

Internet Protocol Address (IP Address):

-Can either be static or dynamic:

- If it is statically set it is usually setup by the user or built into the configuration of the device
- If you didn't set your IP address to be static, chances are it is a dynamic IP address

Dynamic address assignment:

- Usually done by some sort of DHCP server (we will cover this more later)
- Address can be changed once assigned to it, either by DHCP server or by user (spoofing)

So what is an IP Address?

- In version 4 (which we are currently on, but rolling over to IPv6 slowly) the IP address is 32 bit or 4 byte address separated by periods (ex: 192.168.0.0), each segment is called a tuple with valid values ranging from 0 – 255 (for those that know binary the values range from 0b00000000 to 0b11111111)

-The total IP address space is around 4.3 billion devices (which is why we need to switch to IPv6)

Media Access Control (MAC Address):

- Unique identifier for each piece of hardware on a network, this address is tied to the networking hardware and is completely separate from your IP address.

- This address does not change no matter where you are in the world or what network you connect to, although it can be changed through software (spoofing)

- This address is used extensively in LAN environments to ensure correct packet delivery

- A MAC address is 6 groups of 1-byte address split up into 2-hex notation values meaning that valid values range 0-9 and A-F.

- MAC Addresses usually appear in the following notation (01:23:45:67:89:AB)

Dynamic Host Configuration Protocol Server (DHCP Server):

-The DHCP server keeps two databases active, one contains all the static IP's set on the network and the other contains the available dynamic address pool

Process of requesting an IP works like this:

- 1) Computer contacts the DHCP server by sending out a DHCP discover packet, tells the server whether the address it is asking for is dynamic or static
- 2) If it is asking for a static IP, DHCP server looks through both databases to ensure that IP is not being currently used, if machine is allowed to use static IP's then DHCP server grants it the lease and updates its static IP pool table with the IP address and MAC address of the computer. If the machine is asking for a dynamic IP, the DHCP server looks for the next available IP address and assigns it to the machine and again updates the dynamic IP table with the IP and MAC address
 - a. Address are temporary, once the lease expires the client must ask for a renewal.

Exercise 1:

To get a feel for what we are discussing I would ask that you open up a command prompt window if on a Windows machine or a terminal window if on a *nix machine.

On Windows:

- 1) Type the following command: ipconfig /all
- 2) Next you need to look for the interface you are using, if it's a wired connecting like mine you will see a header called Ethernet adapter Local Area Connection if you are using wireless you will have to look for that one
- 3) In this picture you can see the following
 - a. MAC Address or Physical Address
 - b. If DHCP is enabled
 - c. The IPv4 Address assigned to my computer
 - d. When my lease was obtained and when it will expire
 - e. Where my DHCP server is located (my router's IP address)

```
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : 
Description . . . . . : Realtek PCIe GBE Family Controller
Physical Address. . . . . : 40-61-86-C7-D2-84
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv4 Address. . . . . : 192.168.1.244(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Monday, September 03, 2012 7:26:57 PM
Lease Expires . . . . . : Tuesday, September 04, 2012 7:26:56 PM
Default Gateway . . . . . : 192.168.1.1
DHCP Server . . . . . : 192.168.1.1
DNS Servers . . . . . : 8.8.8.8
                        8.8.4.4
NetBIOS over Tcpip. . . . . : Enabled
```

On Linux/Unix:

Your experience will be almost the same as Windows with a few twists

- 1) Open up a terminal
- 2) Type the command: ifconfig
- 3) Find your adapter you are using (either wireless or wired)
- 4) In this picture you will find:
 - a. Mac Address or HWaddr
 - b. IP address or inet addr

```
root@root:~# ifconfig
eth0  Link encap:Ethernet  HWaddr 00:0c:29:59:e7:6d
      inet addr:192.168.1.196  Bcast:192.168.1.255  Mask:255.255.255.0
      inet6 addr: fe80::20c:29ff:fe59:e76d/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
      RX packets:28 errors:0 dropped:0 overruns:0 frame:0
      TX packets:26 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:3392 (3.3 KB)  TX bytes:2508 (2.5 KB)
      Interrupt:19 Base address:0x2000
```