

Introduction to Raspberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (models B and B+) to 512 MB. The system has Secure Digital (SD) (models A and B) or Micro SD (models A+ and B+) sockets for boot media and persistent storage. In this theme we will use the B+ model. Following Figure shows the introduction of R-PI

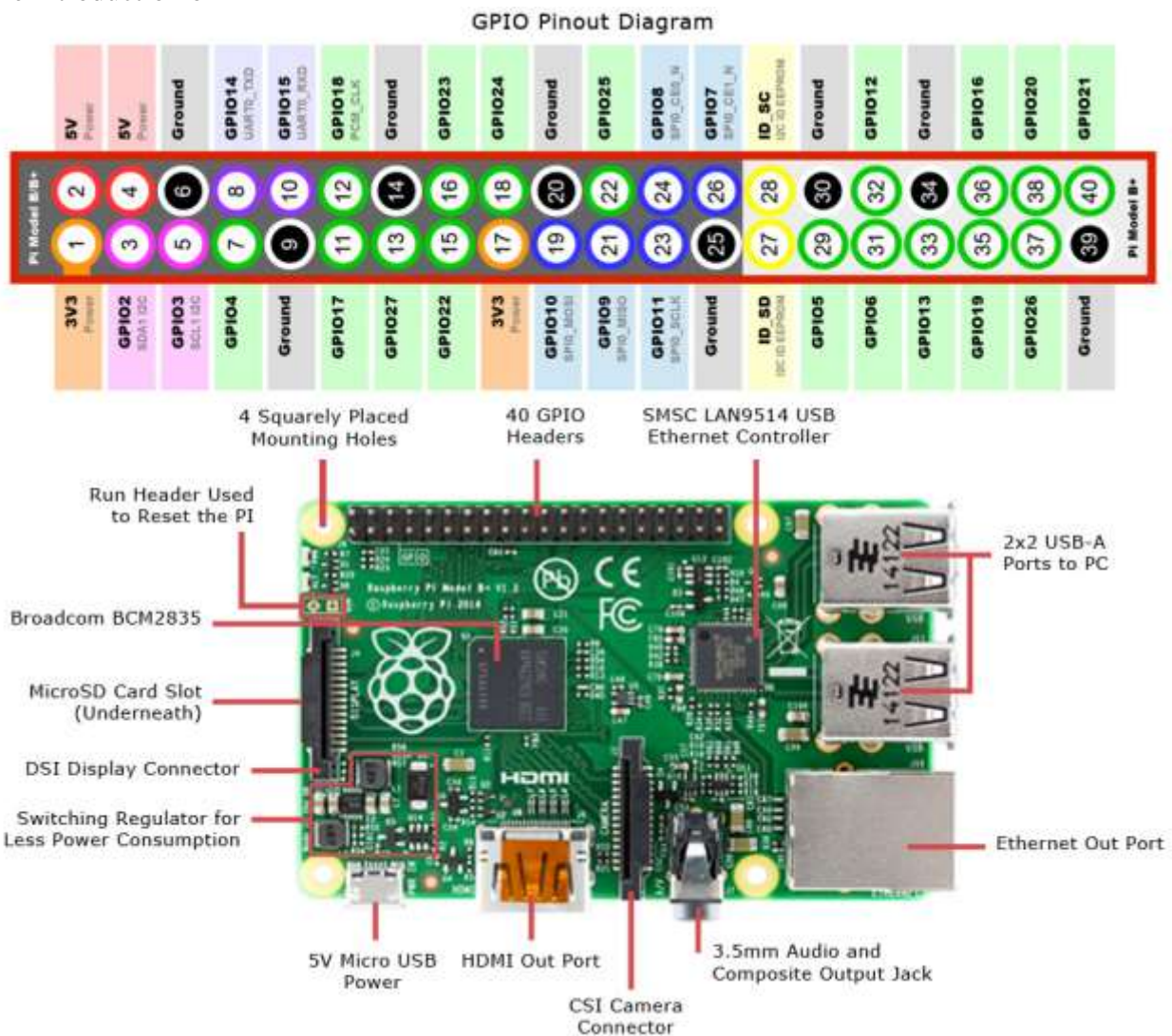


Figure 1.1: R-PI introduction(<https://www.element14.com>)

WIFI Network connection and SSH

Network settings configuration using DHCP Server (wireless settings)

1. Insert the SD card (with OS already written) into the micro SD slot of R-Pi.
2. Connect the wireless adapter, keyboard, mouse and monitor (using a HDMI cable) to the Raspberry Pi.
3. Power ON the board and monitor. You will notice a set of code running on the monitor. After a couple of minutes, screen will be similar to Figure 1.

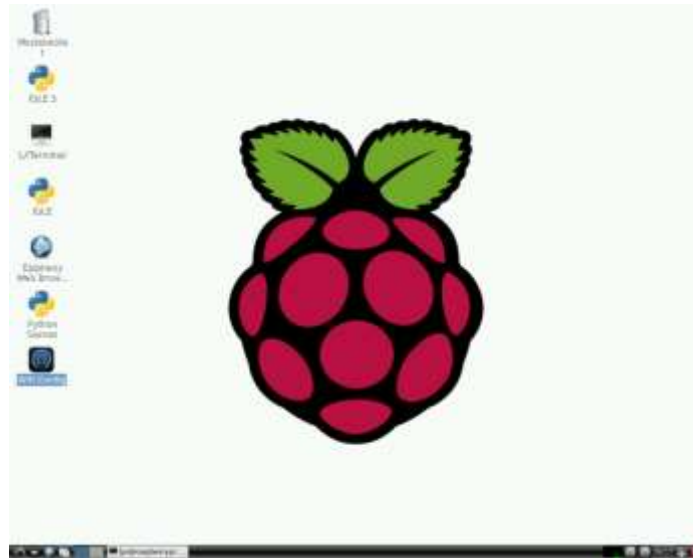


Figure 1: R-PI Desktop

4. Open terminal by double clicking on “LXTerminal” icon.
5. Check the hardware connected to R-PI. To check it type “lsusb” in terminal. This command will list the hardware connected to R-PI. Output of “lsusb” command will be similar to Figure 1.2. As we are using Edimax Technology co. WIFI adapter, it should be present in the hardware connected list.

```
Bus 002 Device 002: ID 8087:8000 Intel Corp.  
Bus 002 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub  
Bus 001 Device 005: ID 0bda:0129 Realtek Semiconductor Corp. RTS5129 Card Reader Controller  
Bus 001 Device 004: ID 04f2:b43c Chicony Electronics Co., Ltd  
Bus 001 Device 003: ID 8087:07dc Intel Corp.  
Bus 001 Device 002: ID 8087:8000 Intel Corp.  
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub  
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub  
Bus 003 Device 003: ID 17ef:6622 Lenovo  
Bus 003 Device 010: ID 7392:7811 Edimax Technology Co., Ltd EW-7811Un 802.11n Wireless Adapter [Realtek RTL8188CUS]  
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

Figure 1.2: “lsusb” command output

6. Now click on the icon “WIFI Config” and this will open the GUI as shown in Figure 1.3



Figure 1.3: WIFI Config GUI

7. Click on the scan button to find the **WIFI** network nearby. This will pop up a new window as given in Figure 1.4. You can select the WIFI network from the list to access.
8. Select your WIFI security type and enter your password in PSK dialog box. Click on “Add” button to add the network.

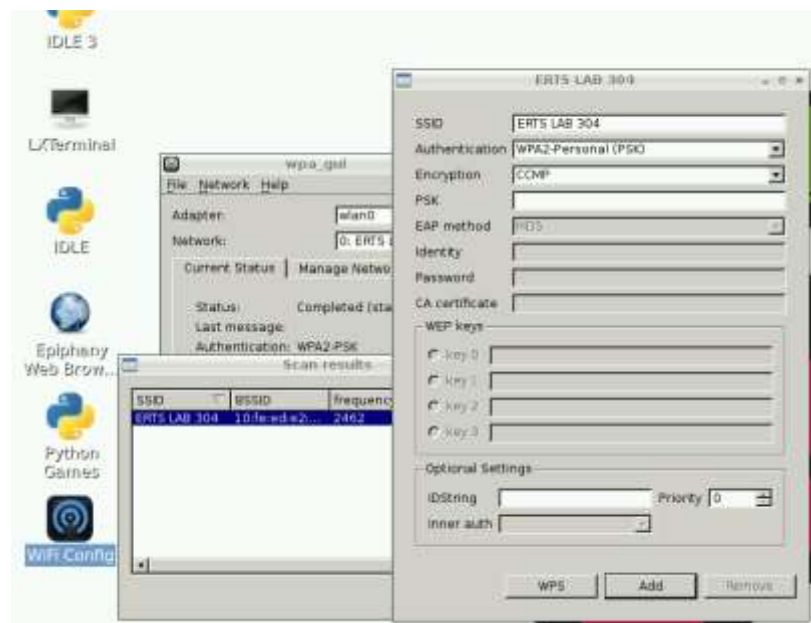


Figure 1.4: Add WIFI network

9. Select the WIFI network in dropdown list of “network” in “wpa-gui” and click on “connect”. If everything goes well this “GUI” will give the IP address as shown in Figure 1.5



Figure 1.5: Final connection

SSH (Secure shell):

SSH is used to setup remote connection between Raspberry Pi and Linux machine without any additional software. Following are the requirement for SSH

1. Raspberry Pi and Linux machine must be connected in same network. It means, suppose R-PI is connected to wifi “task1xyz” then Linux PC should also be connected to same wifi network “task1xyz”.
2. You must know the Raspberry Pi IP address for SSH. To know IP address of Raspberry Pi type “ifconfig” in R-PI terminal and this will give the output as shown in Figure 1.6. If Raspberry Pi is connected to LAN cable then Raspberry Pi IP will be given in “eth0” section and if it is connected to WIFI then IP will be shown in “wlan0” section.

```
sinnu@sinnu:~/Documents/catkin_ws$ ifconfig
eth0: Link encap:Ethernet HWaddr f8:0f:41:cd:9f:07
       inet addr:10.129.28.244 Bcast:10.129.255.255 Mask:255.255.0.0
       inet6 addr: fe80::f801:41ff:fed:9f07/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:22044368 errors:0 dropped:112 overruns:0 frame:0
       TX packets:106716 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:1728292968 (1.7 GB) TX bytes:31390209 (31.3 MB)
       Interrupt:20 Memory:f7d00000-f7d20000

lo: Link encap:Local Loopback
       inet addr:127.0.0.1 Mask:255.0.0.0
       inet6 addr: ::1/128 Scope:Host
       UP LOOPBACK RUNNING MTU:65536 Metric:1
       RX packets:1600753 errors:0 dropped:0 overruns:0 frame:0
       TX packets:1600753 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:0
       RX bytes:1041350129 (1.0 GB) TX bytes:1041350129 (1.0 GB)

wlan0: Link encap:Ethernet HWaddr a8:a8:cd:89:e0:db
       inet addr:10.196.26.6 Bcast:10.196.31.255 Mask:255.255.224.0
       inet6 addr: fe80::a8a8:cdff:fe89:e0db/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:521034 errors:0 dropped:0 overruns:0 frame:0
       TX packets:60320 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:1000
       RX bytes:93255752 (93.2 MB) TX bytes:9671678 (9.6 MB)
```

Figure 1.6 Output of “ifconfig”

Procedure to remote connection to Raspberry Pi using SSH in PC/Laptop terminal:

1. Open terminal in PC/Laptop and type following command :

```
ssh pi@<IP address>
```

For example, Raspberry Pi IP is 192.168.0.122 then command will be:

```
ssh pi@192.168.0.122
```

2. It will ask for the password, so type password for Raspberry Pi. Default password for Raspberry Pi is “raspberrypi”. Type “yes” if it asks anything else before password.

Now you have successfully logged in to Raspberry Pi using SSH. You can disconnect screen, mouse and keyboard from R-Pi.

NOTE: You can only access the files using terminal. GUI will not be accessible in SSH