

# Networking

## Public and Private Networks



# Public IP Addresses

- A **public IP address** is an IP address that can be accessed directly over the internet and is assigned to your network router by your internet service provider (ISP)
  - The terms public, global, and external may all be used interchangeably, although public is the most common
  - All servers and sites on the Internet use public IP addresses
  - All public IP addresses on the Internet are unique to their host or server and cannot be duplicated



# Private IP Addresses

- There are specific addresses that are stored for private networks
  - These addresses cannot be accessed by a machine outside of a private network
  - **RFC1918** sets the addresses as displayed in the following table

IP Address Range	CIDR Notation	Number of Addresses
10.0.0.0 – 10.255.255.255	10.0.0.0/8	16,777,216
172.16.0.0 – 172.31.255.255	172.16.0.0/12	1,048,576
192.168.0.0 – 192.168.255.255	192.168.0.0/16	65,536

- Why are these addresses set aside for private networks?
  - There aren't enough IPv4 addresses for every device
  - RFC1918 addresses allow the same address to be used among different private networks



# NATs and PATs

- How does a device on a public network talk to a device on a private network?
  - Use a **NAT (network address translation)**
  - NATs translate a private IP address to a public IP address where a machine on a private network can still be accessed by a machine on a public network
    - Only use the public IP address, and not the private IP, adding an extra layer of security to the device on the private network
  - Use a **PAT (port address translation)**
  - Private IP addresses can be translated to the public network, but they use a port number
    - The private network can then map that port number to a specific device on the private network



# VIP and Subinterfaces

- A **virtual IP (VIP)** address is an IP address that does not contain the actual network interface numbers
  - This is able to be done with a NAT that will be able to make a device with a VIP still be connected to the WAN and have network access
- **Subinterfaces** occur when a physical interface is split into many interfaces
  - Happens on Layer 3 of the OSI Model
  - Common when one router wants to have two different networks on the same device
    - The router will create the two networks and still have a way for those two communicate with each other while keeping them separate

