



## Chapter 6

# Addressing the Network - IPV4

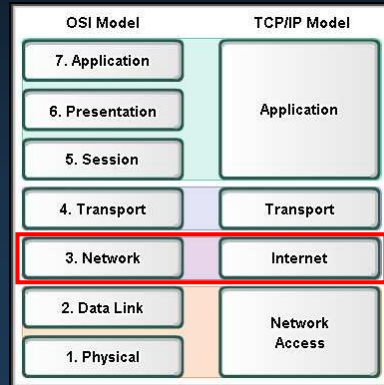
## Part III

### Note for Instructors

- These presentations are the result of a collaboration among the instructors at St. Clair College in Windsor, Ontario.
- Thanks must go out to Rick Graziani of Cabrillo College. His material and additional information was used as a reference in their creation.
- If anyone finds any errors or omissions, please let me know at:
  - [tdame@stclaircollege.ca](mailto:tdame@stclaircollege.ca).

## Addressing the Network: IPv4

### Subnetting: Dividing Networks Into the Right Sizes



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## Dividing Networks Into the Right Size

Network: 192.168.80.0 Subnet Mask: 255.255.255.224

ID	Network Address	Subnet Address Range	Broadcast Address
0	192.168.80.0	192.168.80.1 – 192.168.80.30	192.168.80.31
1	192.168.80.32	192.168.80.33 – 192.168.80.62	192.168.80.63
2	192.168.80.64	192.168.80.65 – 192.168.80.94	192.168.80.95
3	192.168.80.96	192.168.80.97 – 192.168.80.126	192.168.80.127
4	192.168.80.128	192.168.80.129 – 192.168.80.158	192.168.80.159
5	192.168.80.160	192.168.80.161 – 192.168.80.190	192.168.80.191
6	192.168.80.192	192.168.80.193 – 192.168.80.222	192.168.80.223
7	192.168.80.224	192.168.80.225 – 192.168.80.254	192.168.80.255

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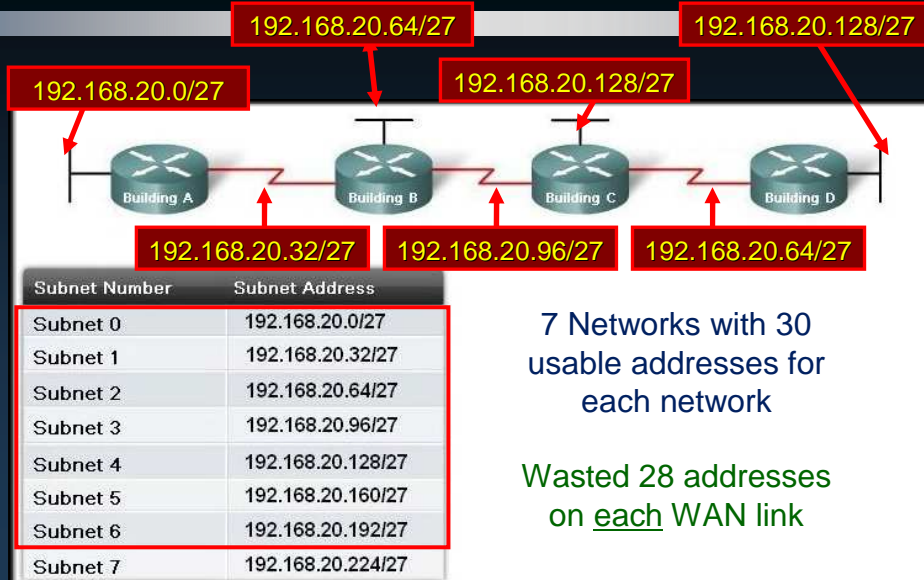
## Variable Length Subnet Masking (VLSM)

- A serious limitation of using only a *single subnet mask across a given network-prefix* (the number of network or 1 bits in the mask) was that an organization is *locked into a fixed-number of fixed-sized subnets*.
- VLSM enables a network number to be configured with different subnet masks on different interfaces.
  - Subnet an already subnetted network address.
  - Conserves IP addresses.
  - More efficient use of available address space.
- Allows for more hierarchical levels within an addressing plan.

## Variable Length Subnet Masking (VLSM)

10.0.0.0/8 Subnet using /16				
Subnet	1 <sup>st</sup> Host	Last Host	Broadcast	
10.0.0.0/16	10.0.0.1	10.0.255.254	10.0.255.255	
10.1.0.0/16	10.1.0.1	10.1.255.254	10.1.255.255	
10.2.0.0/16	Subnet	1 <sup>st</sup> Host	Last Host	Broadcast
10.3.0.0/16	10.3.0.0/24	10.3.0.1	10.3.0.254	10.3.0.255
Subnet	10.2.1.0/24	10.2.1.1	10.2.1.254	10.2.1.255
10.255.0.0/16	10.255.0.0/24	10.255.0.1	10.255.0.254	10.255.0.255
	Etc.			
	10.2.255.0/24	10.2.255.1	10.2.255.254	10.2.255.255

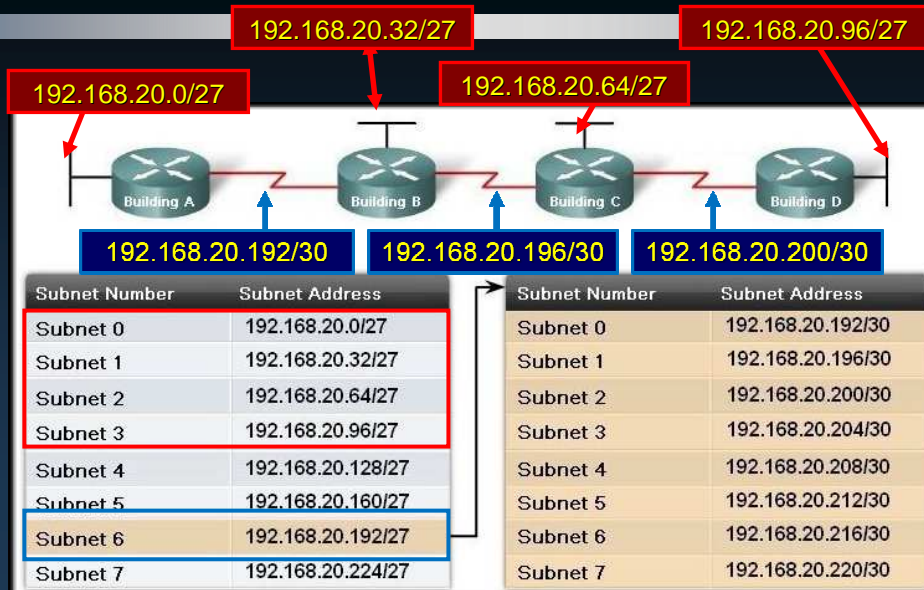
## Variable Length Subnet Masking (VLSM)



7 Networks with 30 usable addresses for each network

Wasted 28 addresses on each WAN link

## Variable Length Subnet Masking (VLSM)



## Variable Length Subnet Masking (VLSM)

Original Subnet Mask Magic Number = 32	255.255.255.224	255.255.255.252	Sub-Subnet Mask Magic Number = ?
192.168.20.0	0 0 0 0 0 0 0 0	1 1 0 0 0 0 0 0	192.168.20.192
192.168.20.32	0 0 1 0 0 0 0 0	1 1 0 0 0 1 0 0	192.168.20.196
192.168.20.64	0 1 0 0 0 0 0 0	1 1 0 0 1 0 0 0	192.168.20.200
192.168.20.96	0 1 1 0 0 0 0 0	1 1 0 0 1 1 0 0	192.168.20.204
192.168.20.128	1 0 0 0 0 0 0 0	1 1 0 1 0 0 0 0	192.168.20.208
192.168.20.160	1 0 1 0 0 0 0 0	1 1 0 1 0 1 0 0	192.168.20.212
192.168.20.192	1 1 0 0 0 0 0 0	1 1 0 1 1 0 0 0	192.168.20.216
192.168.20.224	1 1 1 0 0 0 0 0	1 1 0 1 1 1 0 0	192.168.20.220

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## Variable Length Subnet Masking (VLSM)

*"If you know how to subnet, you can do VLSM."*

**What's the trick?**

Always satisfy the requirements of your biggest LAN and then work your way down ....

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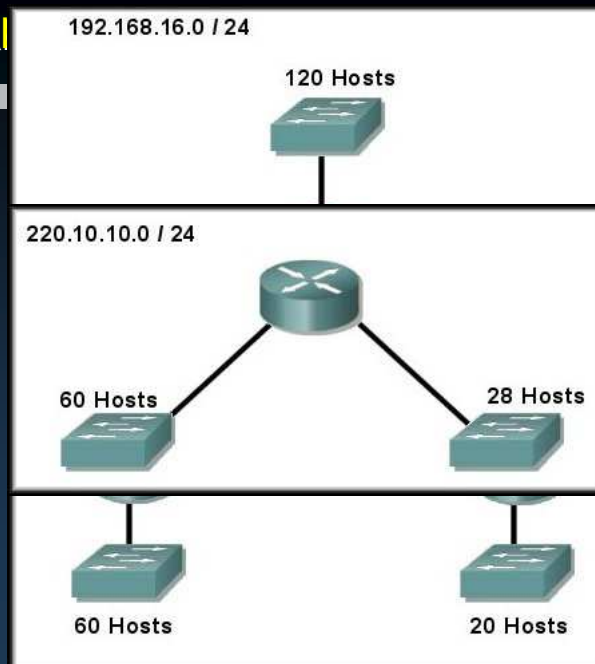
## Variable Length Subnet Masking (VLSM)

- **Steps for VLSM:**
  1. List the number of hosts required per network beginning with the largest to the smallest.
  2. Convert the subnet mask to binary.
  3. Draw a line where the network portion ends.
  4. Ask yourself the question... *How many bits do I need to support the required number of hosts?*
  5. Move the line to show your new network portion.
  6. Determine your new magic number.
  7. Finish subnetting using the new magic number.
- **The starting address is always the first network.**
- **You cannot go past the next network of the previous level.**

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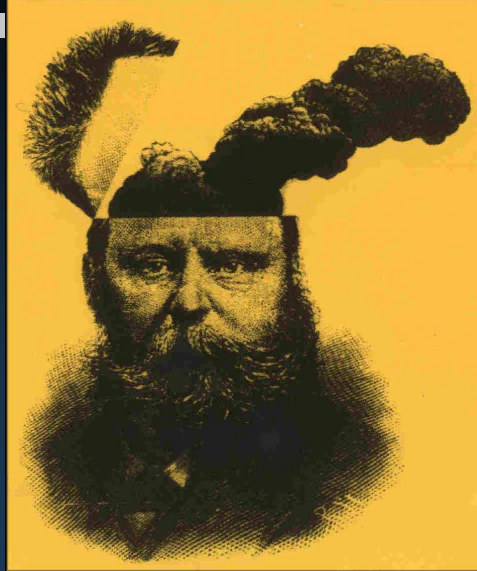
## Variable Length Subnet Masking (VLSM)



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Even though you may feel like this.....



It's time to do some more.....