

Getting Started with TCP/IP and VirtualBox

Objectives

In this work, the first objective is to understand the TCP/IP configuration basics and familiarize these concepts using both cell phone and computer devices, the second objective is to download a hypervisor such as VirtualBox or VMWare, familiarize with concept of hypervisor and create a sample virtual machine on host computer. Mini tasks to allow complete the main objectives include: learn the requirements to access the internet (IP address, netmask, router, DNS server), understand subnetting, know the difference between a public and private IP address, understand how DNS converts IP to strings, pack routing. DHCP, looking up IP address, subnet mask, router, DNS and DHCP for both cell phone and computer device, downloading a hypervisor and installing the Ubuntu Linux on virtual machine.

TCP/IP, Subnetting

To connect to the internet on a device that allows internet connectivity require four(4) basic configuration settings (1) The IP address is a 32 bit number given to a device and allows the device use the Internet Protocol, (2) The netmask is a 32-bit number that divides IP address into subnets, (3) The router is a physical device that allows data to be sent and received on a computer network, (4) The Domain Name System(DNS) is a naming system used for anything connected to the internet.

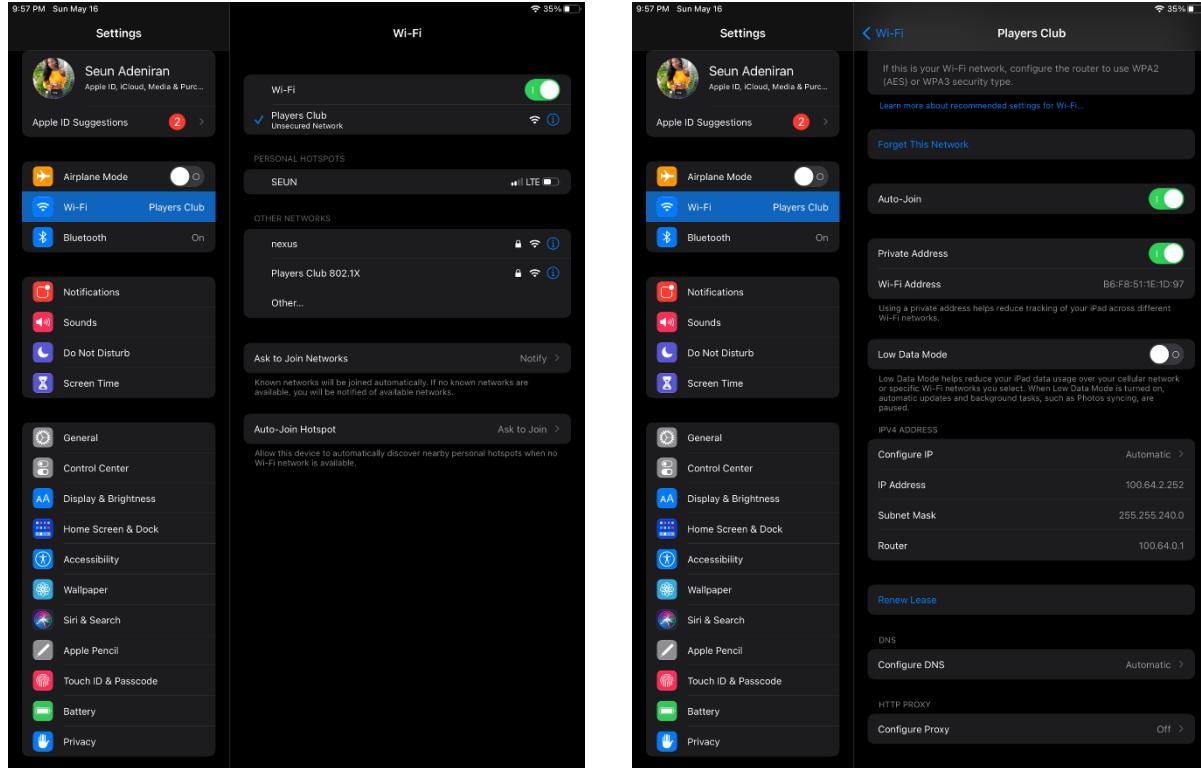
On my Windows computer, finding the IP address, subnet mask, router address, DNS server address was uncomplicated. Typing in the command ipconfig/all, and pressing the Enter button in the command prompt (cmd) divulged this information as shown below:

```
Wireless LAN adapter WiFi:

Connection-specific DNS Suffix . :
Description . . . . . : Realtek RTL8723BE 802.11 bgn Wi-Fi Adapter
Physical Address. . . . . : 70-77-81-19-C0-E5
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::1153:a7f1:55f7:df06%19(PREFERRED)
IPv4 Address. . . . . : 100.64.15.37(PREFERRED)
Subnet Mask . . . . . : 255.255.240.0
Lease Obtained. . . . . : Sunday, May 16, 2021 2:02:02 PM
Lease Expires . . . . . : Sunday, May 16, 2021 9:02:02 PM
Default Gateway . . . . . : 100.64.0.1
DHCP Server . . . . . : 100.64.0.1
DHCPv6 IAID . . . . . : 175142785
DHCPv6 Client DUID. . . . . : 00-01-00-01-25-A1-51-3C-3C-A8-2A-AE-5A-16
DNS Servers . . . . . : 100.64.0.1
NetBIOS over Tcpip. . . . . : Enabled
```

The IP address of this device is 100.64.15.37, subnet mask is 255.255.240.0, router address is 100.64.0.1, DNS IP address is 100.64.0.1.

On my iPad, finding the IP address, subnet mask, router address, DNS server address was uncomplicated. Navigating to the Settings -> Wi-Fi -> Players Club (Wi-Fi name cell phone is connected to) divulged the necessary information as shown below:



The IP address of this device is 100.64.2.252, subnet mask is 255.255.240.0, router address is 100.64.0.1, DNS IP address is 100.64.0.1.

To determine if router address and IP address are on the same subnet, the router address, IP address, subnet mask values were all converted to binary, the binary AND result of router address and subnet mask is now compared to the AND result of IP address and subnet mask. If the values of both results are the same, this indicates the router address and IP address are on the same subnet. The calculations are shown below:

For computer:

IP address: 100.64.15.37 – 01100100.01000000.00001111.00100101

Router address: 100.64.0.1 – 01100100.01000000.00000000.00000001

Subnet Mask: 255.255.240.0 – 11111111.11111111.11110000.00000000

Binary AND of IP and subnet: 01100100.01000000.00000000.00000000

Binary AND of router and subnet: 01100100.01000000.00000000.00000000

Comparison yields TRUE to condition

For cell phone:

IP address: 100.64.2.252 – 01100100.01000000.00000010.11111100

Router address: 100.64.0.1 – 01100100.01000000.00000000.00000001

Subnet Mask: 255.255.240.0 – 11111111.11111111.11110000.00000000

Binary AND of IP and subnet: 01100100.01000000.00000000.00000000

Binary AND of router and subnet: 01100100.01000000.00000000.00000000

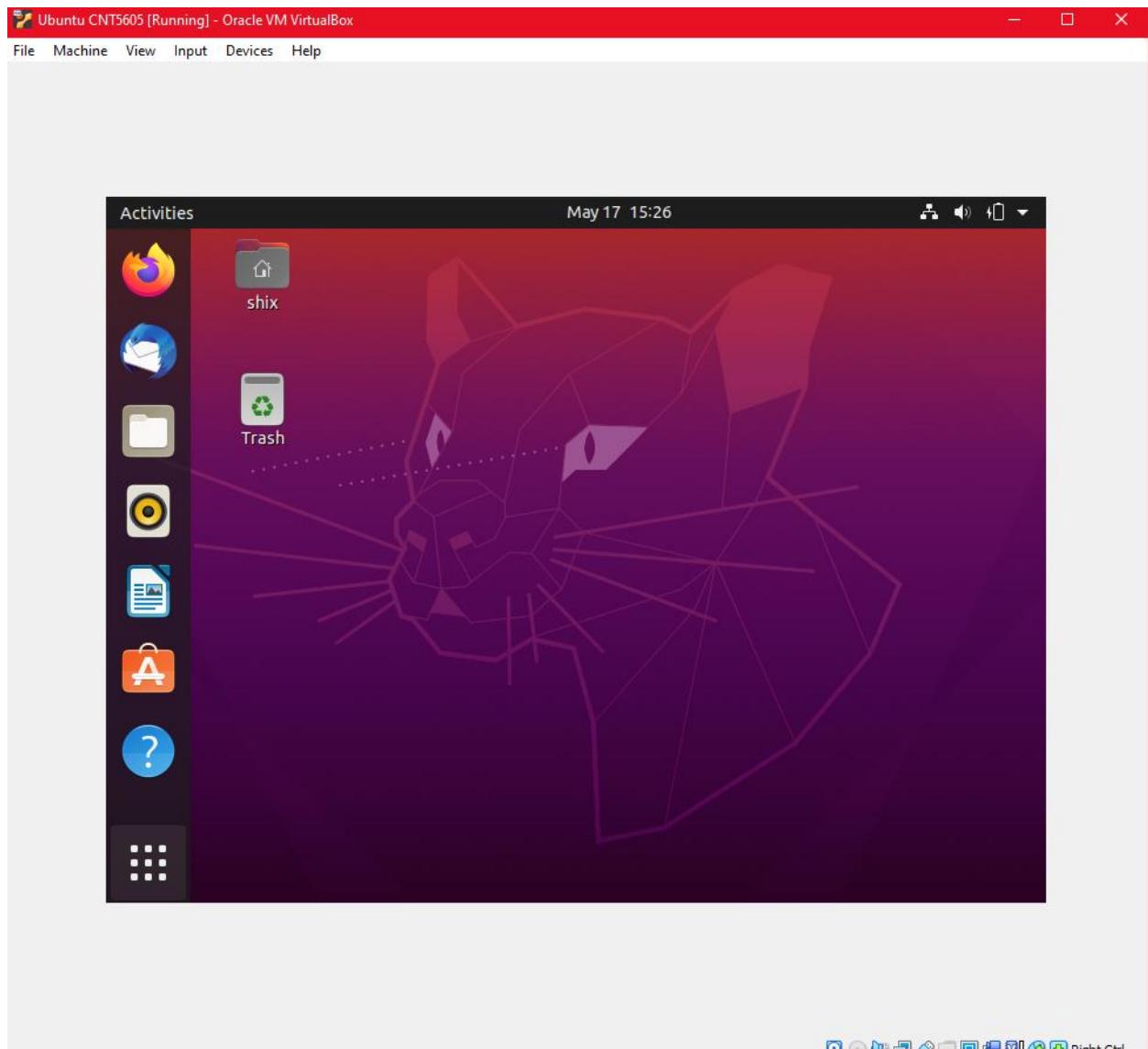
Comparison yields TRUE to condition

To differentiate my IP as a private address, I checked the list of reserve IPv4 address ranges for private network and realized my IP address on both cell phone and computer are private IP addresses. Also, my IP address is a dynamic one, as the DHCP allots a dynamic IP address.

HyperVisors – Virtual Box

I downloaded VirtualBox on my computer system from the official website and the software runs well on my computer. As I have used virtual machines previously, I already have virtualization enabled on my computer system. Currently my computer has 530GB disk space unused which is a lot more than the 100GB requirement.

To create a Linux environment in the virtual machine, I downloaded the latest Ubuntu software from the official website, created a Linux virtual environment in VirtualBox and installed the Ubuntu software on the VM. Below is a screenshot of the Linux operating system after installation on Virtual machine.



Extras

1. To know if two IP addresses are on the same subnet for example 100.64.0.1 and 100.64.2.252, I can easily deduce that these two networks are on the same subnet because they both have a netmask of 16 and the first 2 block are the same.
2. Dynamic IP addresses are not always safe and make your device susceptible to malware or attacks, it is important to always use some paid anti-malware software to prevent attacks from hackers or corrupted websites while connecting to a network you do not trust.