1. IP Addresses

```
┌──(kali㉿kali)-[~]
└─$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::a00:27ff:fe50:4c14  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:50:4c:14  txqueuelen 1000  (Ethernet)
        RX packets 81133  bytes 75244139 (71.7 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 48935  bytes 11455421 (10.9 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 19865  bytes 22892102 (21.8 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 19865  bytes 22892102 (21.8 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

IP Addresses

- Layer 3 in the OSI Model

IPv4

- Most Common form

- Decimal Notation

- 32 Bits/4 Bytes

- Each Section is 8 Bits Stored in Binary

    - 11111111.11111111.11111111.11111111

    - 128 64 32 16 8 4 2 1

    - If all 1's then it is equal to 255

    - 128+64+32+16+8+4+2+1=255

        - Another Example is 00000111

            - That is 4+2+1=7

                - 2^{32}=4,294,967,296

                    - The number of possible IPv4 IP Addresses available

                        - We are out of IPv4 Addresses

IPv6

- Hexadecimal Notation
- 128 Bits
- 2^128 = 3.403e+38
    - Will take a long time to fill all of this address space
    - Still not used as frequently as IPv4

NAT (Network Address Translation)

- Most networks have multiple devices on a network
    - Different devices like phones, TVs laptops, and IoT devices
        - 192.168.0.0
            - Private IP Address
                - Can be passed out through a Public IP Address

Network Class	Network Numbers	Network Mask	No. of Networks	No. of Hosts per Network
CLASS A	10.0.0.0	255.0.0.0	126	16,646,144
CLASS B	172.16.0.0 to 172.31.0.0	255.255.0.0	16,383	65,024
CLASS C	192.168.0.0 to 192.168.255.255	255.255.255.0	2,097,151	254
LOOPBACK (localhost)	127.0.0.0 to 127.0.0.7	255.255.255.0	-	-

-
    - Purchase IP Addresses from Your ISP
        - All Network traffic in a network goes out a single IP Address