

piRover Builds with K2

Creating a Remote Connection

Rev 3.1

Overview:

In this activity, you will connect to your Raspberry Pi and complete configuration steps so that you will have remote access to your piRover. You'll download and install the required software on your computer system and make your first remote connection into the system.

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.
3. Modify the Wi-Fi access point name and authentication.

Resources:

1. 2024 piRover kit with K2 microSD card image
2. NMC Wi-Fi Access Point (AP)
 - a. SSID: **NMC-PSK**
 - b. PSK/password: **Baffle-Amused-Stencil4**

Materials:

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

Directions:

1. A typical setup for a Raspberry Pi single-board computer is shown in Figure 1. Note the USB-C power connection in addition to the USB Dongle providing keyboard and mouse connectivity. A small HDMI monitor is displaying the Pi desktop and requires the Micro-HDMI cable included in your kit.

piRover Builds with K2

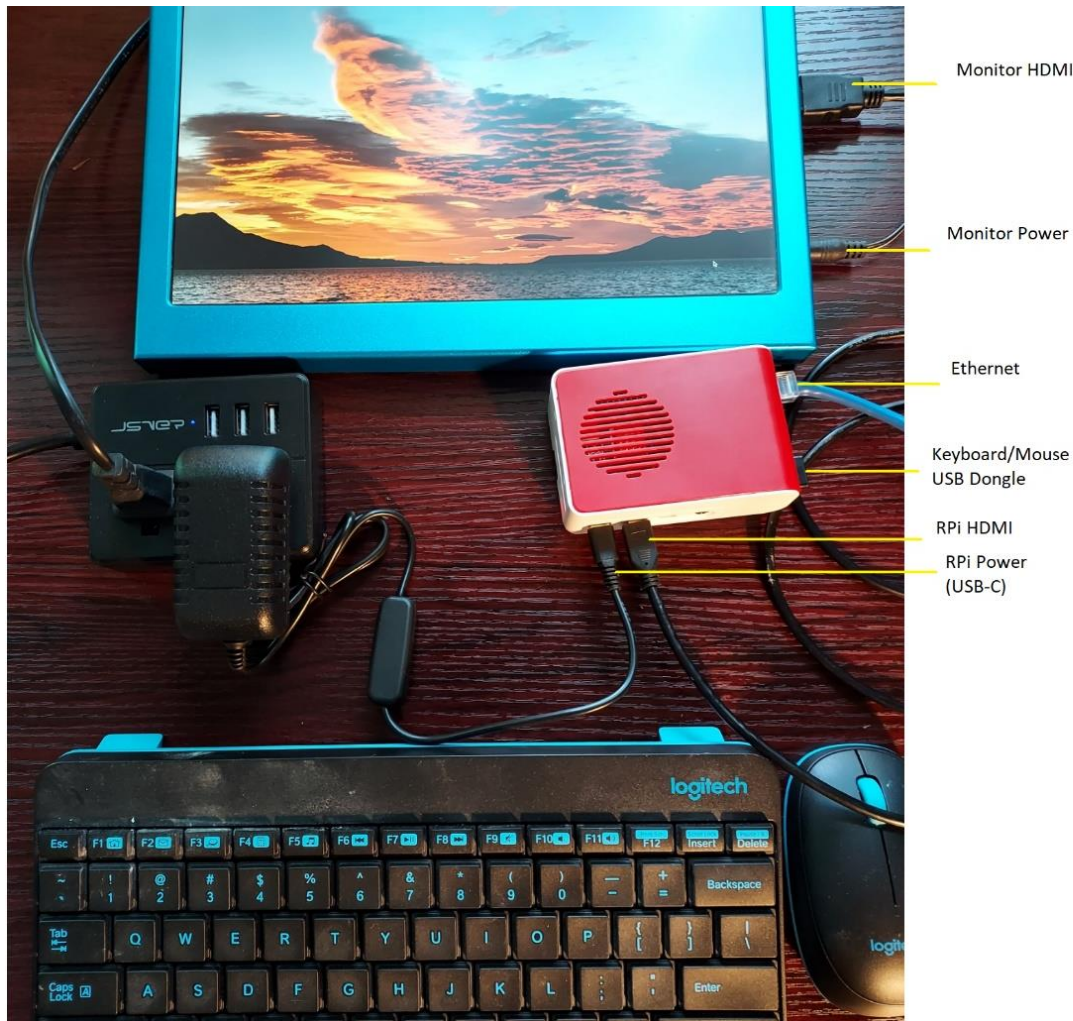
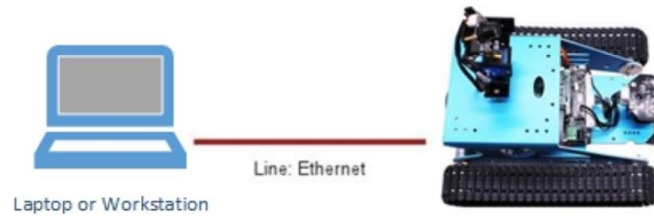


Figure 1 - RPi Single Board Computer Setup

2. In this class, you are connecting to the Raspberry Pi integrated into your piRover system. Typically, you will not have a monitor, keyboard, or mouse directly connected to the Pi, but these components may be required if you are having issues connecting. Normally you will connect using a remote desktop service (VNC) running on the Pi. This is often referred to as “headless mode.”
3. In this activity, you make your first connection to the RPi using the Ethernet cable provided. Eventually you may be able to connect using Wi-Fi connectivity and the Ethernet connection is not required.
4. The first step in making the remote connection is to connect the piRover to your computer using the Ethernet cable provided.

piRover Builds with K2



5. Recall that if your computer does not have an Ethernet port, a USB to Ethernet adapter is required like the one shown below. This requirement was discussed during the first week of class.



Figure 2 Ethernet to USB adapter

6. You'll be creating a peer-to-peer network connection between your workstation and the Raspberry Pi. If you are using a Windows PC an additional software driver is required to make this type of connection. If you are on a PC, navigate to this [Bonjour Print Services for Windows](https://support.apple.com/en-us/106380) link. Download and install the driver. This step is not required if you are using an NMC workstation in a PS lab.

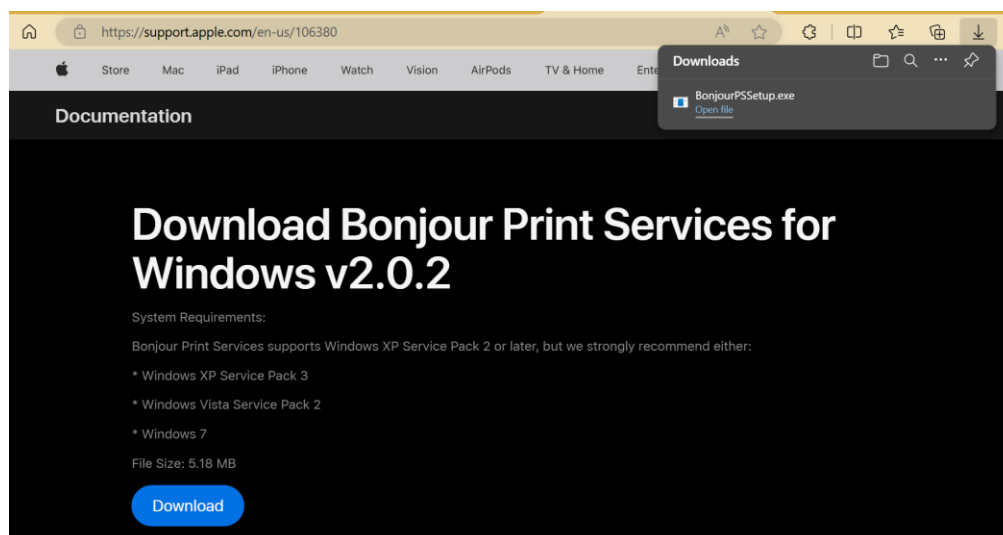


Figure 3 Bonjour Print Services for Windows

piRover Builds with K2

1. You'll use VNC remote desktop software to provide the remote connection. The RPi system provided for you has the VNC server feature enabled as shown below, but you must install the VNC client on your workstation. Again, this step is not required if you are using an NMC workstation in a PS lab.

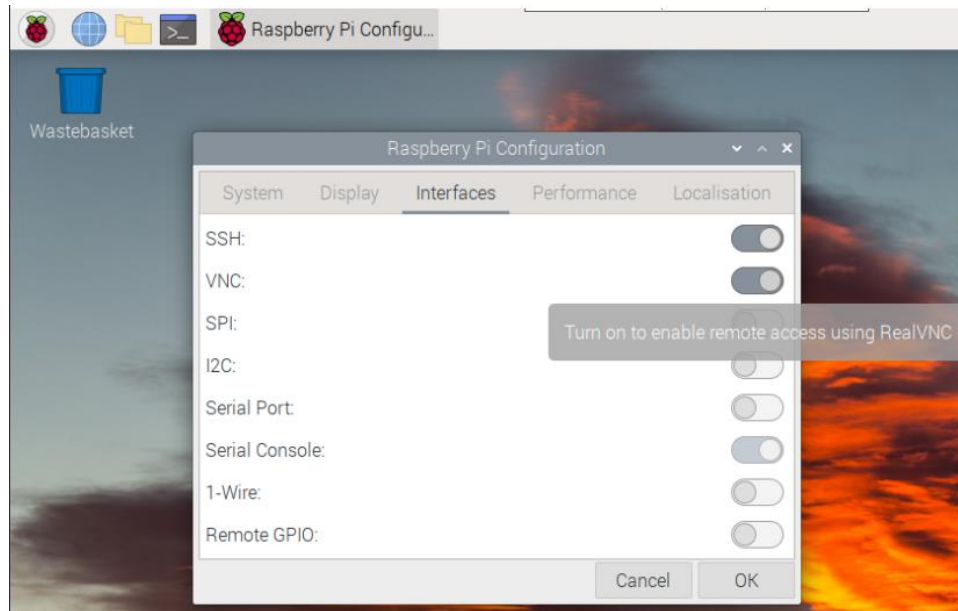


Figure 4 Remote Desktop showing VNC Server Enabled

7. Open the [VNC Viewer](#) link on your workstation. Download and install the VNC Viewer client software. **Just install the viewer software.** The software is free, and you DO NOT need to sign up for additional software or services such as VNC Connect.
8. You are now ready to connect.
 - a. Turn the power on to the piRover. Note the red LED indicating that power is applied and the flashing green LED light indicating activity.
 - b. Allow time for the piRover to complete its boot process. The Yahboom software loads by default and you will hear four beeps indicating the Yahboom service on the piRover is ready.
9. Open VNC Viewer on your workstation. A typical application window is shown on the following page. The application window is blank at

piRover Builds with K2

this time due to no prior remote connection. Icons will appear here once you successfully connect.

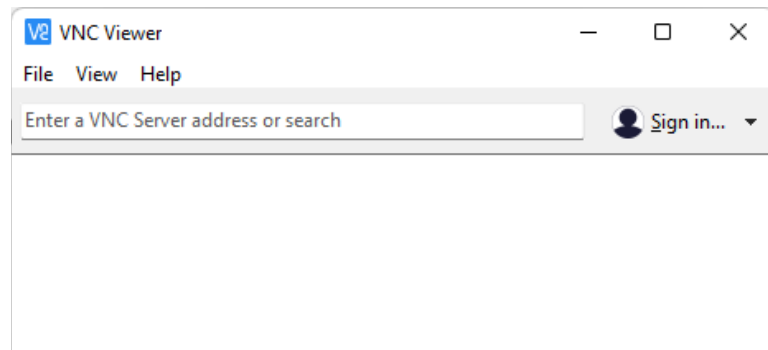


Figure 5 VNC Client Window

10. Enter the VNC Server address below. The server name (or hostname) is **piRover**. The **.local** is appended to the end due to the peer-to-peer network connection that is created over the Ethernet.

piRover.local

11. You must provide credentials to create the remote connection. Enter **pi** as the user and **nmc_ram** as the default password. You will continue to use pi as the user throughout the course. You will change the default password once you are connected.

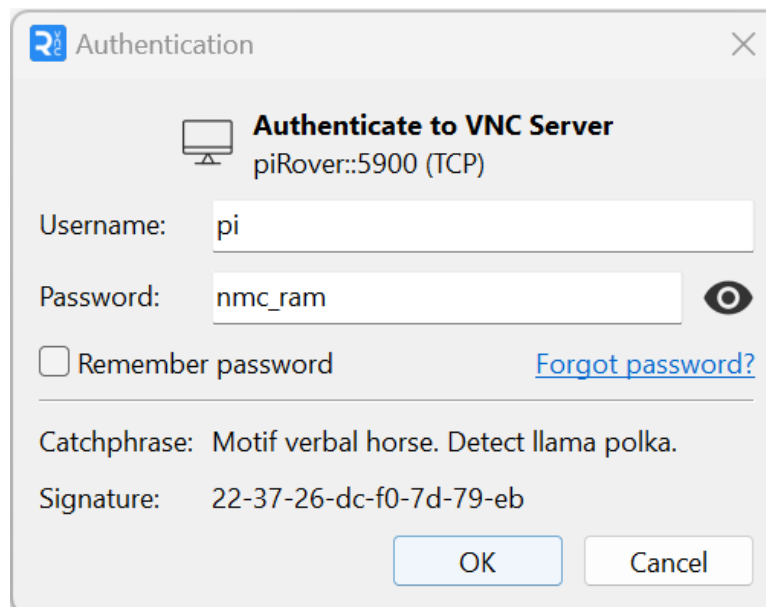


Figure 6 VNC Authentication

piRover Builds with K2

12. Click OK. A remote desktop is displayed.

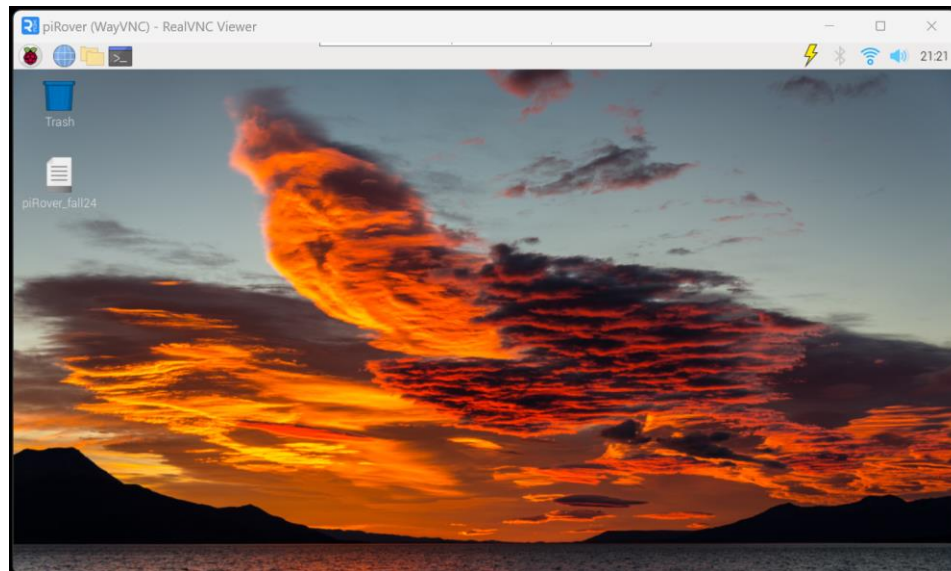


Figure 7 RPi Remote Desktop using VNC Viewer

13. Change the initial **nmc_ram** password to secure your system. Click the Raspberry in the top left corner and then click Preferences and then Raspberry Pi Configuration as shown below.

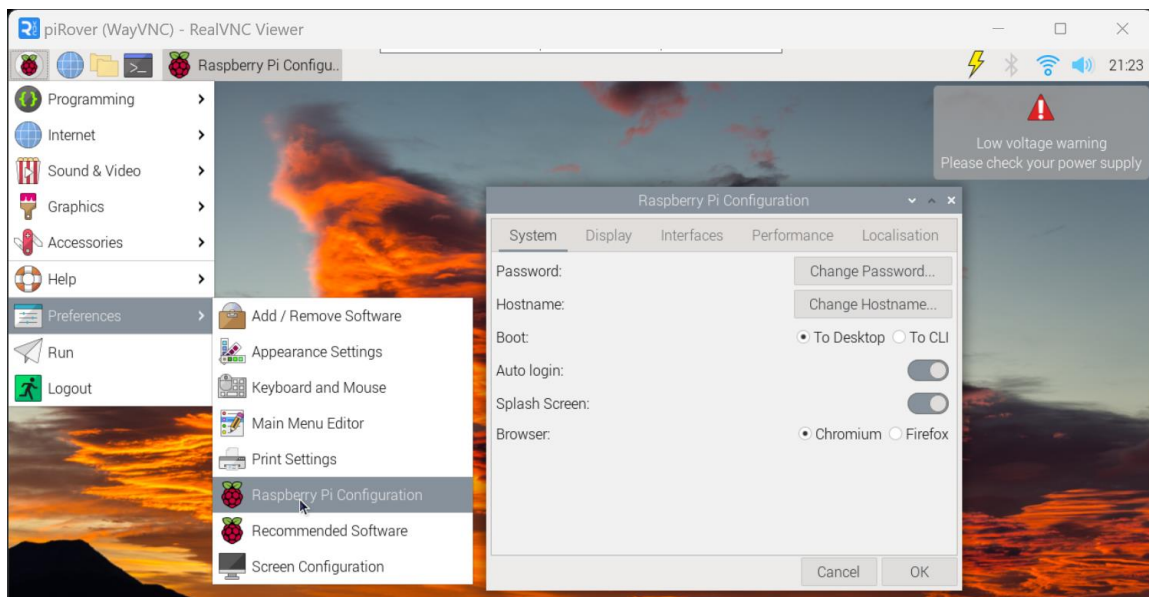


Figure 8 RPi Menu and Configuration

14. Click the Change Password button and enter your new password. Confirming the password will activate the OK button. Click OK and then close the configuration window. **NOTE:** You must remember your password! There is no administrative override or ability to reset.

piRover Builds with K2

15. If you forget your password, you'll need to start with a new image of the operating system, reconfigure, and then restore any project work from your cloud storage.
16. Now that the password is updated. Restart the piRover using the menu as shown below.

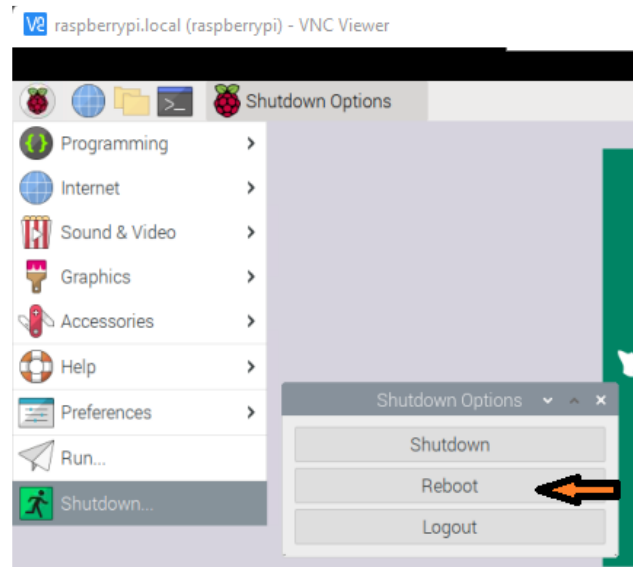


Figure 9 Reboot using the RPi Menu

17. The VNC view will lose the connection and attempt to reconnect.
18. Once the piRover boots, the Authentication screen will be displayed again. Enter your new password, click the *Remember password* check box, and click OK. The remote desktop will display.

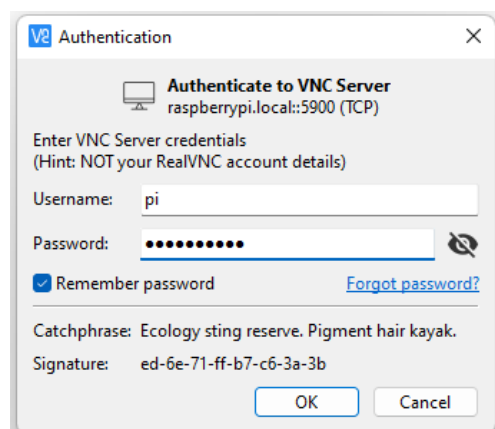


Figure 10 VNC Authentication with Remember Checkbox Ticked

19. The next step is to configure the piRover's Wi-Fi connection. Open the remote desktop and locate the Wi-Fi icon in the upper righthand location on the desktop.

piRover Builds with K2

20. Note this double-arrow icon shown on the right side of the taskbar. This symbol indicates that there is not a current Wi-Fi connection.



Figure 11 Taskbar showing no Wi-Fi connectivity

21. Click on this icon to select the Wi-Fi access point from the available list as shown in the image below.
- The instructor will review access options if you are on NMC's campus.
 - Guest Wi-Fi – You must open the browser on your Pi and navigate to nmc.edu. A “terms and conditions” page is shown. Click to accept using the button at the bottom of the page.
 - NMC Wi-Fi Access Point (AP) for RAM devices. You'll only need to set this connection once. This is new and its availability around campus is unknown at this point.
 - SSID: **NMC-PSK**
 - PSK/password: **Baffle-Amused-Stencil4**
 - If you are connecting to your home access point or smartphone hotspot, you will need the required password or pass phrase.

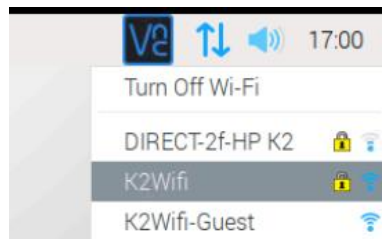


Figure 12 Taskbar showing sample AP connections

22. Connecting to a secure Wi-Fi access point (AP) will cause the following password prompt to be displayed. Enter the required password and click the Connect button.

piRover Builds with K2

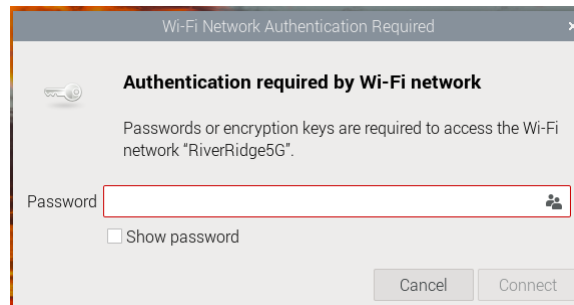


Figure 13 Wi-Fi authentication prompt

23. The icon on the taskbar will update to a typical Wi-Fi icon as shown below. Hovering over this icon will display details of your connection.

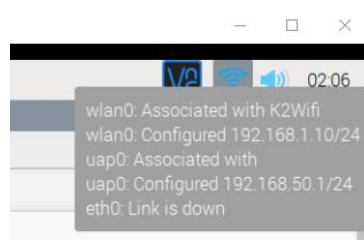


Figure 14 Wi-Fi connected with IP details shown

24. 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.

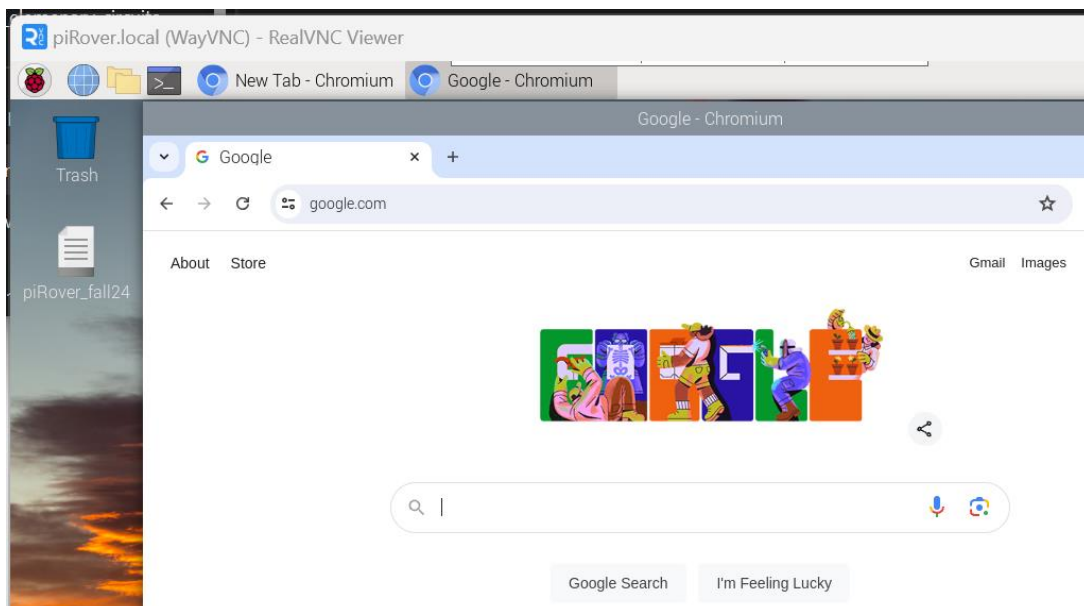


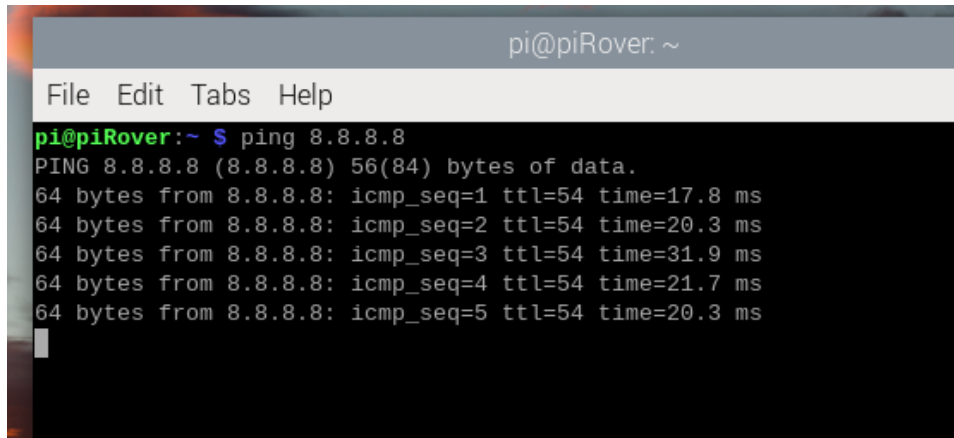
Figure 15 Browser with Google page loaded

25. A more common way for a developer to check for an Internet connection is to “ping” a server. Open a terminal window and enter

piRover Builds with K2

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

A screenshot of a terminal window titled 'pi@piRover: ~'. The window has a menu bar with 'File', 'Edit', 'Tabs', and 'Help'. The terminal shows the command 'ping 8.8.8.8' being executed. The output displays five successful ping replies from 8.8.8.8, each showing 64 bytes of data, an icmp_seq number from 1 to 5, a TTL of 54, and response times ranging from 17.8 ms to 31.9 ms.

```
pi@piRover: ~  
File Edit Tabs Help  
pi@piRover:~ $ ping 8.8.8.8  
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.  
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=17.8 ms  
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=20.3 ms  
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=31.9 ms  
64 bytes from 8.8.8.8: icmp_seq=4 ttl=54 time=21.7 ms  
64 bytes from 8.8.8.8: icmp_seq=5 ttl=54 time=20.3 ms  
^C
```

Figure 16 Ping command showing replies

Assessment:

Your instructor will discuss any assessment action due at this time. You must be able to remotely connect to the piRover. All future piRover class activities are dependent on this remote connection.