piRover Builds with K2

Configuring the Raspberry Pi Rev 1.0

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: Configure the Raspberry Pi

1. In the last activity, you configured a Wi-Fi access point on your piRover. You will use this along with the VNC Viewer application on your workstation to provide remote access to your system. This connection is required for most activities from this point on. To make your remote connection…

    a. On your workstation, connect to the Wi-Fi access point created by your piRover. Course examples use Yahboom_Tank_K2. Yours will be named differently. If you have difficulty creating this connection, refer to the prior Remote Connection activity.

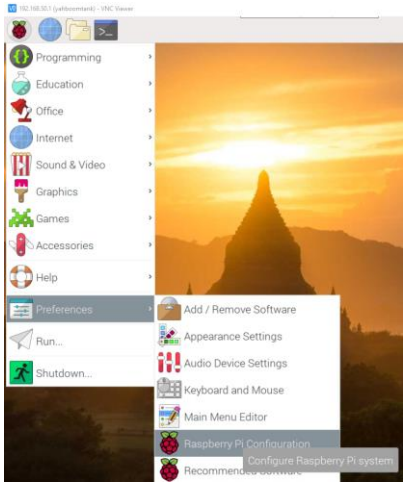
    b. When creating the Yahboom_Tank connection you use the password specified during the Remote Connection activity.

    c. Launch VNC Viewer on your workstation and connect to the piRover. A static IP address is used, meaning it does not change. It is **192.168.50.1** for all piRovers. It is the SSID of the Wi-Fi access point (Yahboom_Tank_[your initials]) that determines the piRover that you are connecting to.

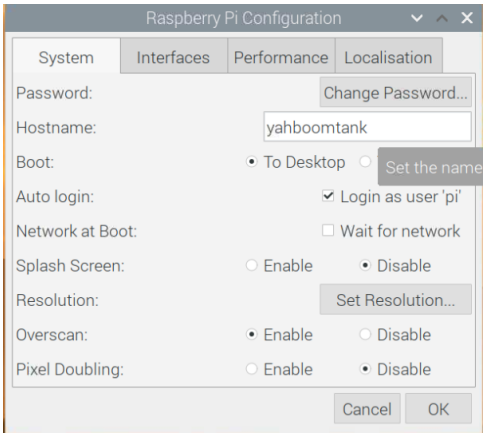
    d. When making the remote connection with VNC, **pi** is the username and the default password is **yahboom**. You update the password in this activity so that it matches the one you set for the Wi-Fi access.

    e. Setting passwords to identical values is not the best practice, but in this case, you are the only user and using consistent passwords for access prevents connection issues.

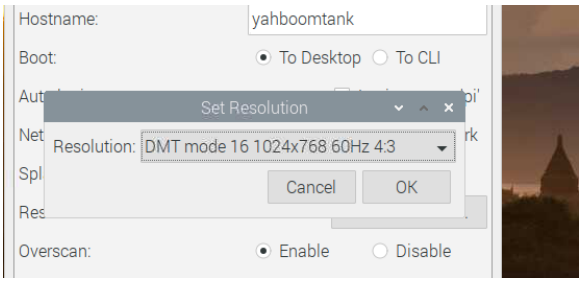
2. With your system connected via the VNC Viewer, open the Raspberry Pi configuration tool using the File menu as shown below.



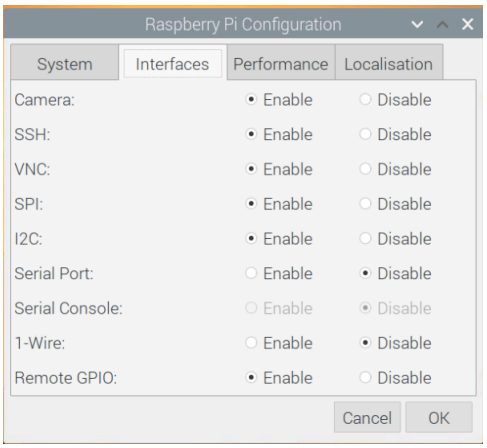
3. The System configuration tab is displayed. Modify the Hostname, removing the underscore as shown below. The host name is now **yahboomtank** and matches that in the Wi-Fi AP configuration. The earlier error message is will not be displayed.
4. Use the Change Password... option to reset the password to the same value you provided in the AP configuration file during the Remote Connection activity.



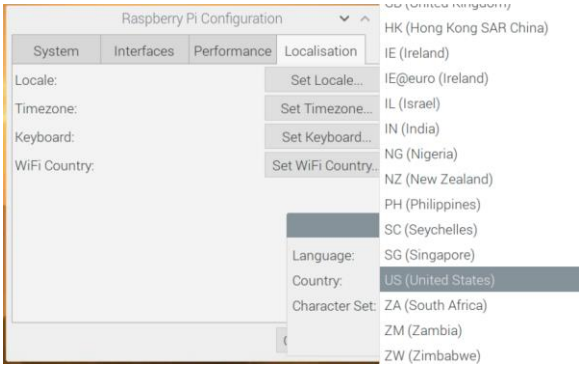
5. Note the Set Resolution button. This setting is not normally used when there is a monitor connected to the Pi. The system can determine the best screen resolution for the monitor connected. But, in your case, you are using the Raspberry Pi in what is called a "headless" mode, meaning there is no monitor connected. You are displaying the desktop via remote software. There is no HDMI monitor connection and the preferred resolution is unknown. You may need to modify the screen resolution depending on the monitor or screen on your workstation or laptop.
6. If the Raspian desktop looks "big" on your monitor, it is likely using the lowest resolution setting. Click on the Set Resolution... button and increase the resolution. A good option is "DMT mode 16 1024 x 768. You can adjust to other resolutions but be careful here. If you set to a resolution that you cannot work with remotely, you'll be required to attach an HDMI monitor to fix.



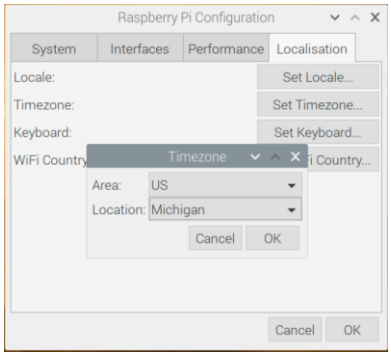
7. Select OK and the system prompts you to reboot. Select Yes. You will lose the VNC remote connection. Wait for the reboot and use VNC to reestablish the connection. Recall that you did modify the password, so new credentials will need to be entered for the VNC connection.
8. Return to the Configuration tool and click on the Interfaces tab. Note that most are enabled. This is not typically 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.



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

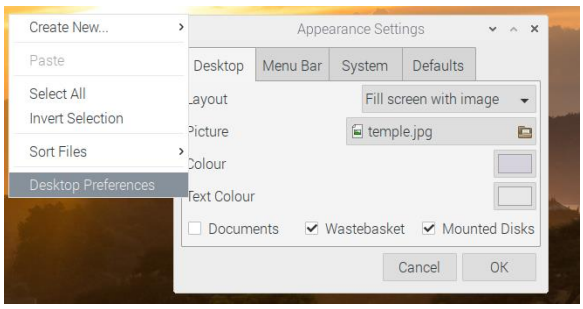


10. Click Set Timezone and update the setting for your location.

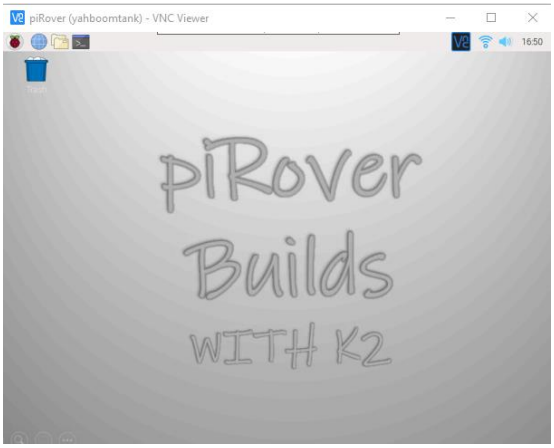


11. Ignore the Set Wi-Fi Country setting for now.

12. Select OK and the system prompts you to reboot. Let 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.



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

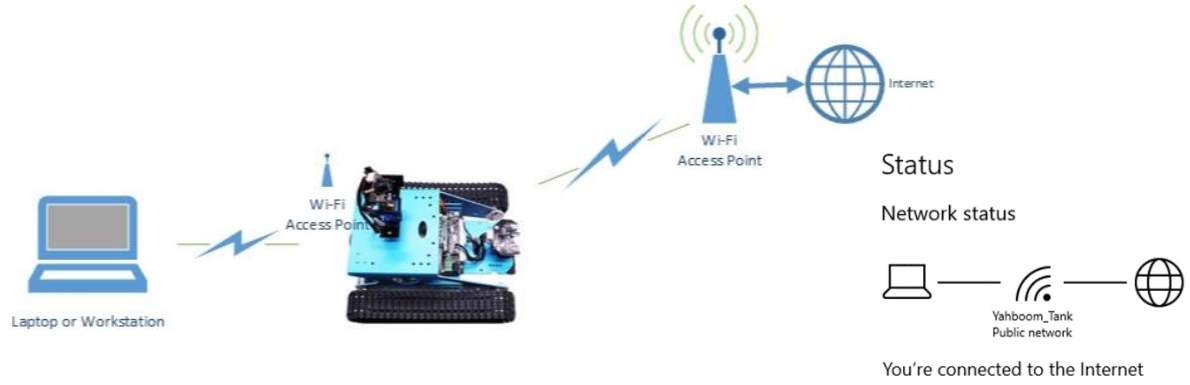


14. Reboot your system either using the menu option or by entering "reboot" at a terminal prompt.

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.

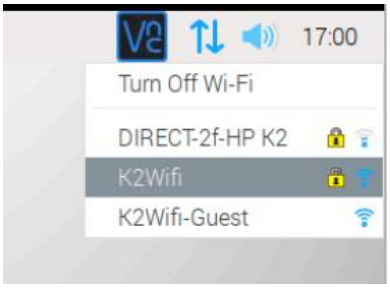
In this part of the configuration activity, you will connect the Raspberry Pi as a Wi-Fi client to your local area network via your home or school Wi-Fi access point. This will provide an Internet connection for the piRover and will also enable the piRover to be an Internet Hotspot for your laptop or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

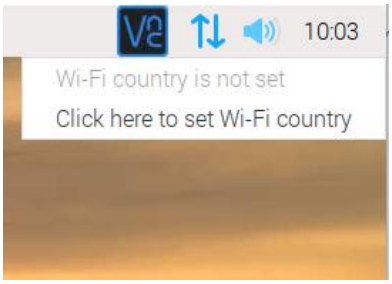


Keep in mind that while this will provide an Internet connection to your workstation, all traffic will be routed through the Raspberry Pi. This will significantly impact your connection speed, and this connection should only be used when working with the piRover.

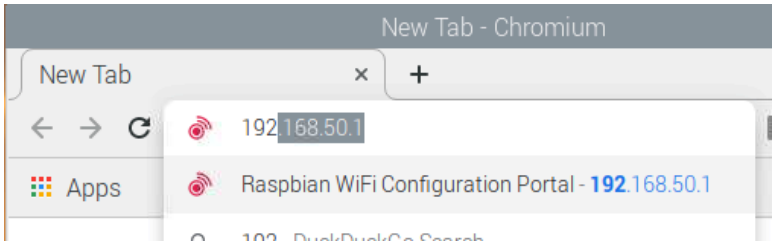
1. Reestablish your remote connection to the piRover by connecting to the Yahboom_Tank access point and opening the remote desktop in VNC Viewer.
2. The Wi-Fi status is shown in the upper righthand corner of the desktop on the taskbar next to the VNC icon. Note that it is currently showing no connection (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.

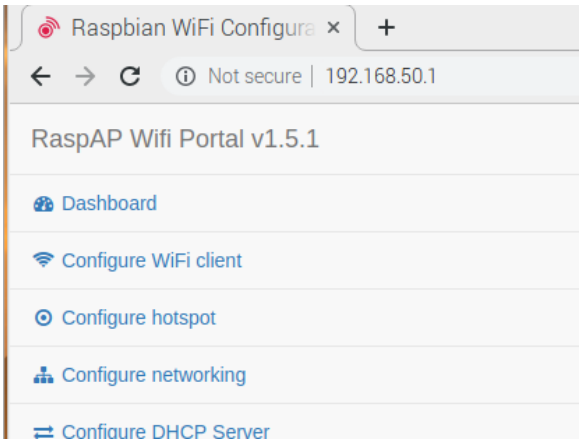




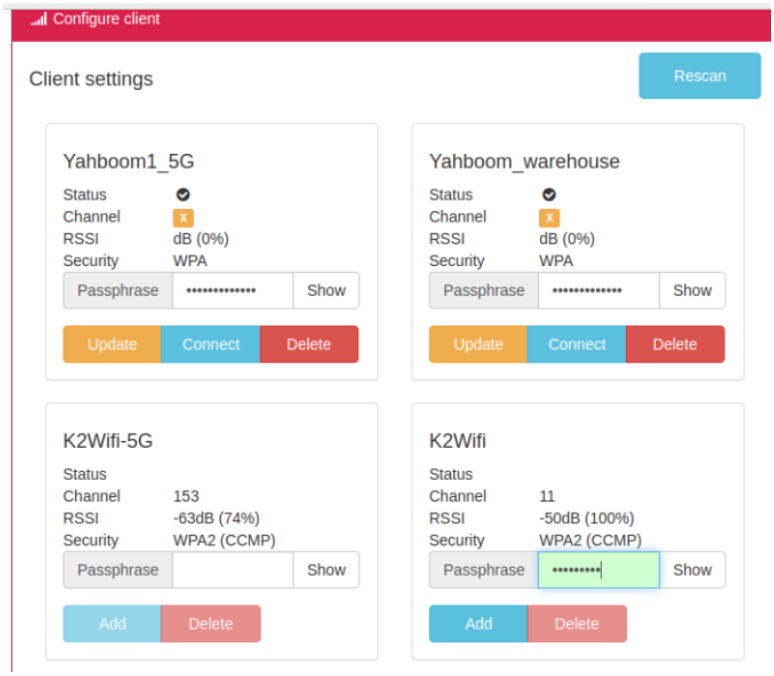
4. To connect to your Wi-Fi access point, open the browser and connect to the Raspian WiFi Configuration Portal at 192.168.50.1



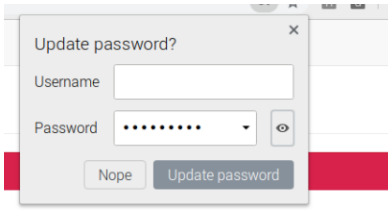
5. This is a local site that requires authentication. The username is ***admin*** and the password is ***yahboom***, but your system has stored these from prior access. You can just click Sign in.
6. Select the Configure WiFi client from the menu.



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. This is not required.



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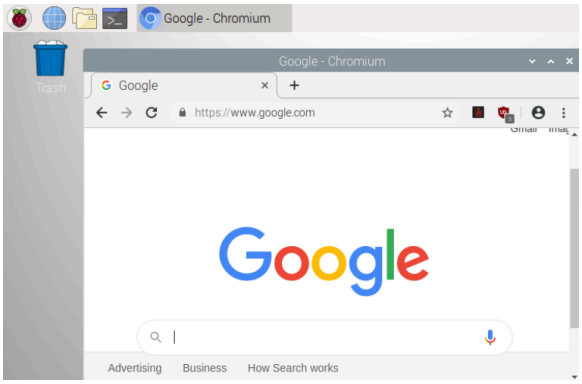
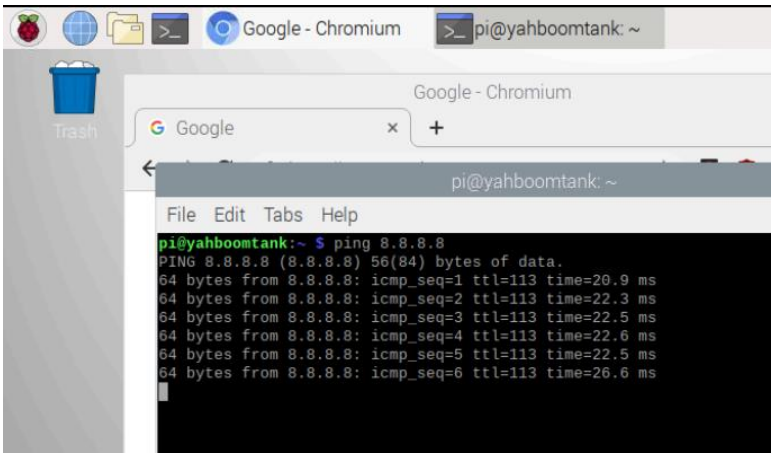
10. Note in the image above that there are two IP addresses shown. The uap0 connection is the piRover access point and is enabling the remote VNC connection from your workstation to the piRover. The wlan0 connection is the Wi-Fi client connection from the piRover to the home local area network. The uap0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

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.

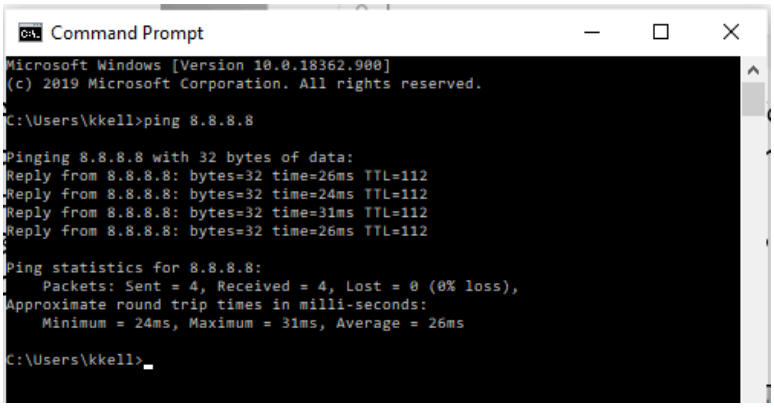


12. A more common way for a developer to check for an Internet connection is to "ping" a server. Open a terminal window and enter the following command. This "pings" the Google name space server at 8.8.8.8. If your connection is good, you will see replies as shown below. Close the window or use Ctrl+C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

    ping 8.8.8.8



13. Now verify that you have an Internet connection on your desktop. Unless you have another connection such as wired Ethernet, any Internet traffic on workstation is routed through the Raspberry Pi. Again, this connection is limited and will typically be used only during piRover activities.



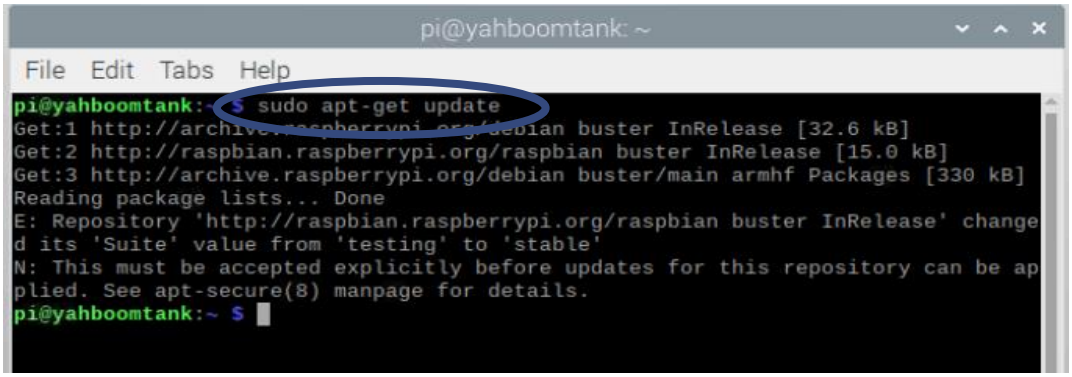
Part 3: Updating the Raspbian Operating System

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.

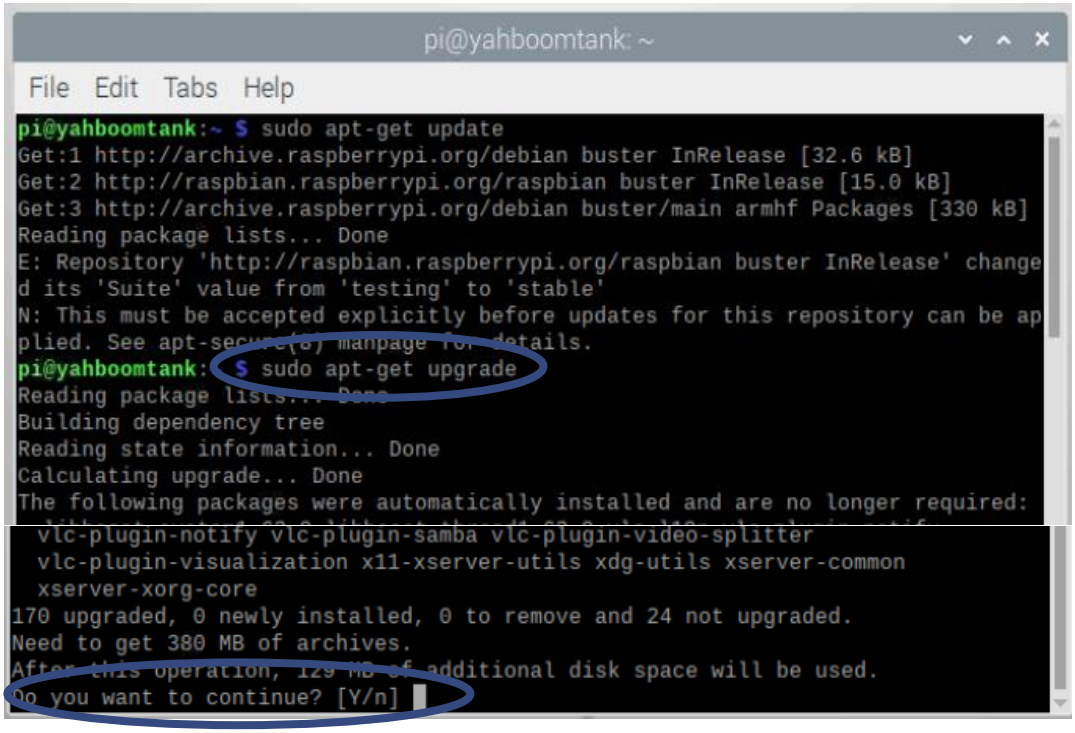
   sudo apt-get update



2. There will likely be a message on an update to “buster” version. Try again with the following parameter added.q

   sudo apt-get update --allow-releaseinfo-change

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.



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 complete immediately because you just completed 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.