piRover Builds with K2

Configuring the Raspberry Pi Rev 1.1

Overview:

In this activity, you will configure the Raspberry Pi settings by accessing the Configurations tool from the File menu. You will continue the configuration task by connecting the Raspberry Pi to your local area network via your home or school Wi-Fi connection. This Wi-Fi connection is in addition to the Wi-Fi access point that the hostapd service (see connecting activity) is providing.

Finally, you will update the Raspian operating system. During this final task, it is critical that you have a sufficient charge on the piRover battery. The update and upgrade operations take significant time and resources. You do not want to lose power and crash during these updates. The SD card will likely be corrupted, and you'll need to start over with a new Yahboom image.

Prerequisites:

Prior to beginning the instruction provided in this lesson you must have completed the following:

1. piRover: Creating a Remote Connection

Performance Outcomes:

1. Modify Raspberry Pi Setting using the configuration interface.
2. Connect to a local area network and the Internet using Wi-Fi.
3. Update the Raspian operating system.

Resources:

1. Yahboom Raspberry pi G1 Tank Repository
2. Embedded Systems: Lecture 8: Lab 1: Building a Raspberry Pi Based WiFi AP
3. Raspberry Pi 3 – WiFi Station + AP

Materials:

1. Wi-Fi access point
2. Laptop or Workstation with Wi-Fi access

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Part 1: Remote Connection – Review

1. In the "Connecting" activity, you connected to the piRover using both a wired connection (Ethernet) and a Wi-Fi connection (hostapd).
2. With the piRover connected via Ethernet, you are able to remotely access the Raspian desktop by entering **yahboomtank.local** in the VNC Viewer address bar. You are required to authenticate on the Raspberry Pi as a valid user by entering **pi** as the username and **yahboom** as the password.
3. Accessing the piRover via Wi-Fi requires you to connect to the Wi-Fi access point provided by the piRover. The default name (SSID) for this access point is **Yahboom_Tank**. The default passcode for the connection was **12345678**. While you modified these values in the "Connecting" activity, you have just updated the operating system (OS) from Yahboom so the default values are required again. You will revise again in this activity.
4. With a Wi-Fi connection, you are able to remotely access the Raspian desktop by entering the IP address of 192.168.50.1 in the VNC Viewer address bar. Again, you are required to authenticate on the Raspberry Pi as a valid user by entering **pi** as the username and **yahboom** as the password.
5. If you are completing this as a virtual class (i.e. Zoom), the assumption is that you are connecting to the piRover via Ethernet and using your workstations Wi-Fi to access your Internet provider.
6. If you are testing piRover actions like driving and are not participating in class, then the Wi-Fi connection is used.
7. In this activity, it is assumed that you are connected to the piRover over the Ethernet connection.

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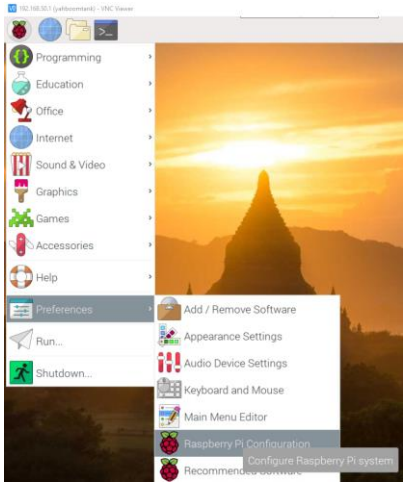
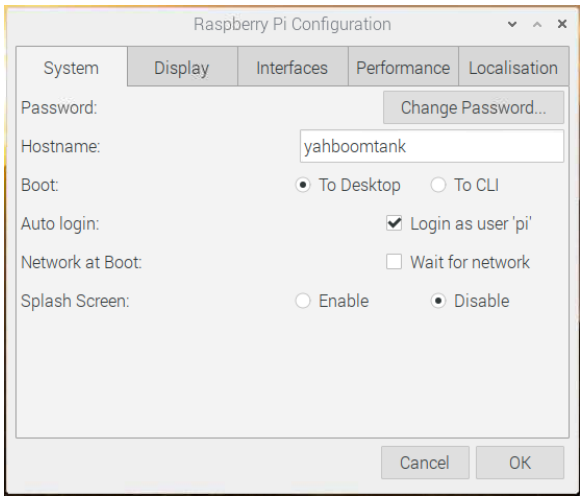
Part 2: Configuring the Raspian System

8. With your system connected via the VNC Viewer, open the Raspberry Pi configuration tool using the File menu as shown below.



9. The System configuration tab is displayed. Modify the Hostname, removing the underscore as shown below. The host name is now **yahboomtank** and matches that in the Wi-Fi AP configuration. The earlier error message will not be displayed.

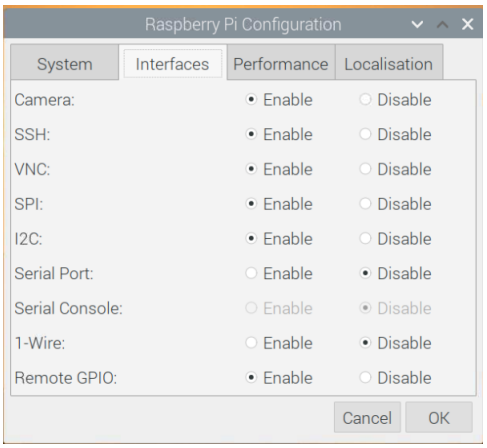
10. Use the Change Password... option to set the password. Use a password that is secure and one that you can remember. There is no way to reset the password. If you forget, you will need to start over with a new Yahboom image!



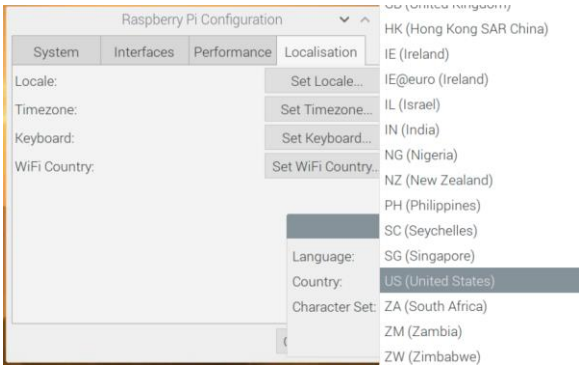
11. Review the Display tab but there are no modifications required here.

12. Select the Interfaces tab. Note that most are enabled. This is not typical when a new Raspberry Pi is configured. For now, note that the VNC service is on, enabling your current remote connection. You'll be

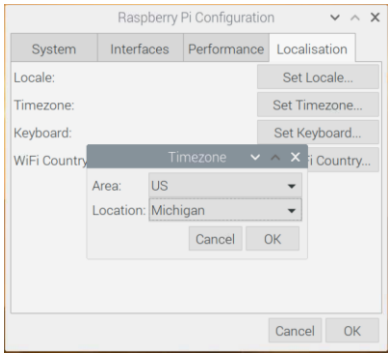
introduced to some of the other interfaces as you move through the course.



13. Select the Set Localisation (note spelling) and set the Country to US.

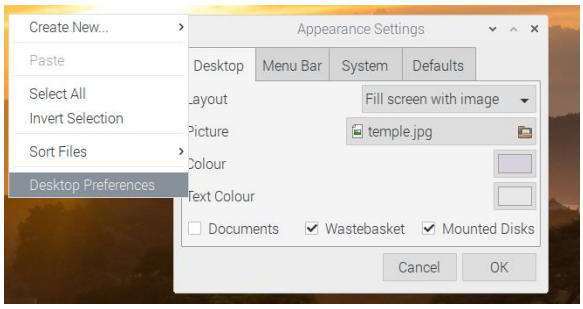


14. Click Set Timezone and update the setting for your location.

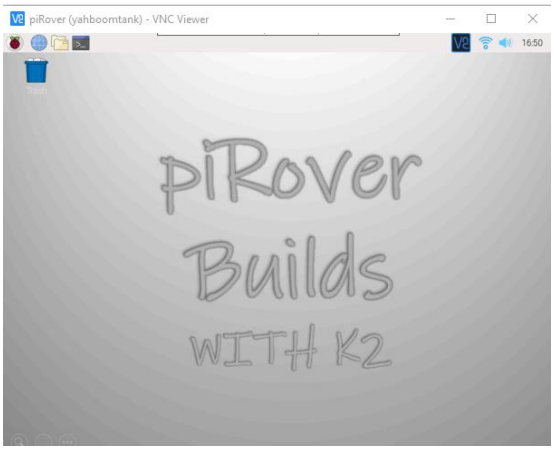


15. Ignore the Set Wi-Fi Country setting for now.

16. Select OK and the system prompts you to reboot. Let's make one other change to the system before rebooting. Right-click on the Desktop. The shortcut menu shown below is displayed. Select Desktop Preferences, and the Appearance Settings control appears. Click the folder icon in the Picture setting and select a new background.



17. Here the "piRover Builds with K2" image was copied to the system and used as the background image.

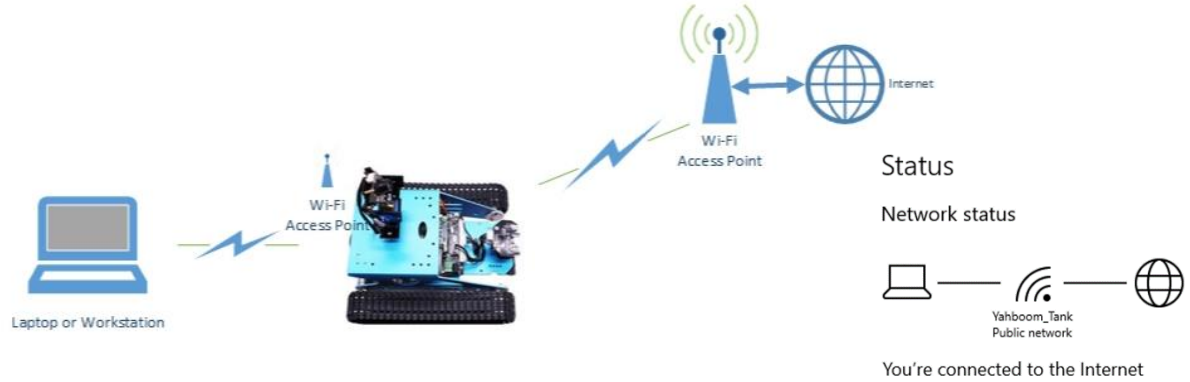


18. Reboot your system either using the menu option or by entering "reboot" at a terminal prompt.

Part 2: Establishing an Internet Connection

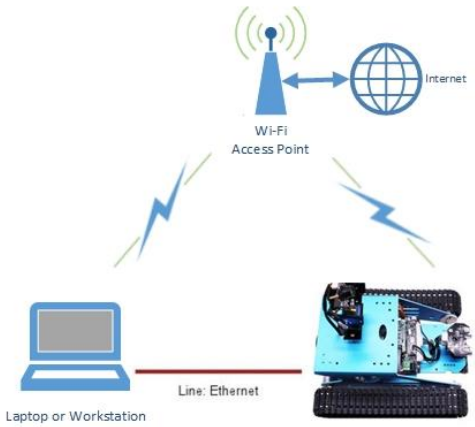
In the prior activity, you create a Wi-Fi connection to the piRover via the access point that it exposed. However, this connection does not provide internet connectivity. Checking your network status will show the connection from your workstation to the Yahboom_Tank access point, but there is no Internet access.

In this part of the configuration activity, you will connect the Raspberry Pi as a Wi-Fi client to your local area network via your home or school Wi-Fi access point. This will provide an Internet connection for the piRover and will also enable the piRover to be an Internet Hotspot for your laptop or workstation.



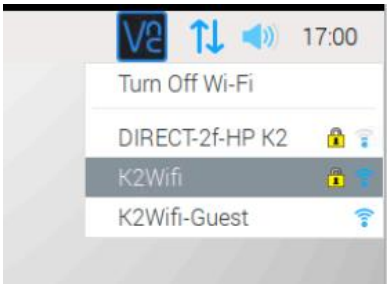
Keep in mind that while this will provide an Internet connection to your workstation, all traffic will be routed through the Raspberry Pi. This will significantly impact your connection speed, and this connection should only be used when working with the piRover.

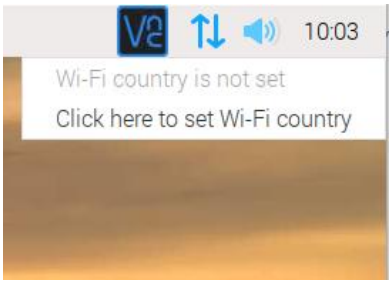
The assumption with this activity is that you are connected via Ethernet from your laptop or workstation. You also are using Wi-Fi on your workstation to connect to your internet provider, enabling a Zoom virtual class. In this activity you will also connect your piRover to your Internet access point so that both devices are able to access Internet resources. See the image on the following page.



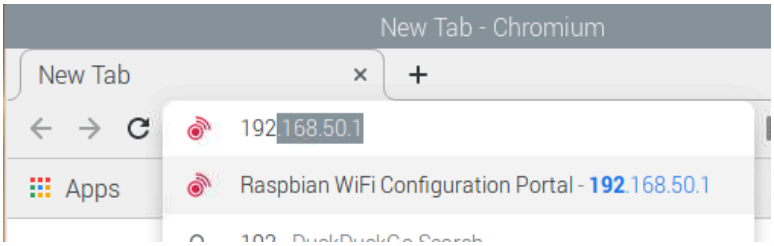
1. Reestablish your remote connection to the piRover and open the remote desktop in VNC Viewer.
2. The Wi-Fi status is shown in the upper righthand corner of the desktop on the taskbar next to the VNC icon. Note that it is currently showing no connection (double arrows).

3. Normally, you click on this icon to select the Wi-Fi access point from the available list as shown in the image on the left. However, with this Raspian configuration you will likely see an error message related to the Wi-Fi country code not being set as shown in the image on the right.

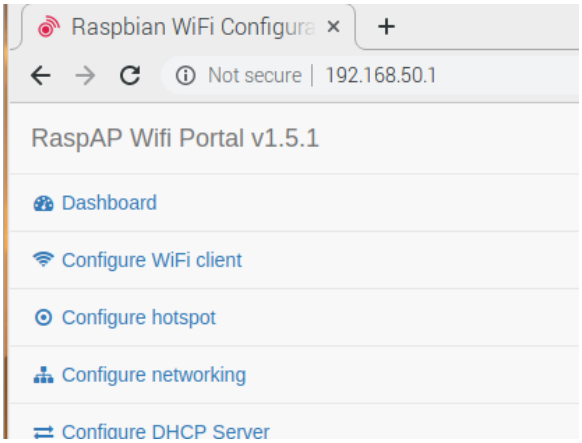




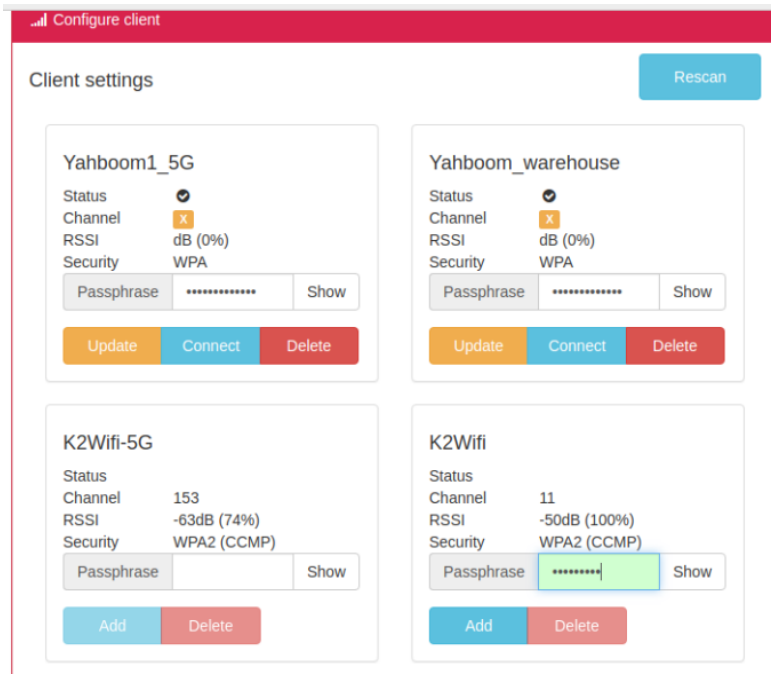
4. To connect to your Wi-Fi access point, open the browser and connect to the Raspian WiFi Configuration Portal at 192.168.50.1



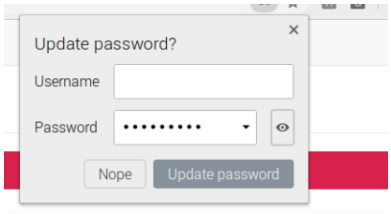
5. This is a local site that requires authentication. The username is ***admin*** and the password is ***yahboom***, but your system has stored these from prior access. You can just click Sign in.
6. Select the Configure WiFi client from the menu.



7. You will see the Wi-Fi access points stored on the system and also new connections available. You can delete the Yahboom connections likely used during factory setup. The image below shows the K2Wifi connections. You will see access points available to you. Connect to your home Wi-Fi or check with an instructor if you are connecting at school. A passphrase is required.



8. The browser prompts to save the password. Click Save.



9. The Wi-Fi client connection is made. Hover over the Wi-Fi icon to see the new IP address assigned to the wlan0 connection.

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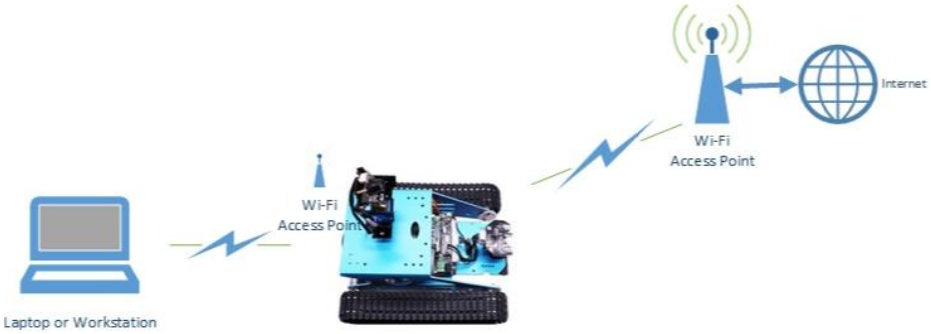
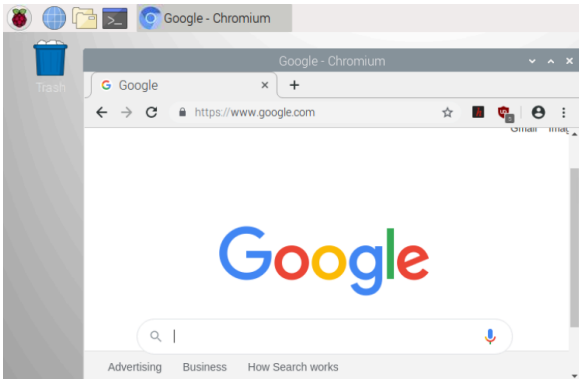
10. Note in the image above that there are two IP addresses shown. The uap0 connection is the piRover access point and enables the remote VNC connection from your workstation to the piRover. The wlan0 connection is the Wi-Fi client connection from the piRover to the home local area network. The uap0 IP address is the same for all piRovers. Your wlan0 address will be different due to the unique connection to your local area network.

uap0: 192.168.50.1 wlan0: 192.168.1.10

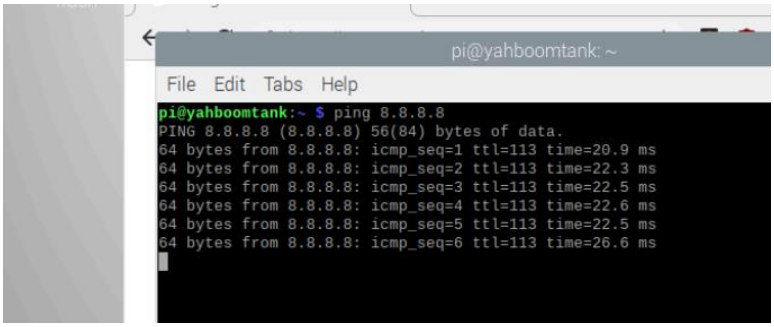


11. Verify that you have an Internet connection on the piRover by launching the browser using the icon on the taskbar and navigating to Google.com. The Google search page should load.



12. A more common way for a developer to check for an Internet connection is to "ping" a server. Open a terminal window and enter the following command. This "pings" the Google name space server at 8.8.8.8. If your connection is good, you will see replies as shown below. Close the window or use Ctrl+C to stop.

ping 8.8.8.8



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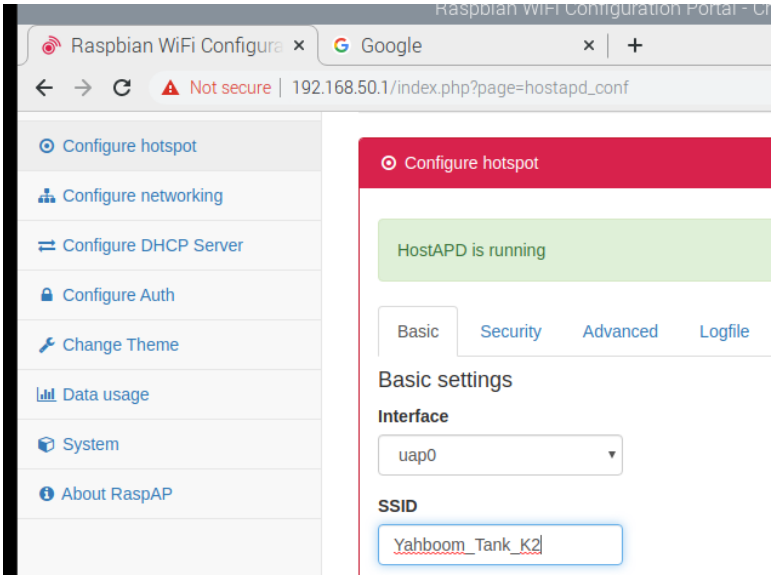
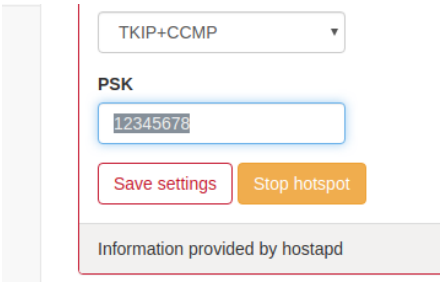
Part 3: Updating the piRover hotspot

13. In the earlier "Connecting" activity you used the command line to modify the hostapd configuration values to customize your piRover Wi-Fi access point (SSID). Click on the "Configure hotspot" item on the RaspAP menu.
14. Update the SSID from Yahboom_Tank to one that includes your initials.



15. Update the passcode for the Wi-Fi by clicking on the Security tab and replacing the PSK value of 12345678. Consider using the same password that you used for the pi user during your initial configuration updates.



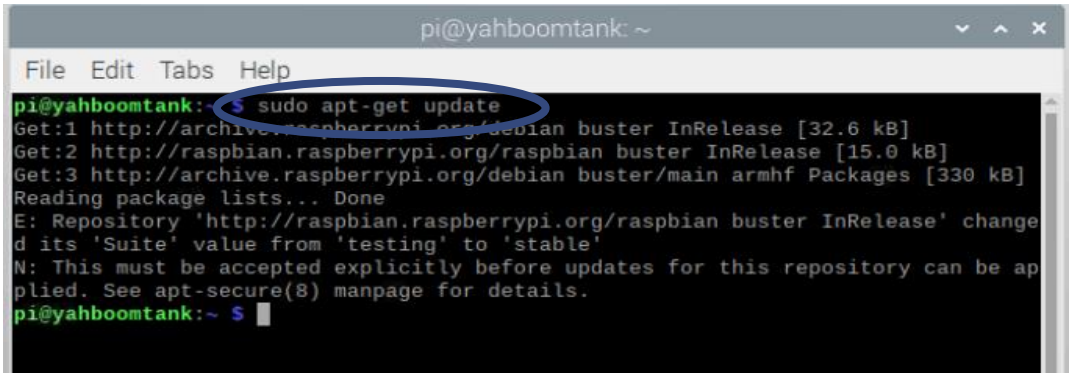
Part 3: Updating the Raspbian Operating System

In the final configuration step, you update the Raspbian operation system. This results in significant changes to the system and will take a long time to complete based on how long it has been since the last update was run. YOU MUST have a fully charged battery prior to performing this step. If you lose power during the update, the system

image in the SD card will likely get corrupted. You will need to start over with a new piRover image.

1. Open a command prompt and run the following command. This accesses a package manager and updates the list of available packages (updates). This action will run relatively quickly because is just updates the list of packages…nothing is installed.

   sudo apt-get update

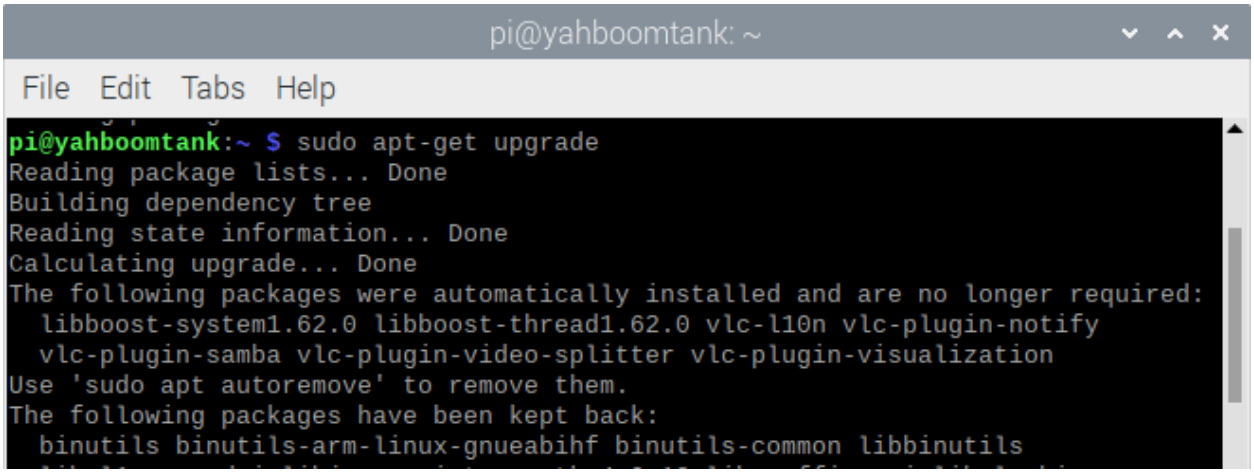


2. There will likely be a message on an update to "buster" version. Accept this update by entering the following.

   sudo apt update -y

3. Finally, upgrade your system based on the new package list by entering the following command. This installs updates and does use additional space on the SD card. Reply **Yes** when prompted.

   sudo apt-get upgrade



4. Again, this upgrade will take a significant amount of time based on the number of packages that must be updated. When the upgrade is complete, reboot and verify that you can still connect and interact with the Raspian desktop.

Assessment:

Create the following images using a screen capture tool. See the Toolbox section on the Moodle site for assistance with screen capture.

1. Raspbian_desktop.jpg – use a screen capture tool to grab an image of your Raspian desktop showing a revised background image (see part 1 – step 13)
2. WiFi_Internet.jpg – use a screen capture tool to show the active Internet connection on Raspberry Pi. Hover over the icon on the task bar to get the IP addresses displayed as shown in step 3 of part 2.
3. Update_upgrade.jpg – return to a terminal window on the Pi. Use the up-arrow key to access the command history and run the update command followed by the upgrade command of part 3. This command will be completed immediately because you just completed the required updates. Capture an image of the terminal window.
4. Submit Rasbpian_desktop.jpg, WiFi_Internet.jpg, and Update_upgrade.jpg along with other weekly assignment in a zip file to the Moodle site.