

IP Subnetting

What we need to identify when choosing subnet mask?

1. How many subnets does the chosen subnet mask produce?
2. How many valid hosts per subnet are available?
- 3. What are the valid subnets?**
4. What's the broadcast address of each subnet?
5. What are the valid hosts in each subnet?

How many subnets?

- $2^x - 2$ = number of subnets. x is the number of masked bits, or the 1s.
- For example, in 11000000, the number of ones gives us $2^2 - 2$ subnets. In this example, there are 2 subnets.

How many hosts per subnet?

- $2^y - 2$ = number of hosts per subnet. y is the number of unmasked bits, or the 0s.
- For example, in 11000000, the number of zeros gives us $2^6 - 2$ hosts. In this example, there are 62 hosts per subnet.

What are the valid subnets?

- $256 - \text{subnet mask} = \text{block size, or base number.}$
- For example, $256 - 192 = 64$. 64 is the first subnet. The next subnet would be the base number plus itself, or $64 + 64 = 128$, (the second subnet). You keep adding the base number to itself until you reach the value of the subnet mask, which is not a valid subnet because all subnet bits would be turned on (1s).

What's the broadcast address for each subnet?

- The broadcast address is all host bits turned on, which is the number immediately preceding the next subnet.

What are the valid hosts?

- Valid hosts are the numbers between the subnets, omitting all 0s and all 1s.

Exercise1

- Subnet the network address 192.168.10.0 using subnet mask 255.255.255.192.
 1. How many subnets does the chosen subnet mask produce?
 2. How many valid hosts per subnet are available?
 3. What are the valid subnets?
 4. What's the broadcast address of each subnet?
 5. What are the valid hosts in each subnet?

Exercise 2

- subnet the network address 192.168.10.0 and subnet mask 255.255.255.224.
1. How many subnets does the chosen subnet mask produce?
 2. How many valid hosts per subnet are available?
 3. What are the valid subnets?
 4. What's the broadcast address of each subnet?
 5. What are the valid hosts in each subnet?

Exercise 3

- determine the subnet and broadcast address of the following IP address:

192.168.10.33 = Node address

255.255.255.224 = Subnet mask

Exercise 4

- determine the subnet and broadcast address of the following IP address:

192.168.10.33 = Node address

255.255.255.240= Subnet mask

Subnetting Class B addresses

- 172.16.0.0 = Network address
- 255.255.192.0 = Subnet mask

172.16.0.0 = Network address

255.255.255.224 = Subnet address

1. How many subnets does the chosen subnet mask produce?
2. How many valid hosts per subnet are available?
3. What are the valid subnets?
4. What's the broadcast address of each subnet?
5. What are the valid hosts in each subnet?

Subnetting in your head

- **Question:** What subnet and broadcast address is the IP address 172.16.10.33 255.255.255.224 a member of?
- **Answer:** $256 - 224 = 32$. $32 + 32 = 64$. Bingo: 33 is between 32 and 64. However, remember that the third octet is considered part of the subnet, so the answer would be the 10.32 subnet. The broadcast is 10.63, since 10.64 is the next subnet.
- **Question:** What subnet and broadcast address is the IP address 172.16.90.66 255.255.255.192 a member of?
- **Answer:** $256 - 192 = 64$. $64 + 64 = 128$. The subnet is 172.16.90.64. The broadcast must be 172.16.90.127, since 90.128 is the next subnet.

Subnetting in your head

- **Question:** What subnet and broadcast address is the IP address 172.16.50.97 255.255.255.224 a member of?
- Answer: $256 - 224 = 32$, 64, 96, 128. The subnet is 172.16.50.96, and the broadcast must be 172.16.50.127 since 50.128 is the next subnet.
- **Question:** What subnet and broadcast address is the IP address 172.16.10.10 255.255.255.192 a member of?
- Answer: $256 - 192 = 64$. This address must be in the 172.16.10.0 subnet, and the broadcast must be 172.16.10.63.
- **Question:** What subnet and broadcast address is the IP address 172.16.10.10 255.255.255.252 a member of?
- Answer: $256 - 252 = 4$. The subnet is 172.16.10.8, with a broadcast of 172.16.10.11.

Subnetting Class A

- **Example : 255.255.240.0 (/20)**
- *Subnets?* $2^{12} - 2 = 4094$.
- *Hosts?* $2^{12} - 2 = 4094$.
- *Valid subnets?* $256 - 240 = 16$

Subnetting Class A 255.255.255.192 mask
for 10.0.0.0, list the first 4 subnets

Subnet				
First host				
Last host				
Broadcast				

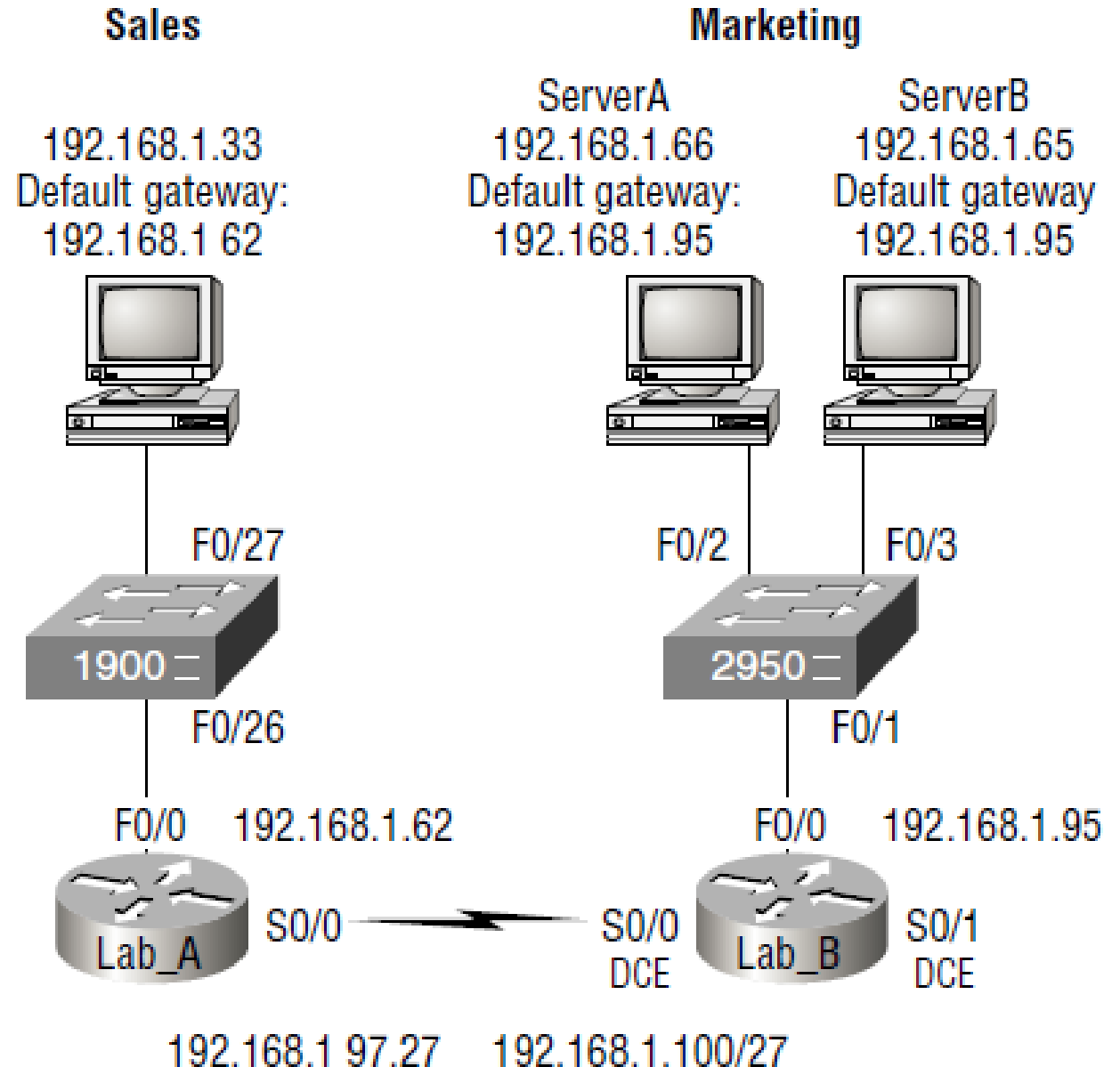
Troubleshooting Network problems

1. Ping 127.0.0.1. This is the diagnostic or loopback address, and if you get a successful ping, your IP stack is then considered to be initialized. If it fails, then you have an IP stack failure and need to reinstall TCP/IP on the host.
2. Ping the IP address of the local host. If that's successful, then your Network Interface Card (NIC) card is functioning. If it fails, then there is a problem with the NIC card. This doesn't mean that a cable is plugged into the NIC, only that the IP protocol stack on the host can communicate to the NIC.
3. Ping the default gateway (router). If the ping works, it means that the NIC is plugged into the network and can communicate on the local network. If it fails, then you have a local physical network problem that could be happening anywhere from the NIC to the router.
4. If steps 1 through 3 were successful, try to ping the remote server. If that works, then you know that you have IP communication between the local host and the remote server. You also know that the remote physical network is working.

Practical Example

A user in the Sales department calls and tells you that she can't get to ServerA in the Marketing department.

You ask her if she can get to ServerB in the Marketing department, but she doesn't know because she doesn't have rights to log on to that server. What do you do?



- A user in the Sales LAN can't get to ServerB

