# NetAcad Modules 3-7 Review

# IP Addressing

ITN Chapter 7

# IP Terminology

- **Dotted-decimal notation**: an IP address written in 4 octets in decimal format
- **Binary**: base 2 number system of 0s and 1s
- **Octet**: a group of 8 binary digits
- **Network portion**: bits of the IP address that identify the subnet
- **Host portion**: bits of the IP address that identify individual nodes
- **Subnet mask**: used to identify the network and host portions of an address
- **Prefix length**: (also known as slash or CIDR notation) the number of 1s in the binary form of the subnet mask

# Addressing Terminology

- **Static IP address**: an IP address manually managed by an administrator or user
- **Dynamic IP address**: an IP address automatically managed by a server
- **Unicast**: communication between two individual devices
- **Multicast**: a message sent from one device to a group of devices
- **Broadcast**: a message sent from one device to all listening devices
- **Public address**: can be used globally
- **Private address**: can only be used within an internal network

# Private Addresses

- 10.0.0.0/8
  - or 10.0.0.0 to 10.255.255.255
- 172.16.0.0/12
  - or 172.16.0.0 to 172.31.255.255
- 192.168.0.0/16
  - or 192.168.0.0 to 192.168.255.255

# Classful Addressing

- Legacy addressing where networks are assigned a network address in a class with a predefined allowed number of hosts
- Replaced with CIDR addressing to allow for less waste in address allocation

| Class C Specifics | |
|---|---|
| Address block | 192.0.0.0 - 223.255.255.0 |
| Default Subnet Mask | /24 (255.255.255.0) |
| Maximum Number of Networks | 2,097,152 |
| Number of Host per Network | 254 |
| High order bit | 110xxxxx.___.___.___ |

| Class B Specifics | |
|---|---|
| Address block | 128.0.0.0 - 191.255.0.0 |
| Default Subnet Mask | /16 (255.255.0.0) |
| Maximum Number of Networks | 16,384 |
| Number of Host per Network | 65,534 |
| High order bit | 10xxxxxx.___.___.___ |

| Class A Specifics | |
|---|---|
| Address block | 0.0.0.0 - 127.0.0.0* |
| Default Subnet Mask | /8 (255.0.0.0) |
| Maximum Number of Networks | 128 |
| Number of Host per Network | 16,777,214 |
| High order bit | 0xxxxxxx.___.___.___ |

# Subnetting IP Networks

## ITN Chapter 8

# Subnetting Terminology

- **Subnet**: section of a network
- **Broadcast domain**: group of devices that can receive a broadcast from one another; usually all connected by layer 2 switches in one subnet
- **Octet boundary**: subnet created using a /8, /16, or /24 subnet mask
- **VLSM**: (Variable Length Subnet Mask) dividing a network into subnets of different sizes in order to conserve address space

# Planning a Network

- Broadcast domains must remain manageable
- Must leave enough possible subnets for future expansion
- Each subnet must have enough possible host addresses for future expansion
- /24 is the most common subnet boundary as it allows for many different subnets with up to 254 hosts
- Most devices should have a dynamically allocated IP, whereas servers and network devices should have a static IP
- Conserving address space is not much of a concern in IPv6, so networks do not need as detailed planning as IPv4

# Classless Subnetting

- Bits are “borrowed” from the host portions to create subnets of the original network
- Ex. 192.168.0.0/16 is the network address and 8 bits are borrowed via a /24 subnet mask
  - There can be 254 subnets with 254 hosts each
  - One subnet could be 192.168.10.0 and a host on that subnet could be 192.168.10.1
  - Broadcast address of that subnet is 192.168.10.255
- Subnets should be chosen based on the number of needed hosts to conserve addressing space

# Example Subnets

| Prefix Length | Subnet Mask | Subnet Mask in Binary (n = network, h = host) | # of subnets | # of hosts |
|---|---|---|---|---|
| /25 | 255.255.255.128 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nhhhhhhh<br>11111111.11111111.11111111.10000000 | 2 | 126 |
| /26 | 255.255.255.192 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nnhhhhhh<br>11111111.11111111.11111111.11000000 | 4 | 62 |
| /27 | 255.255.255.224 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nnnhhhhh<br>11111111.11111111.11111111.11100000 | 8 | 30 |
| /28 | 255.255.255.240 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nnnnhhhh<br>11111111.11111111.11111111.11110000 | 16 | 14 |
| /29 | 255.255.255.248 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nnnnnhhh<br>11111111.11111111.11111111.11111000 | 32 | 6 |
| /30 | 255.255.255.252 | nnnnnnnn.nnnnnnnn.nnnnnnnn.nnnnnnhh<br>11111111.11111111.11111111.11111100 | 64 | 2 |