, and Linux.

The convenience of VNC comes with considerations for performance and security. While the responsiveness of the connection depends on factors like network speed and graphical complexity, it generally provides an acceptable user experience. However, ensuring the security of the VNC connection is paramount, with the implementation of passwords and encryption to safeguard against potential risks. Despite these considerations, the resource efficiency of VNC makes it an excellent choice, allowing users to save physical space and resources by eliminating the need for a dedicated monitor, keyboard, and mouse for the Raspberry Pi.

In conclusion, Raspberry Pi's desktop, coupled with VNC, offers a versatile and accessible solution for users looking to remotely manage their Raspberry Pi projects. The straightforward setup, cross-platform compatibility, and resource efficiency make VNC an invaluable tool for a variety of applications, from server setups to IoT projects, enhancing the overall flexibility and usability of the Raspberry Pi platform.

REFERENCES

How to remotely access the Desktop of your Raspberry Pi over the internet / PiTunnel. (n.d.). PiTunnel.
<https://www.pitunnel.com/doc/access-vnc-remote-desktop-raspberry-pi-over-internet>



- IONOS editorial team. (2022, November 22). *How to set up a VNC on your Raspberry Pi*. IONOS Digital Guide. <https://www.ionos.com/digitalguide/server/configuration/setting-up-virtual-network-computing-on-raspberry-pi/>
- Kl, A. (2022, September 20). *Step by step tutorial to set up VNC on Raspberry Pi*. <https://www.linkedin.com/pulse/step-tutorial-set-up-vnc-raspberry-pi-arun-kl>
- Kl, A. (2023a, December 4). *Step by step tutorial to set up VNC on Raspberry Pi*. The Sec Master. <https://theseccmaster.com/step-by-step-tutorial-to-set-up-vnc-on-raspberry-pi/>
- RealVNC®. (2023, November 13). *Raspberry Pi VNC: how to set up a remote desktop / RealVNC*. <https://www.realvnc.com/en/blog/raspberry-pi-vnc/#:~:text=Enable%20VNC%20on%20Raspberry%20Pi,-The%20next%20step&text=To%20enable%20VNC%20on%20the,Then%20click%20'OK'.&text=Using%20the%20arrows%20to,%20and%20select%20'OK'>.

For your additional References that has been used please use the citation tools on the website <https://www.scribbr.com/> using APA 7th Edition English, and paste it below.