

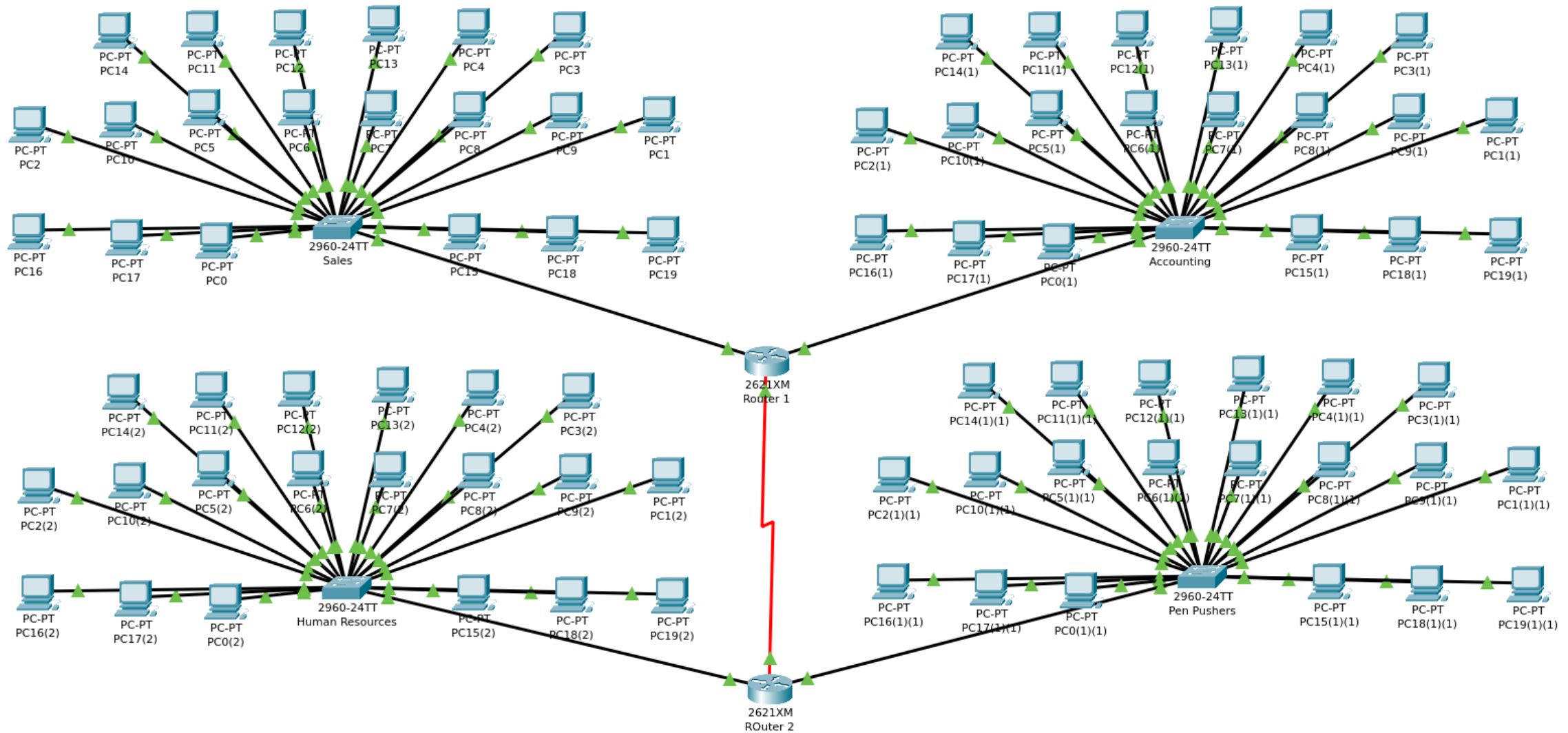
Custom Subnet Solutions



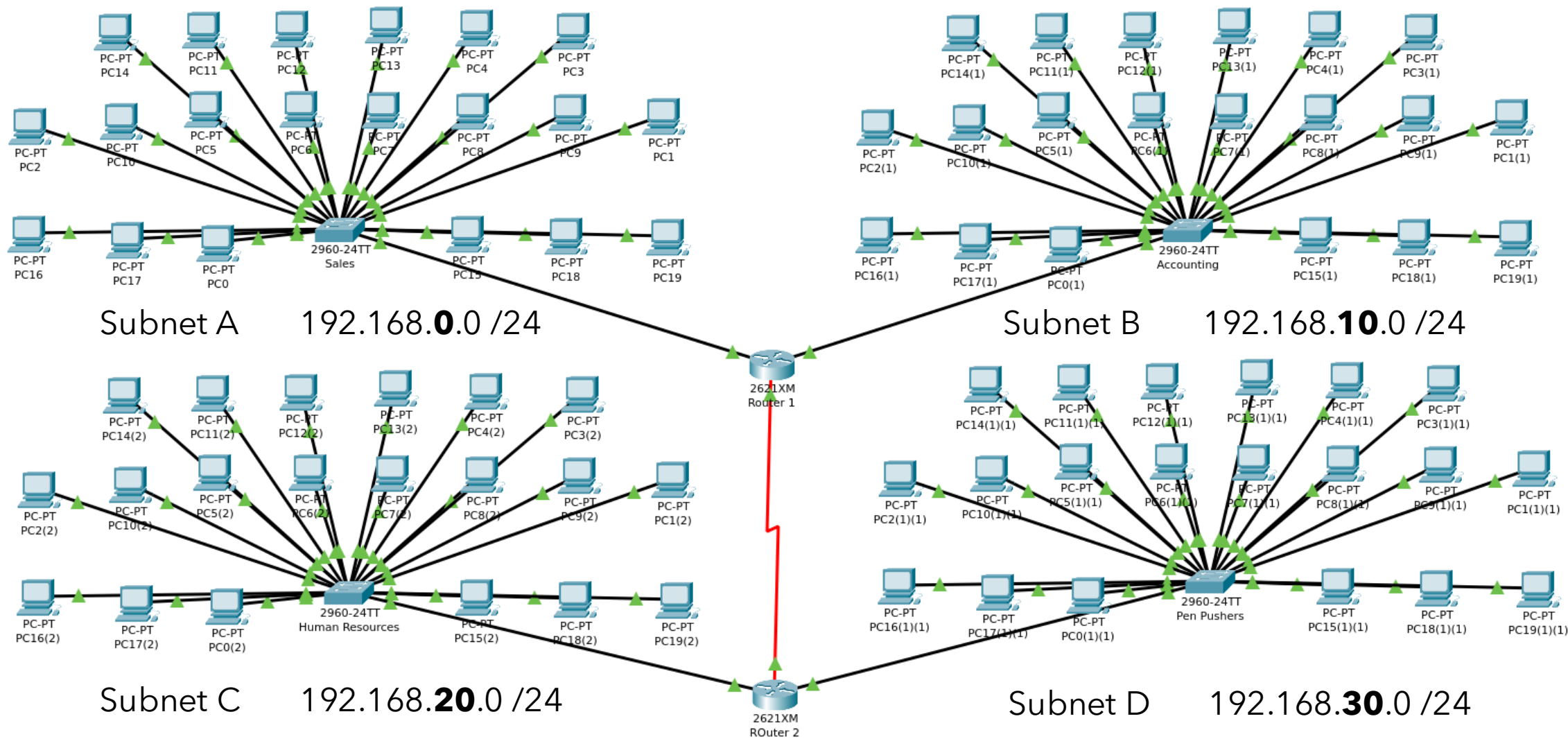
Jonathan Edwards 2024

Happy New Year ... from co1507

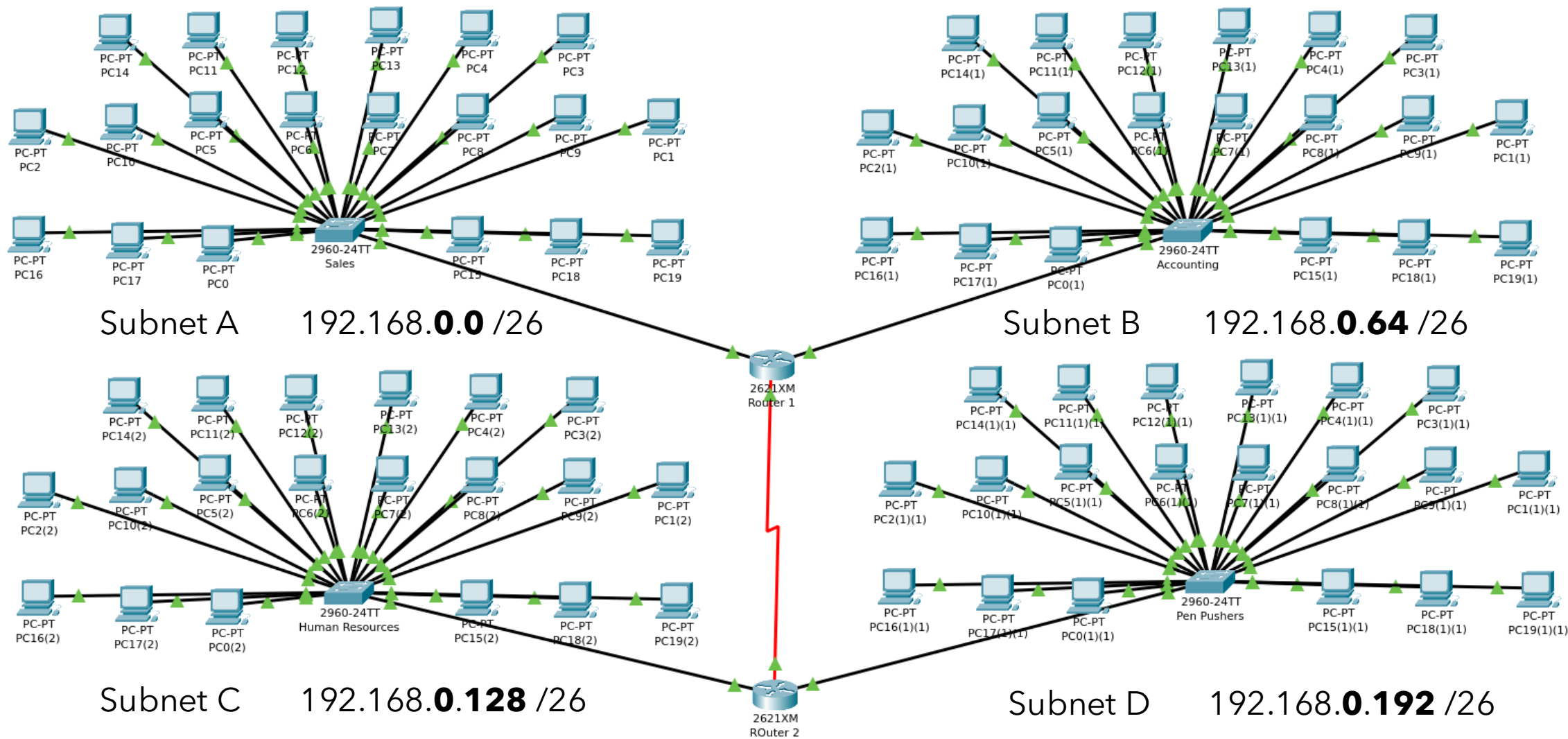




How do we address this scenario?
4 subnets, 20 PCs per department



With 4 separate network addresses...
lots of wasted address space!



With a custom subnet mask
we can fit all 4 into $\frac{1}{4}$ of the address space

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- Custom Subnet Mask **255.255.255.192** or 11111111 11111111 11111111 11000000
 - 26 bit **network address**
 - Of which 2 bits subnet bits
 - 6 bit **host id address**
- **4** subnets created (2^2)
- Each has capacity for **62** host IP addresses (2^6)
- Network addresses are spaced 64 apart
 - 192.168.0.0 or 11000000 10101000 00000000 00000000
 - 192.168.0.64 or 11000000 10101000 00000000 01000000
 - 192.168.0.128 or 11000000 10101000 00000000 10000000
 - 192.168.0.192 or 11000000 10101000 00000000 11000000

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- If we needed 8 subnets we could take one more bit and use the subnet mask...
- 255.255.255.224 or 11111111 11111111 11111111 11100000
 - 27 bit network address
 - Of which 3 bits subnet bits
 - 5 bit host id address
- 8 subnets created (2^3)
- Each has capacity for 30 host IP addresses (2^5)
- Network addresses are spaced 32 apart
- 192.168.0.0 or 11000000 10101000 00000000 00000000
- 192.168.0.32 or 11000000 10101000 00000000 00100000
- 192.168.0.64 or 11000000 10101000 00000000 01000000
- 192.168.0.96 or 11000000 10101000 00000000 01100000

There are 4 more...
.128 .160 .192 .224

From Last Lab: Scenario A

Host IP address	192.168.100.139 11000000 10101000 01100100 10001011
Original subnet mask	255.255.255.0 11111111 11111111 11111111 00000000
Custom subnet mask	255.255.255.224 (/27) 11111111 11111111 11111111 11100000
Number of subnet bits	3 (in yellow above)
Number of subnets created	8 (2^3)
Number of host bits per subnet	5 (in green above)
Number of valid host IPs per subnet	30 ($2^5 - 2$)

Scenario A

192.168.100.139 = 11000000 10101000 01100100 100 01011

192.168.100.128 = 11000000 10101000 01100100 100 00000 = Network address

192.168.100.129 = 11000000 10101000 01100100 100 00001 = 1st host IP address

192.168.100.158 = 11000000 10101000 01100100 100 11110 = last host IP address

192.168.100.159 = 11000000 10101000 01100100 100 11111 = Broadcast address

From Last Lab: Scenario B

Host IP address	192.168.33.26 11000000 10101000 00100001 00011010
Original subnet mask	255.255.255.0 11111111 11111111 11111111 00000000
Custom subnet mask	255.255.255.192 (/26) 11111111 11111111 11111111 11000000
Number of subnet bits	2 (in yellow above)
Number of subnets created	4 (2^2)
Number of host bits per subnet	6 (in green above)
Number of valid host IPs per subnet	62 ($2^6 - 2$)

Scenario B

192.168.33.26 = 11000000 10101000 00100001 00 011010

192.168.33.0 = 11000000 10101000 00100001 00 000000 = Network address

192.168.33.1 = 11000000 10101000 00100001 00 000001 = 1st host IP address

192.168.33.62 = 11000000 10101000 00100001 00 111110 = last host IP address

192.168.33.63 = 11000000 10101000 00100001 00 111111 = Broadcast address

From Last Lab: Scenario C

Host IP address	172.16.32.12 10101100 00010000 00100000 00001100
Original subnet mask	255.255.0.0 11111111 11111111 00000000 00000000
Custom subnet mask	255.255.224.0 (/19) 11111111 11111111 11100000 00000000
Number of subnet bits	3 (in yellow above)
Number of subnets created	8 (2^3)
Number of host bits per subnet	13 (in green above)
Number of valid host IPs per subnet	8190 ($2^{13}-2$)

Scenario C

172.16.32.12	=	10101100 00010000 001	00000 00001100	
172.16. <u>32.0</u>	=	10101100 00010000 001	<u>00000 00000000</u>	= Network address
172.16. <u>32.1</u>	=	10101100 00010000 001	<u>00000 00000001</u>	= 1 st host IP address
172.16. <u>63.254</u>	=	10101100 00010000 001	<u>11111 11111110</u>	= Last host IP address
172.16. <u>63.255</u>	=	10101100 00010000 001	<u>11111 11111111</u>	= Broadcast address

and another... (not from lab)

Host IP address	10.201.99.228 00001010 11001001 01100011 11100100
Original subnet mask	255.0.0.0 11111111 00000000 00000000 00000000
Custom subnet mask	255.255.128.0 (/17) 11111111 11111111 10000000 00000000
Number of subnet bits	9 (in yellow above)
Number of subnets created	512 (2^9)
Number of host bits per subnet	15 (in green above)
Number of valid host IPs per subnet	32,766 ($2^{15} - 2$)

10.201.99.228 = 00001010 11001001 0 1100011 11100100

10.201.0.0 = 00001010 11001001 0 00000000 00000000 = Network address

10.201.0.1 = 00001010 11001001 0 00000000 00000001 = 1st host IP address

10.201.127.254 = 00001010 11001001 0 11111111 11111110 = Last host IP address

10.201.127.255 = 00001010 11001001 0 11111111 11111111 = Broadcast address

One more ...

Host IP address	172.18.69.123 00001010 00010001 01000101 01111011
Original subnet mask	255.255.0.0 11111111 00000000 00000000 00000000
Custom subnet mask	255.255.240.0 (/20) 11111111 11111111 11110000 00000000
Number of subnet bits	4 (in yellow above)
Number of subnets created	16 (2^4)
Number of host bits per subnet	12 (in green above)
Number of valid host IPs per subnet	4096 ($2^{12}-2$)

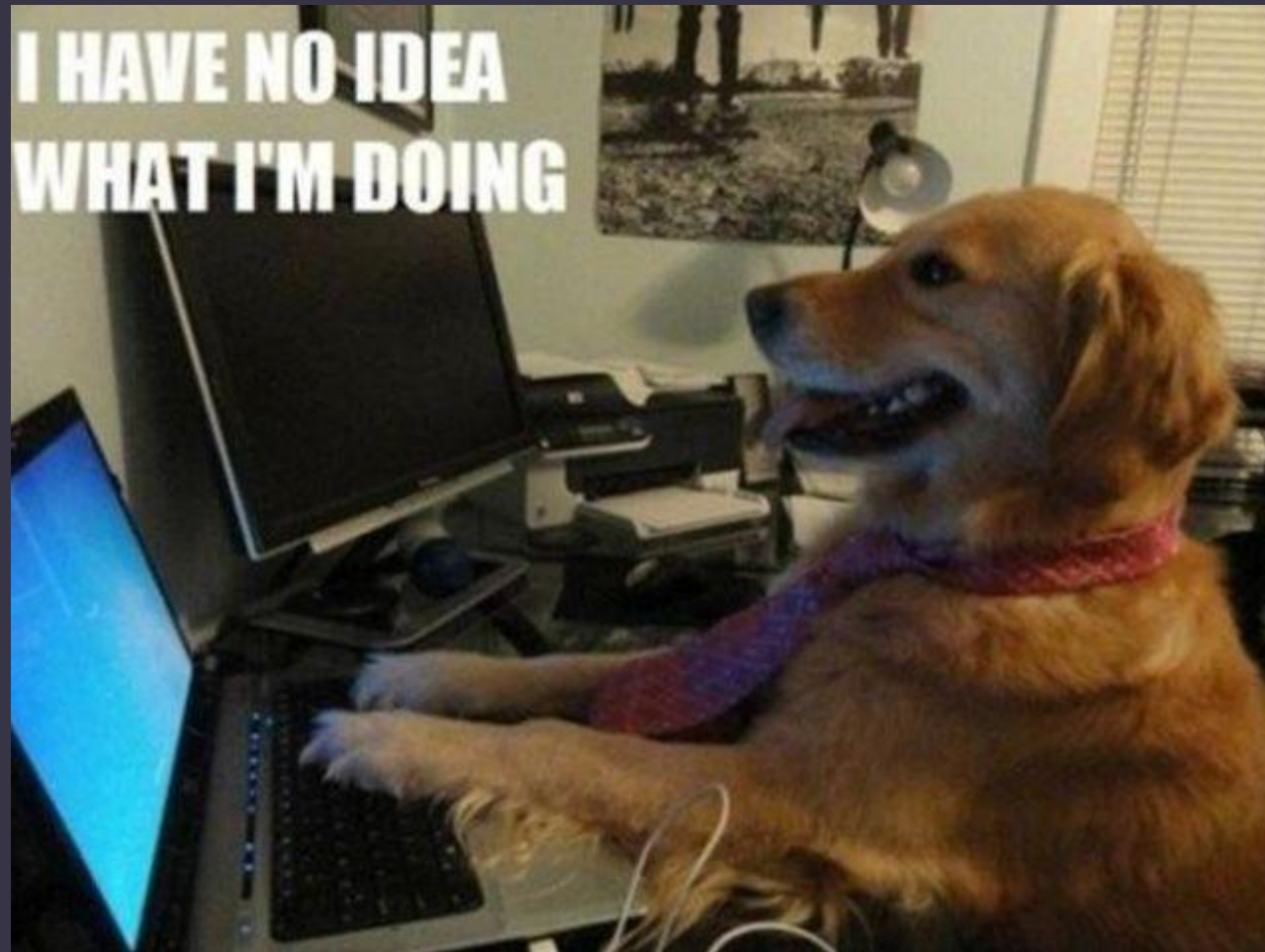
172.18.69.123 = 00001010 00010001 0100 0101 01111011

10.201.64.0 = 00001010 00010001 0100 0000 00000000 = Network address

10.201.64.1 = 00001010 00010001 0100 0000 00000001 = 1st host IP address

10.201.79.254 = 00001010 00010001 0100 1111 11111110 = Last host IP address

10.201.79.255 = 00001010 00010001 0100 1111 11111111 = Broadcast address



Got it yet?

Custom Subnetting isn't as hard as it seems (I promise...)