Network Layer: Subnetting

Lecture 7 | CSE421 – Computer Networks

Department of Computer Science and Engineering
School of Data & Science

Objectives

- IPv4 Exhaustion
- Solution to the depletion of IPv4
- Types of Subnetting
- Examples

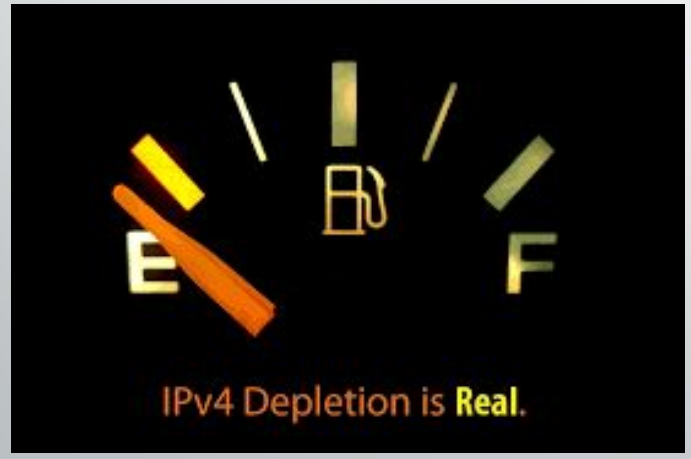
IPv4 Address Exhaustion

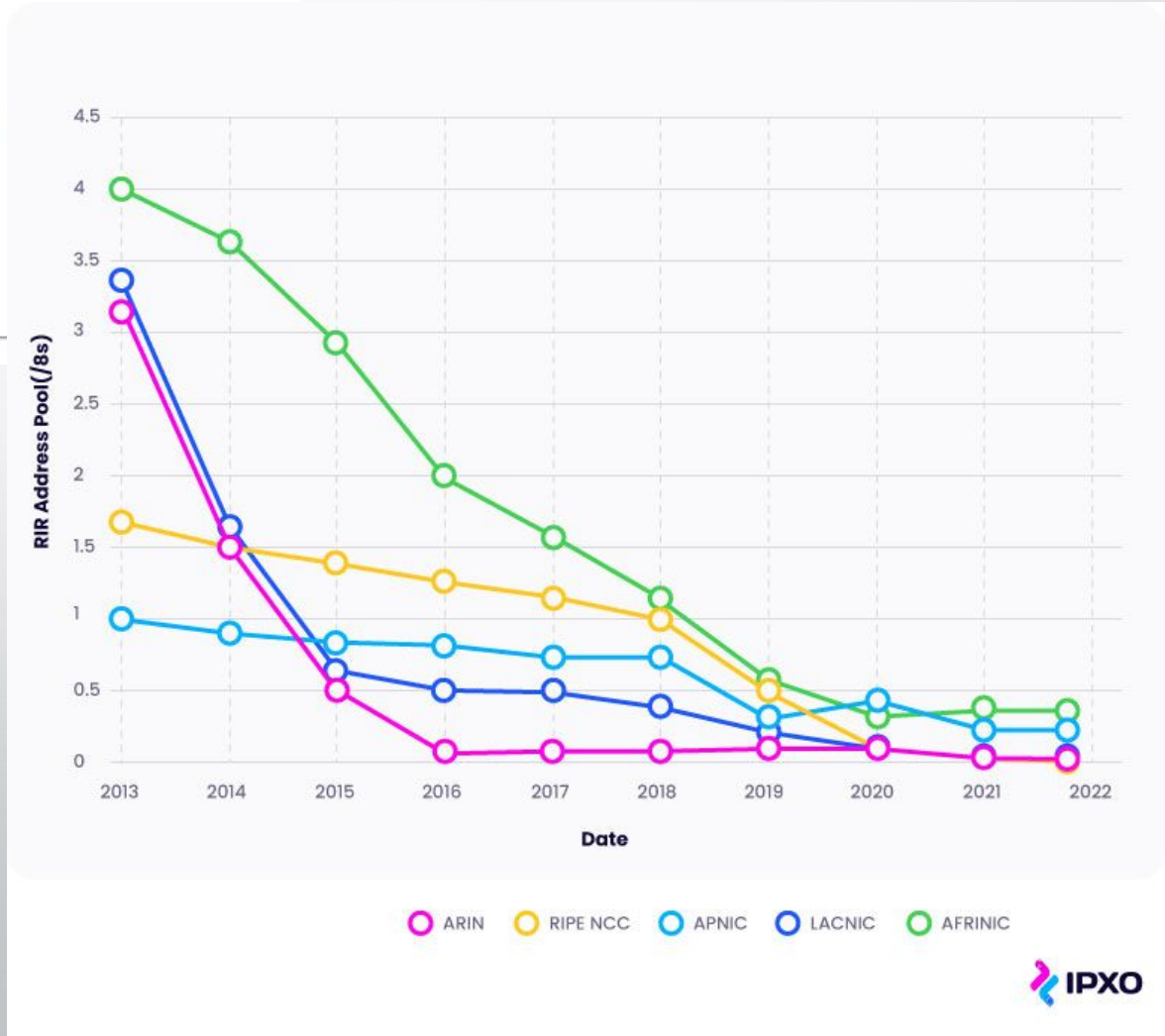
This report generated at 10-Jan-2016 08:20 UTC.

IANA Unallocated Address Pool Exhaustion:
03-Feb-2011

Projected RIR Address Pool Exhaustion Dates:

RIR	Projected Exhaustion Date	Remaining Addresses in RIR Pool (/8s)
APNIC:	**19-Apr-2011** (actual)	0.6284
RIPE NCC:	**14-Sep-2012** (actual)	0.9520
LACNIC:	**10-Jun-2014** (actual)	0.1140
ARIN:	**24 Sep-2015** (actual)	
AFRINIC:	**12-Aug-2018**	1.8246





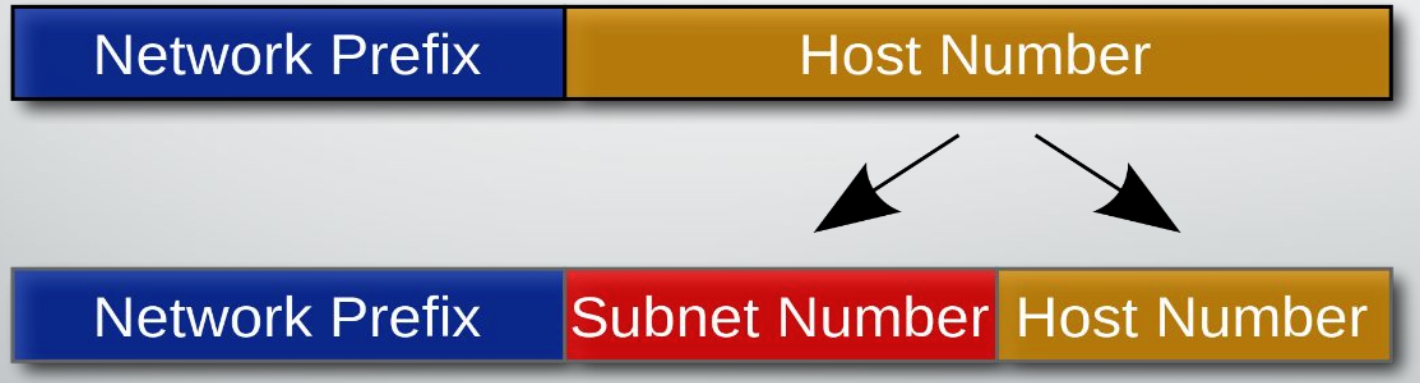
Solutions

- **Long term:**
  - Change to IP version 6.
  - Plenty of addresses using a different scheme
- **Short term:**
  - Use **Subnetting** to avoid wasting addresses
  - Use **private addresses** locally and **NAT** for internet access – lets many host share a few public addresses

Private IP address space	
From	**To**
10.0.0.0	10.255.255.255
172.16.0.0	172.31.255.255
192.168.0.0	192.168.255.255

Subnetting

- Partition a single physical network into more than one smaller logical sub-networks (subnets).
- **Borrow bits** from **the IP address's host part**
- Use these bits to create a number of smaller sub-networks inside the original network.

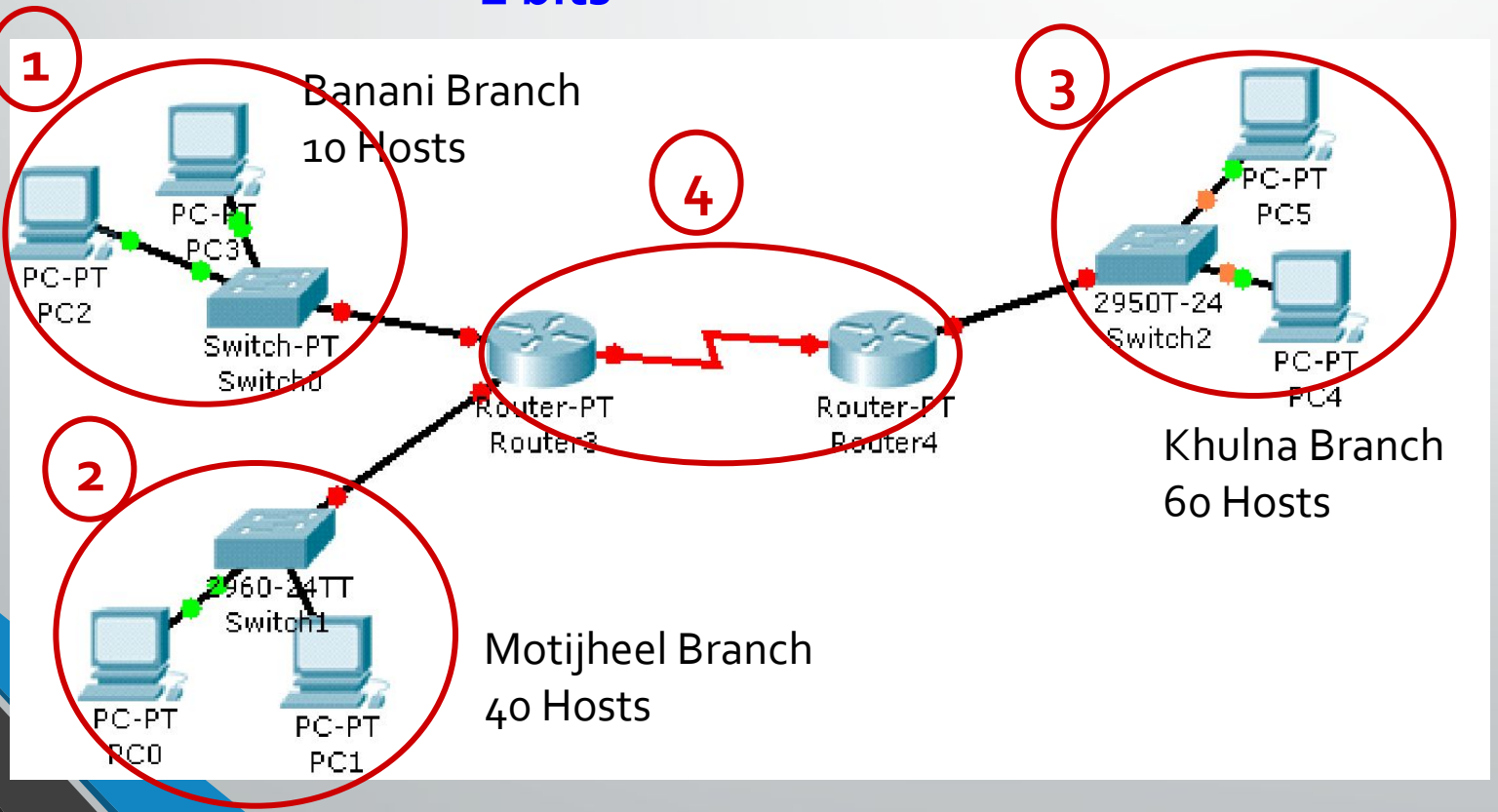


Subnetting

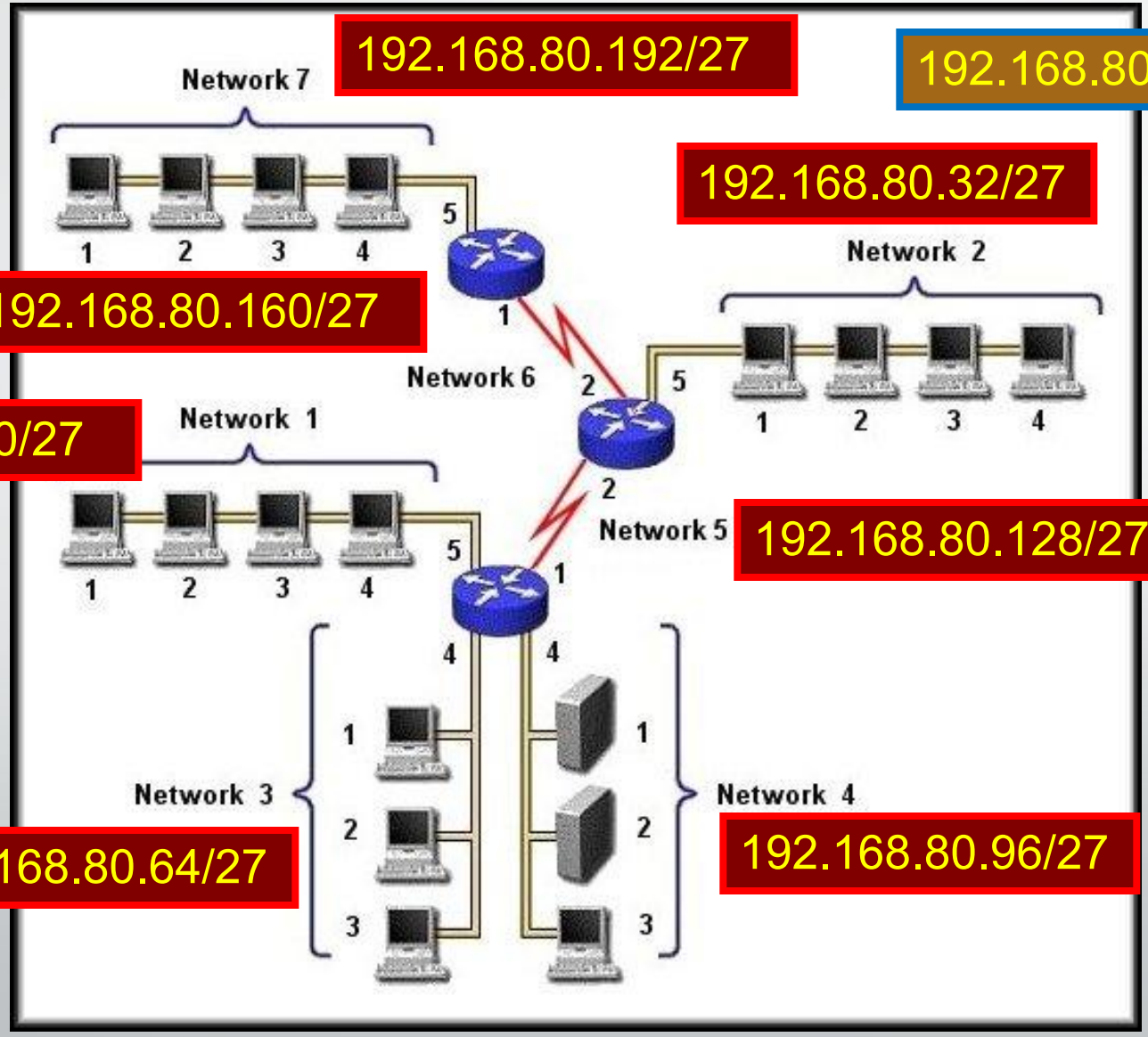
- Two methods of subnetting
  - Fixed Length Subnet Masking
  - Variable Length Masking

Fixed length subnetting

- How many network addresses do you need for the organization?
- How many network addresses do you have? **1** **200.20.20.0/24**
- How many bits do you have for hosts? **8 bits**
- How many host bits do you need to borrow to create the number of sub networks that you need? **2 bits**



Fixed Length Subnetting: Example



Lots of Waste!

- **Problem of Fixed Subnetting:**
  - Waste IPv4 addresses.
  - For example : Router3 –Router2 Network rec
  - How many is available? How many wasted?
  - If you are using private addresses, then you may not be bothered.
  - Waste of public addresses does matter.

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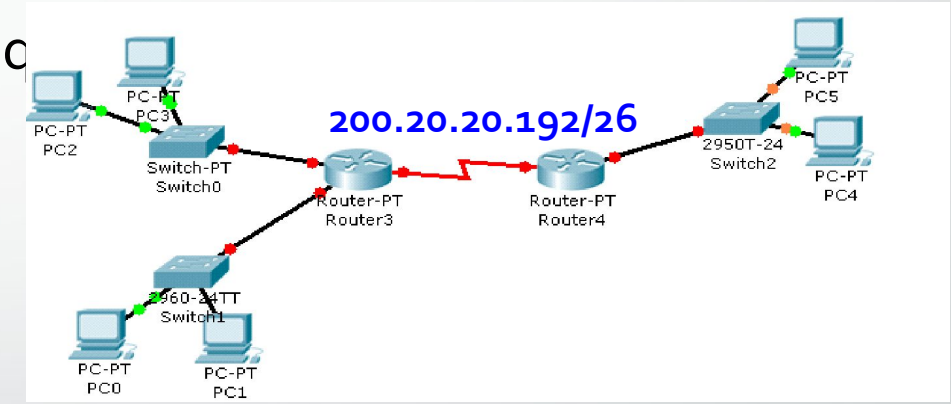
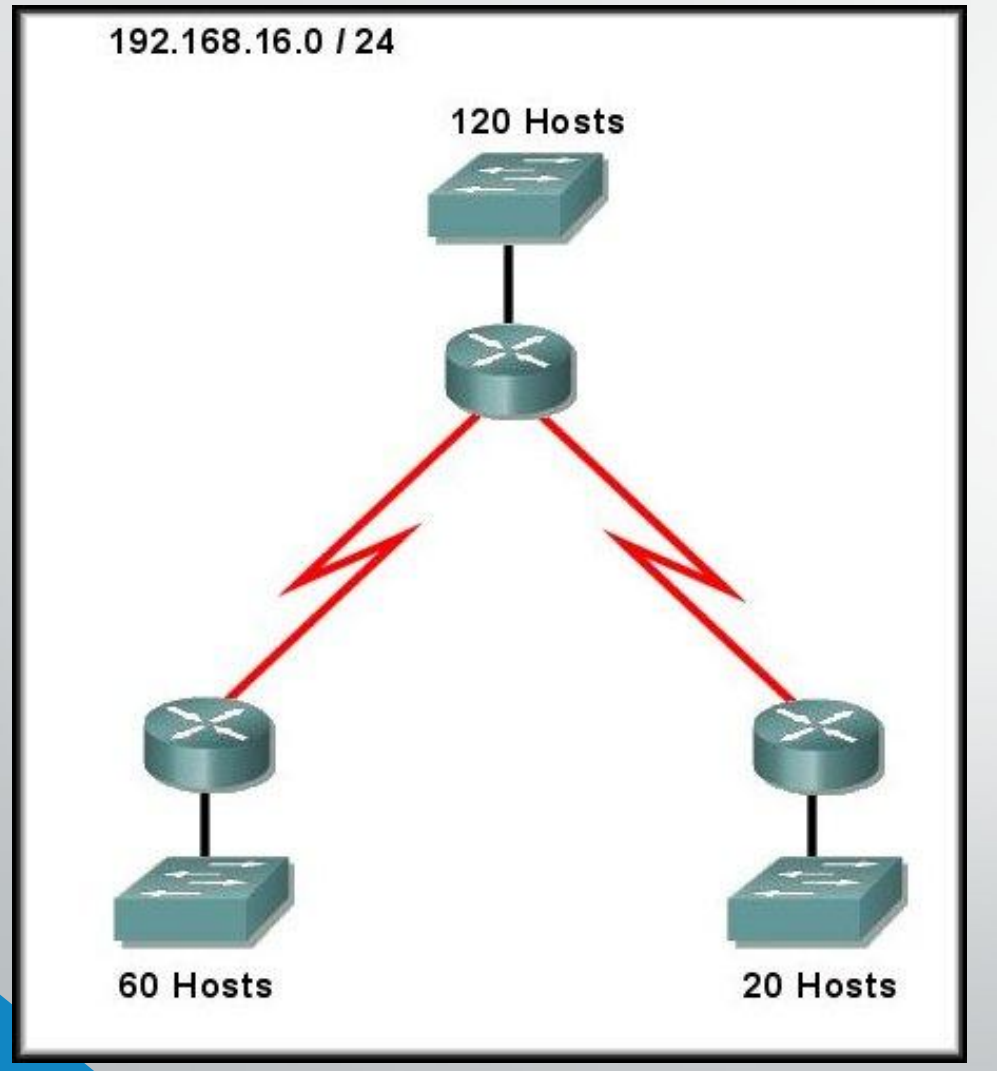


- **Solutions:**
  - Variable Length Subnet Masking (VLSM)
    - Create subnets as per specific host requirements.

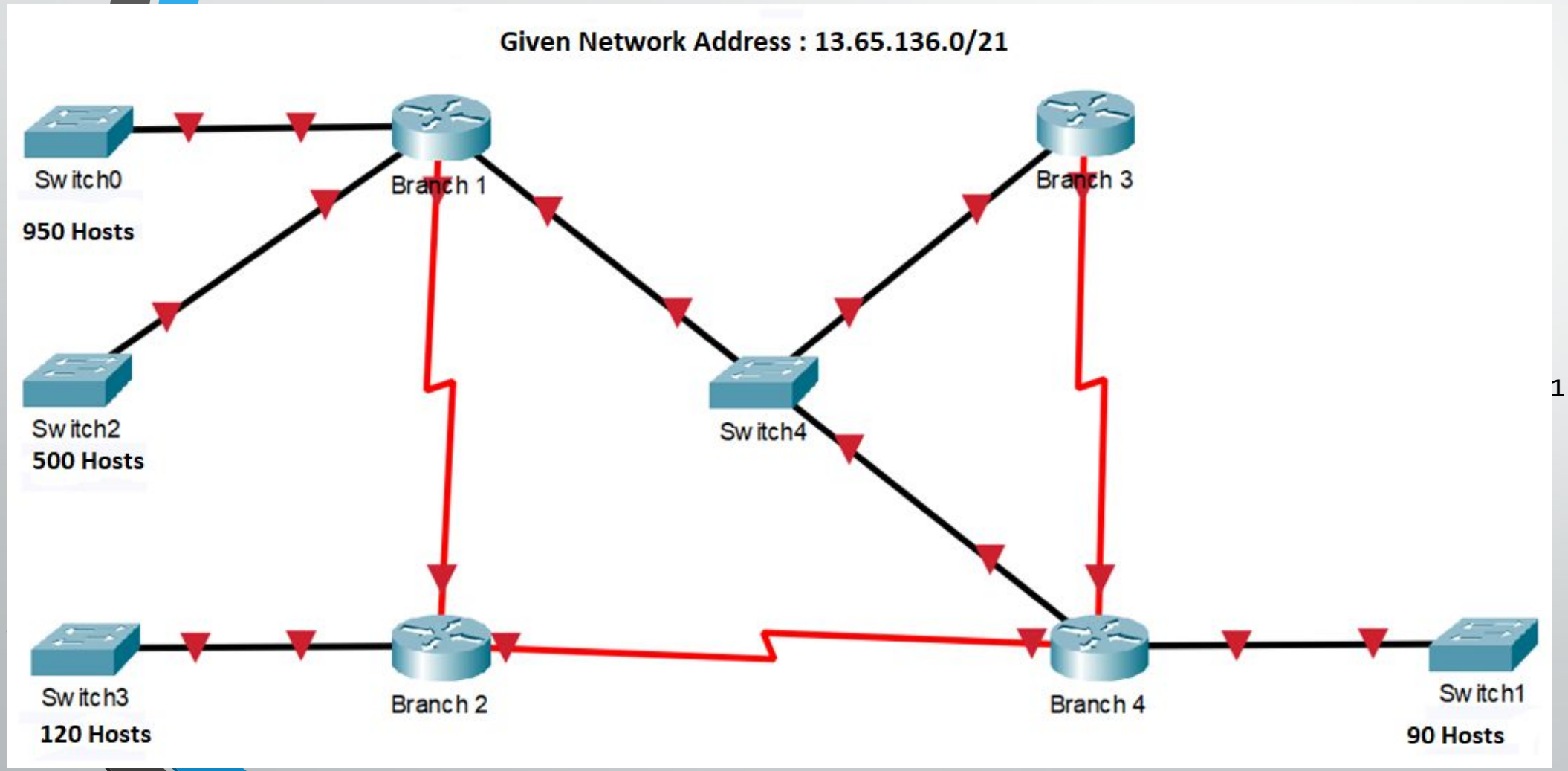
VLSM

- Also known as **"Variable Length Subnet Masking"**
  - Assign a block of IP satisfying only that particular LAN.
    - **200 hosts?** Assign a block of size 256 IPs!
    - **1000 hosts?** Assign a block of size 1024 IPs!
    - **2 Hosts?** Assign a block of size 2 IPs!
- Always satisfy the requirements of your biggest LAN and then work your way down to the smallest LAN.

VLSM Example 1



VLSM Example 2

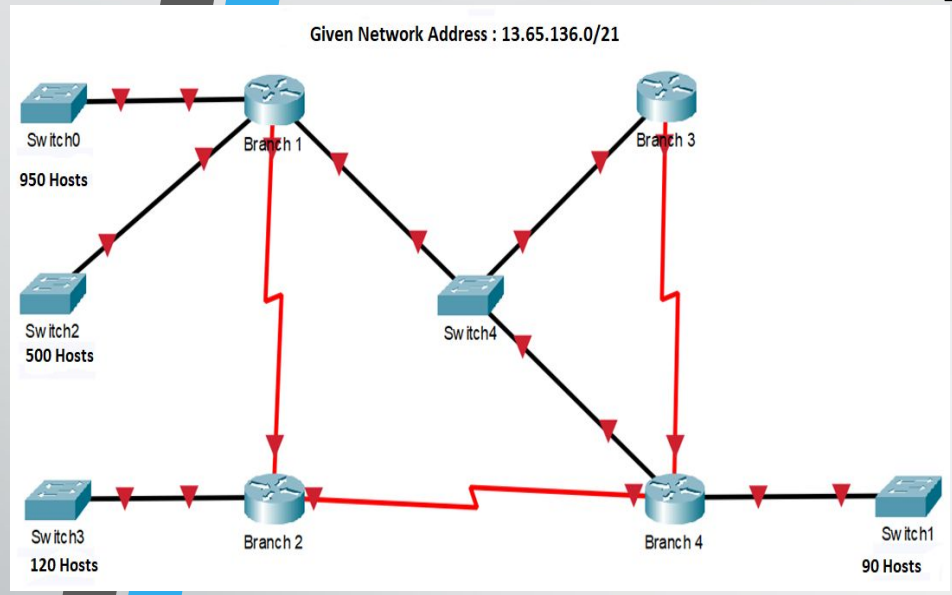


4 LANs

3 WANs

1 Switched Network

VLSM Example 2



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