

piRover Builds with K2

Creating a Remote Connection

Rev 1.0

Overview:

In this activity, you will connect to your Raspberry Pi and complete configuration steps so that you will have exclusive access to your piRover. These steps are critical if you are in a classroom environment where multiple Yahboom G1 Tank robots are active at the same time. Each piRover will be broadcasting the same Wi-Fi access by default. You must create a custom configuration for your device to be sure that you are connected to your device and not your neighbors!

Prerequisites:

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

1. piRover build and test

Performance Outcomes:

1. Connect to a Wi-Fi access point
2. Edit a configuration file to provide custom access
3. Modify the Wi-Fi access point name and authentication

Resources:

1. [Yahboom G1 Tank Repository](#)
2. [Setting up a Raspberry Pi as a WiFi access point](#)
3. [Embedded Systems: Lecture 8: Lab 1: Building a Raspberry Pi Based WiFi AP](#)
4. [Raspberry Pi 3 - WiFi Station + AP](#)

Materials:

1. Wi-Fi access point
2. Laptop or Workstation with Wi-Fi access
3. [VNC Viewer](#)
4. (optional) Laptop or Workstation with Ethernet network connection
5. (optional) Ethernet cable (provided in kit)
6. (optional) [Bonjour Print Services for Windows](#)

Connect and Configure the piRover Wi-Fi access point:

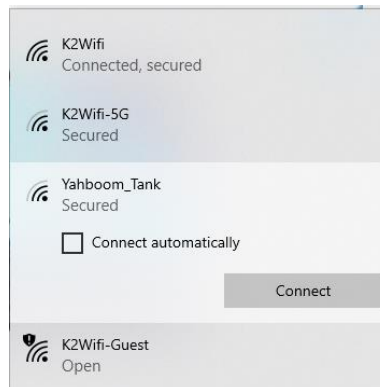
In the next section of the course, you will be remotely connecting to the piRover to write code and control. This requires that you make a

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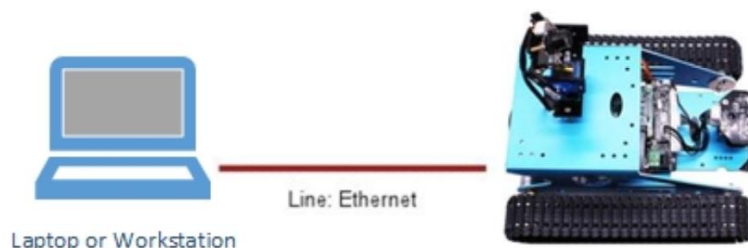
Wi-Fi connection from your workstation or laptop to the piRover. This connection is possible due to the Wi-Fi access point (AP) running on your piRover.



Boot your piRover and you will see the access point listed in the available Wi-Fi connections as Yahboom_Tank.



If you are working independently this connection method is sufficient, but many complete these activities in a classroom with multiple piRovers broadcasting the same Yahboom_Tank SSID. How can you make the connect and be sure that you are communicating with your piRover and not your neighbors?



The best procedure is to first connect to your Raspberry Pi with a wired or Ethernet connection. The required Ethernet cable is provided in your kit, but your workstation must also have an Ethernet port.

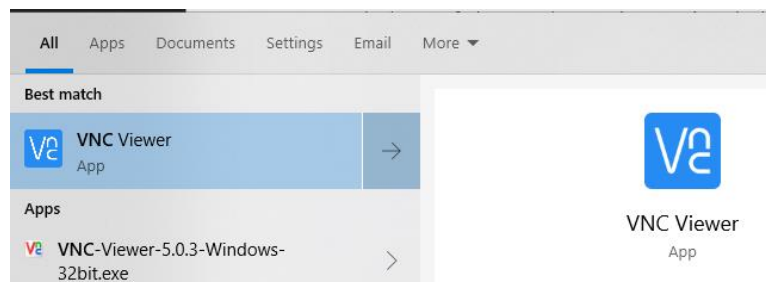
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This is available on most workstations, but if you're working with a laptop, a [USB-3](#) or [USB-C](#) adaptor may be required.

By making this direct connection between the workstation and the Raspberry Pi, you create an ad-hoc or peer-to-peer network connection between the devices. If you are on a Windows workstation, this peer-to-peer connection will only be discovered if you have installed [Bonjour Print Services for Windows](#).

Once the connection is made, you will use the VNC Viewer tool to remotely connect to the Raspberry Pi and interact with the Raspian operating system running on the Raspberry Pi.

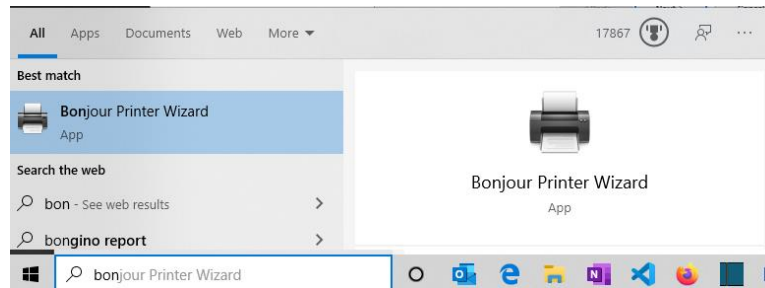
1. Download and install [VNC Viewer](#). This application enables you to connect to the Raspberry Pi remotely providing you with a virtual desktop of the Raspberry Pi's Raspian desktop. You do not need to sign up for a VNC account. You do not need to buy. Just download the viewer and install.
2. If you are working in a classroom or school lab, this installation is likely completed for you.
3. Type VNC into the Search to check.



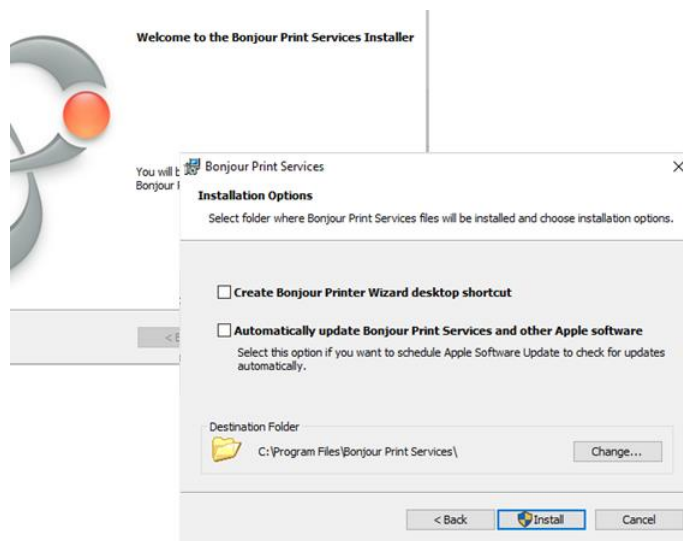
Directions for Wired Connection:

4. If you are on a Windows workstation, complete the installation of the Bonjour Print Services using the [Bonjour Print Services for Windows](#) link. If you are working in a classroom or school lab, this installation is likely completed for you. Check if the service is installed by typing bonjour into the Windows Search on your taskbar. If it is installed, the Print Wizard application will be displayed as shown below.

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5. If the service is not installed, follow the link provided to complete the download and installation. You can uncheck the shortcut and update options on the last screen of the installer. Again, this installation is not required if you are on a Mac workstation.



6. Connect the Ethernet cable between your workstation and the Raspberry Pi. Restart the Raspberry Pi by cycling the power. A peer-to-peer network is created due to the Bonjour discovery service.



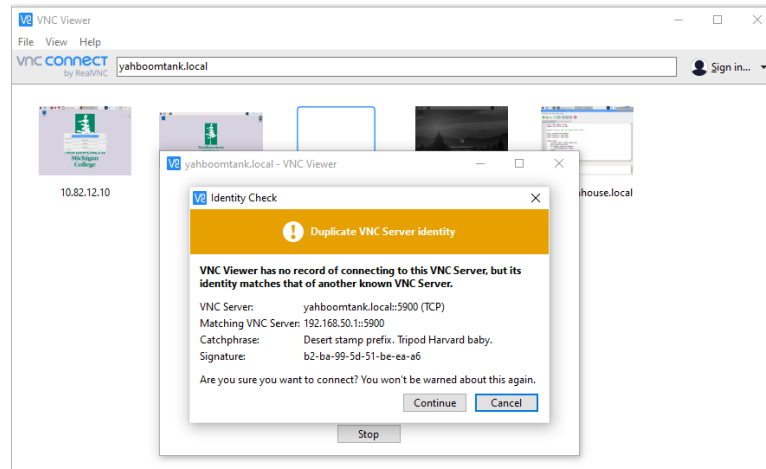
7. Launch VNC Viewer and connect to your device using the name shown below. The ".local" is added due to the peer-to-peer connection

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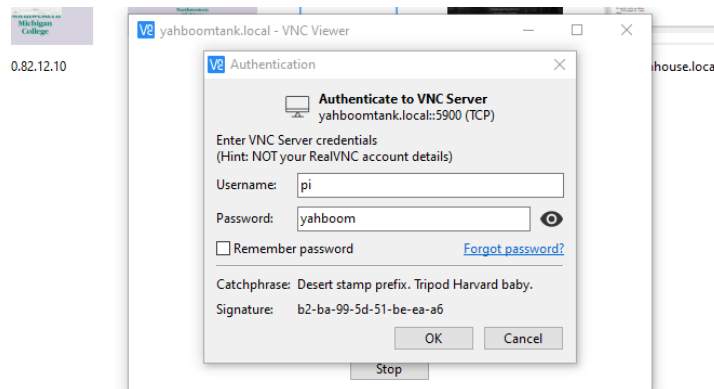
being used. With a normal Ethernet or Wi-Fi connection you will use just “yahboomtank”, dropping the “.local” at the end.

yahboomtank.local

8. The VNC remote connection is successful.

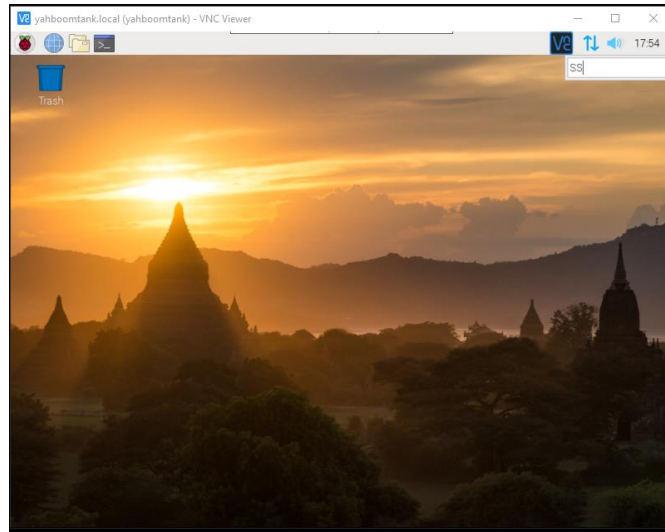


9. Ignore the initial message on duplicate identity. Enter the username **pi** and the default password **yahboom** as shown below.



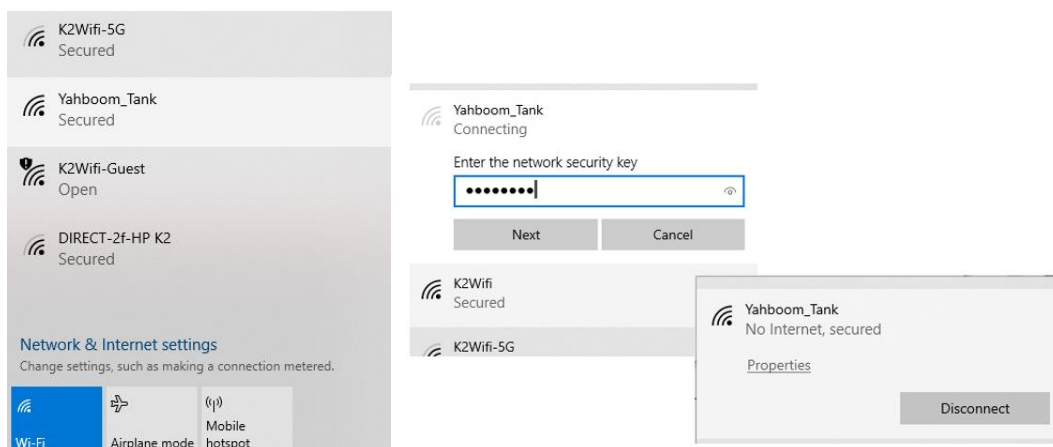
10. The remote viewer is launched with the virtual desktop showing the Raspberry Pi's Raspian interface.

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Directions for wireless – Wi-Fi Connection:

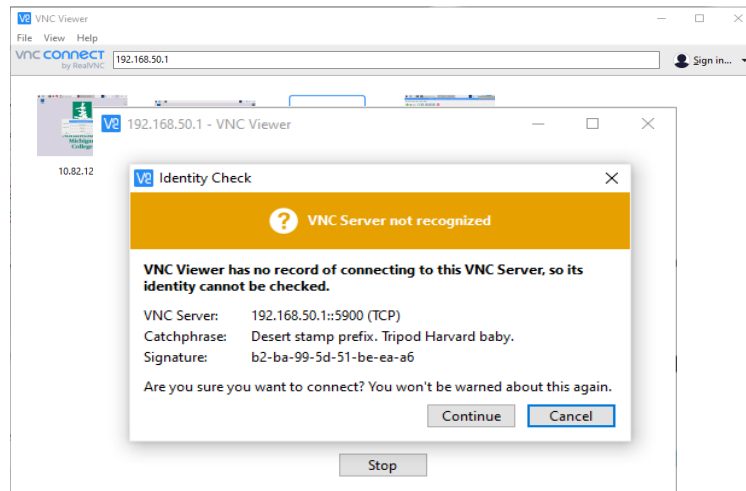
1. Connecting via the Yahboom Wi-Fi access point enables configuration changes to be made, however, connecting to a specific piRover can be difficult if multiple units are active in the Wi-Fi zone at the same time.
2. Boot the piRover and open the Wi-Fi Internet connections control on your workstation. The piRover will broadcast the Wi-Fi access point as **Yahboom_Tank**. See the example image below.



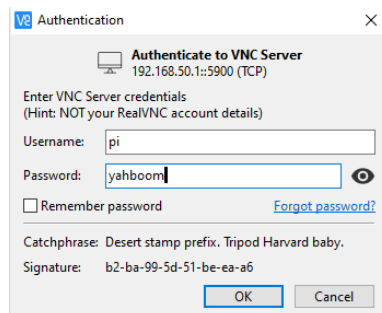
3. Connect to the **Yahboom_Tank** Wi-Fi. The connection is secure although using an older standard. Enter the required network security key – **12345678**. The Wi-Fi connection is made but there is no Internet connection available at this point.

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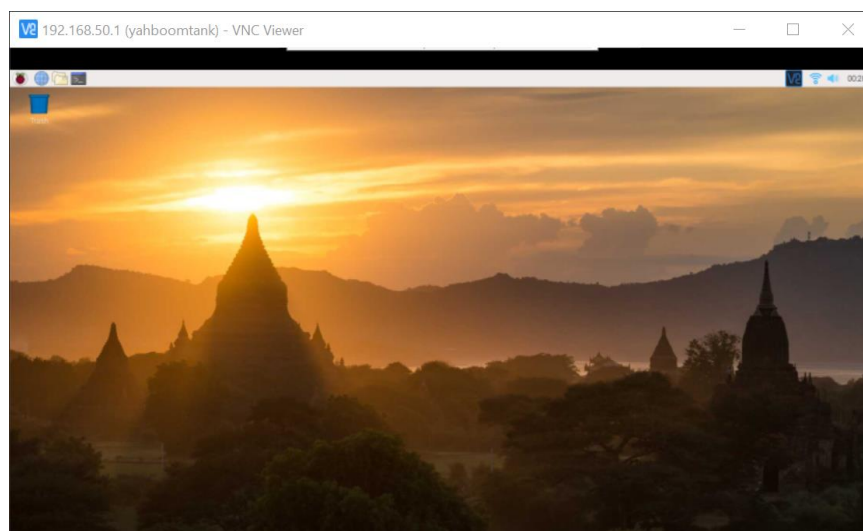
4. Launch the VNC Viewer application on your workstation. For the Wi-Fi remote connect, enter the static IP address of the uap0 network interface – **192.168.50.1**



5. Authenticate using the default username and password as shown below.



6. The remote desktop is displayed using the wireless connection.

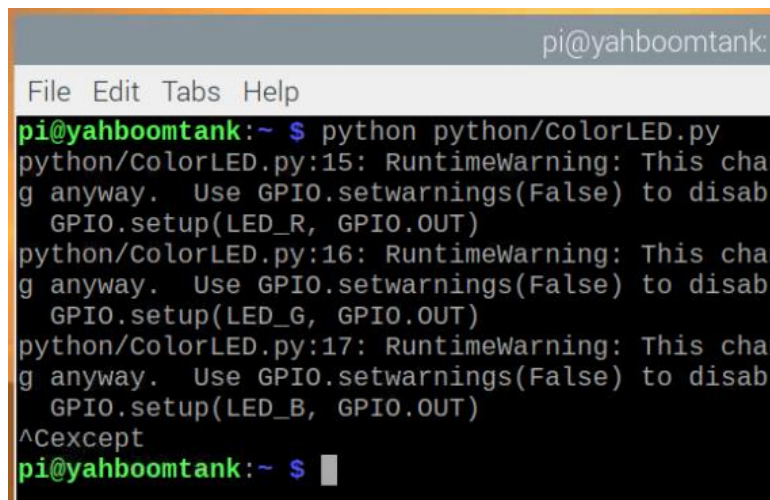


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7. But are you connected to the correct piRover? Again, if there are multiple systems within range of your Wi-Fi, you may not know. To test, open a terminal window from the Raspian desktop and enter the following Python command. (Note the capitalization – it matters!)

python python/ColorLED.py

8. The Python program will run and the LED lights on the front over your rover should flash. If your program runs and your lights don't flash...you have the wrong piRover connected! Use Ctrl-C to exit. An example terminal window is shown below.

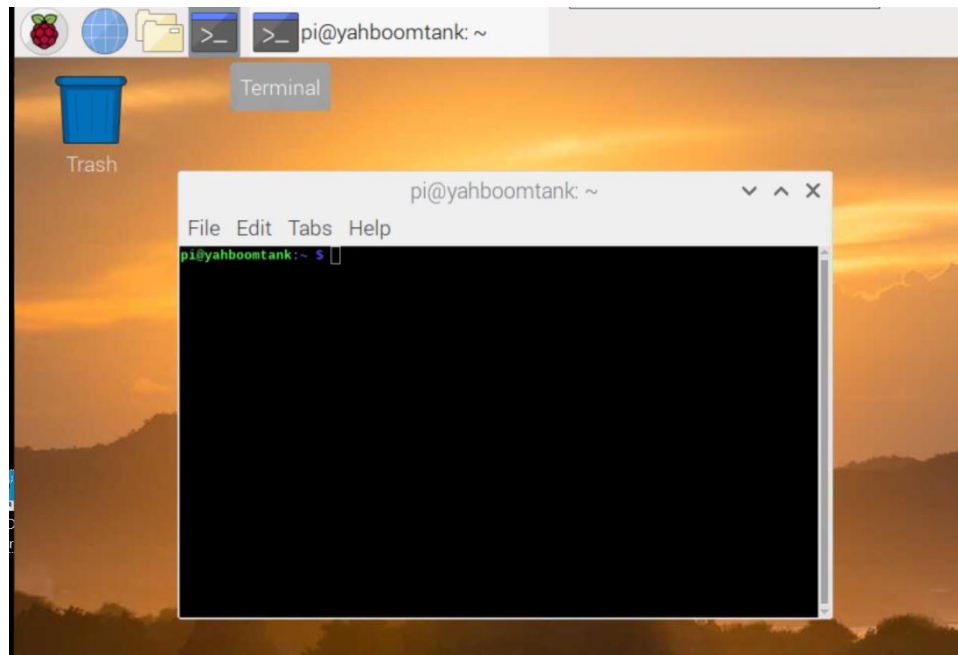


```
pi@yahboomtank:~ $ python python/ColorLED.py
python/ColorLED.py:15: RuntimeWarning: This char
g anyway. Use GPIO.setwarnings(False) to disab
GPIO.setup(LED_R, GPIO.OUT)
python/ColorLED.py:16: RuntimeWarning: This char
g anyway. Use GPIO.setwarnings(False) to disab
GPIO.setup(LED_G, GPIO.OUT)
python/ColorLED.py:17: RuntimeWarning: This char
g anyway. Use GPIO.setwarnings(False) to disab
GPIO.setup(LED_B, GPIO.OUT)
^Cexcept
pi@yahboomtank:~ $
```

Configuring the AP (access point)

1. No matter is you are working independently or in a classroom, it is recommended that you modify the access point name from the default "Yahboom_Tank" to something more specific for your piRover. Here, you will append your initials to the name so that your connection is obvious.
2. At this point you must be connected to the piRover via the VNC viewer application either by following the wired or wireless instructions in the prior section.
3. The Raspberry Pi provides the Wi-Fi access point by running as service called hostapd (host access point daemon). You will learn more about the Command Line Interface (CLI) and editing files in future lessons, but for now, you need to modify the configuration file for the hostapd service to include a unique SSID entry.
4. With the VNC Viewer application open and the Raspian desktop visible, use the icon in the taskbar to open a terminal window.

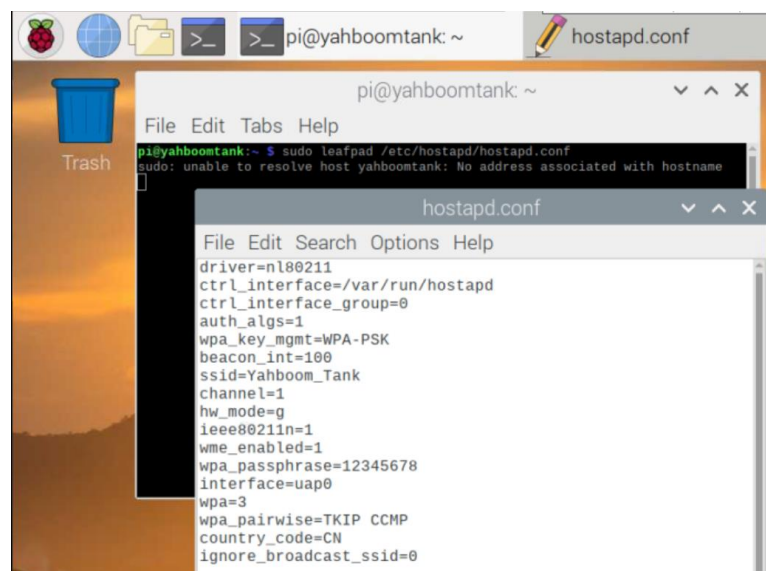
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5. Enter the following command at the prompt in the terminal window.

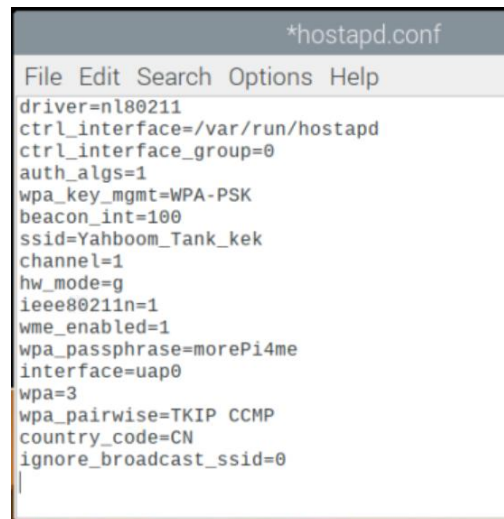
`sudo leafpad /etc/hostapd/hostapd.conf`

6. **sudo** refers to “super user do” and gives you administrator rights. **leafpad** is the text editor, and **/etc/hostapd/hostapd.conf** is the path to and name of the configuration file. Be sure you use lower case and include spaces between the three elements of the instruction.
7. The configuration file is loaded into the leafpad text editor. If the file is blank, you entered the command incorrectly. Close the text editor and try again.



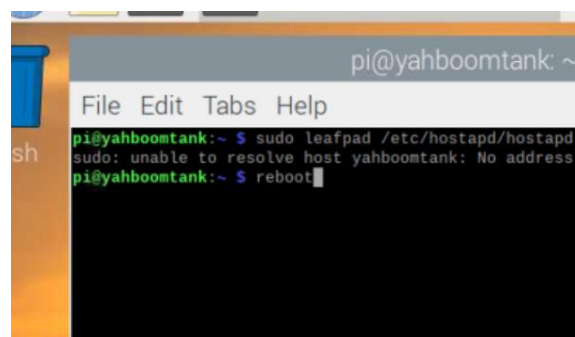
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8. You may see a host name error. You will fix that later. For now, review the content of the configuration file. Note the ssid entry specifying the name as Yahboom_Tank and the password entry set to 12345678.
9. Modify the configuration file to provide exclusive access to your piRover. Edit the ssid line by appending your initials to the end of Yahboom_Tank. In this example the initials _kek are added. Edit the wpa_passphrase line to include a unique password that you will remember. An example of a revised file is shown below.



```
*hostapd.conf
File Edit Search Options Help
driver=nl80211
ctrl_interface=/var/run/hostapd
ctrl_interface_group=0
auth_algs=1
wpa_key_mgmt=WPA-PSK
beacon_int=100
ssid=Yahboom_Tank_kek
channel=1
hw_mode=g
ieee80211n=1
wme_enabled=1
wpa_passphrase=morePi4me
interface=uap0
wpa=3
wpa_pairwise=TKIP CCMP
country_code=CN
ignore_broadcast_ssid=0
|
```

10. Save your modifications to the configuration file by select Save from the File menu.
11. Close the leafpad window.
12. You will need to reboot your Raspberry Pi at this point to apply the configuration changes. Enter the command reboot at the terminal window prompt.



```
pi@yahboomtank: ~
File Edit Tabs Help
pi@yahboomtank:~ $ sudo leafpad /etc/hostapd/hostapd.conf
sudo: unable to resolve host yahboomtank: No address associated with name
pi@yahboomtank:~ $ reboot
```

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13. If you used the “wired” option, close the VNC window and disconnect your Ethernet cable at this point. You will be connecting via the new Wi-Fi connection next.
14. If you were using a Wi-Fi connection, the connection is lost. You will need to close VNC and reestablish your Wi-Fi connection to the Pi.
15. Open the network connection on your workstation. The new Wi-Fi access point is displayed. Note in the example below that two piRover access points are available but named differently.



16. Connect to the access point. Remember to use the new security password that you set in the configuration file.
17. Return to the VNC window and restore the connection to the desktop using its IP address – **192.168.50.1** If you connected via Ethernet before, you need to provide the **pi** username and default password of **yahboom** to connect.

Assessment:

Follow along with the instructor to create a screen capture of your VNC remote connection to your Raspberry Pi. Name the file **VNC_remote.jpg**

Post this image to the assignment link provided. See the tools section for additional help on creating a screen capture. Submit your screen capture with other required files in your weekly submission at the bottom of this week's Moodle section.