TCP/IP and Subnet Masking
With Eli the Computer Guy
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+ Questions

1. **What is TCP/IP Version 6?**
    a. IPv6 is the most recent version of the Internet Protocol, which will replace IPv4.
2. **What version of TCP/IP will we focus on?**
    a. Our focus will be on TCP/IPv4
3. **What does it mean when we say that TCP/IP is actually a protocol suite?**
    a. TCP and IP are two different protocols, but are now bundled into one (along with other protocols) category for more effective networking.
4. **What is a routable protocol?**
    a. Connects all subnets using routers
5. **What OSI layer does IP reside upon?**
    a. It resides on Layer 3, the Network Layer
6. **What OSI layer does TCP reside upon?**
    a. It resides on Layer 4, the Transport Layer
7. **In TCP/IP what is windowing?**
    a. Windowing is the process by which data is send from a source machine to a target machine. It starts in small increments, ensuring delivery and acknowledgement and increases over time. If connection is not ensured or acknowledged, the process starts the process again from last confirmed packet delivered
8. **How many bits does an IP V4 address have?**
    a. 32 bits (8*4)
9. **In TCP/IP, what is the default gateway?**
    a. A network device, commonly your router, which allows connection/communication to be forwarded outside the internal network.
10. **What does Domain Name Server do?**
    a. Translates/Maps domain names to server IP addresses so that computers can communicate.
11. **What is Network Address Translation (NAT)?**
    a. Remaps IP Addresses in and out of a network, allows the reuse of IPv4 in private networks
12. **In a TCP/IP address, what is an octet?**
    a. An octet refers to 8 bits of data that make up part of an IP Address
13. **What is the purpose of a subnet mask?**
    a. A way to segment a network logically so that different computers and devices can't talk on the same physical network
14. **What would the subnet mask be if you wanted to use 8-bits for the network address and 8 bits for subnets?**
    a. 255.0.0.255
15. **When was the last time that class full addressing was was commonly used?**
    a. When CIDR was introduced in 1993
16. **What replaced class full addressing?**
    a. CIDR (Classes Inter Domain Routing)

+ Notes

TCP/IP Overview

- TCP/IP is a protocol suite
    - Is made up of TCP and IP
        - It's multiple protocols mashed into one…

- **Two important things:**
    - IP (Internet Protocol)—controls routing of information to different machines on a network
        - Deals with Subnet masking, default gateways, DNS, etc…
        - It is what allows to computers to communicate
        - It is a **routable protocol**
            - Connect all subnetworks using routers.

                - **Nonroutable protocols**: Every single computer can communicate to each other and are connected
                    - This causes havoc with bandwidth utilization

        - IP is on OSI Layer 3, Network Layer.

    - **TCP** (Transmission Control Protocol)—enables computer to communicate data once they have discovered each other on a network
        - Once the computers have found each other, how are they going to talk?
            - What language, how fast…
        - It's what controls the communication
    - **TCP/IP** is OSI layer 4, Transport Layer

- **Windowing**—the process by which a client computer sends data to a server
    - When two machines try to talk, Windowing is the process of how data is sent from one computer to another
        - In the process, computer 1 sends a packet of data to computer 2, computer 2 receives it and send an acknowledgement to computer 1 that it was received
            - Since it received the first packet, it will try to send more packets based on the availability and success of the packet transfer
                - The receiving computer indicates to sending computer that it received the last packet of the transmission, and the sending computer will send more and more packets, often increasing the number of packets it sends.
        - IF something happens during the transmission, connection loss, the receiving computer will send an acknowledgment to the sending computer and it will start the cycle again.
            - Ex. Only 1 packet of 10 was received, the cycle of only sending 1 packet at a time restarts
    - Expands the window, and closes it again given the connection/circumstance
    - This is important because of Real Time Communication

+ How TCP/IP Works

- **IP Addresses**—are used to signify every computer or device on a network
- **Subnet Mask**—a way to segment a network logically so that different computers and devices can't talk on the same physical network
    - Say you have 200 computers, you might not want them to communicate with each other

- **Default Gateway**—connects networks at the router (it can be the router, modem…)
    - If an IP Address cannot be found on the local network, the computer uses the Default Gateway to find the target system

- **DNS**—map domain names to IP Addresses
- **DHCP**—provides IP addresses on a local network (automatic distribution)
    - Also gives a computer its subnet mask, default gateway and what DNS servers to talk to
        - When a computer connects to a network, it calls out to a DHCP server and the server will give it all the info
        - Provides a lease time for a computer to own that IP
            - How long a computer is allowed to own an IP Address

- **NAT (Network Address Translation)**
    - Remaps IP Addresses in and out of a network
        - External IP hits the router (from server), NAT knows which internal IP sent the request to the outside and sends the traffic to that machine.
            - Keeps all devices from needing a static IP address on the internet

+ What the Numbers Mean

- IP Address signify a numeric value for Octets
    - IP v4 Addresses are four (4) Octets
        - 4x8
            - One Octet is 8-bits
    - From the right hand side, we give each bit a number
        - It all adds up to 255
    - Bits are either on or off

+ Subnet Masking

- When dealing with an IP Address, it tells you two things:

1. The address of the computer or networking device (server, printer… etc)
2. The subnet number / network number

    - The subnet mask tells you the identifier for the network, and the identifier for the computer
- To determine the number of subnets (bits used) =2^n
    - To determine hosts, it is 2^n-2
- To figure out the subnet mask, …..

A class 255.0.0.0
B class 255.255.0.0
C Class 255.255.255.0