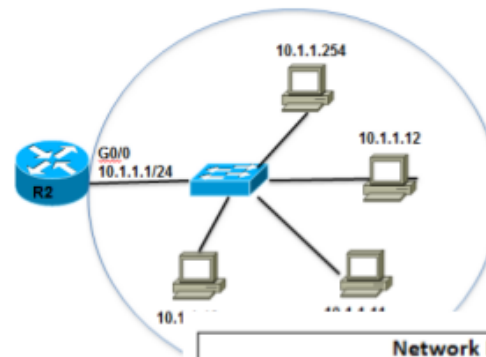


IP Host and Broadcast

- First address (all 0s) - Network
- Last address (all 1s) - Broadcast address

10.1.1.0/24 Network

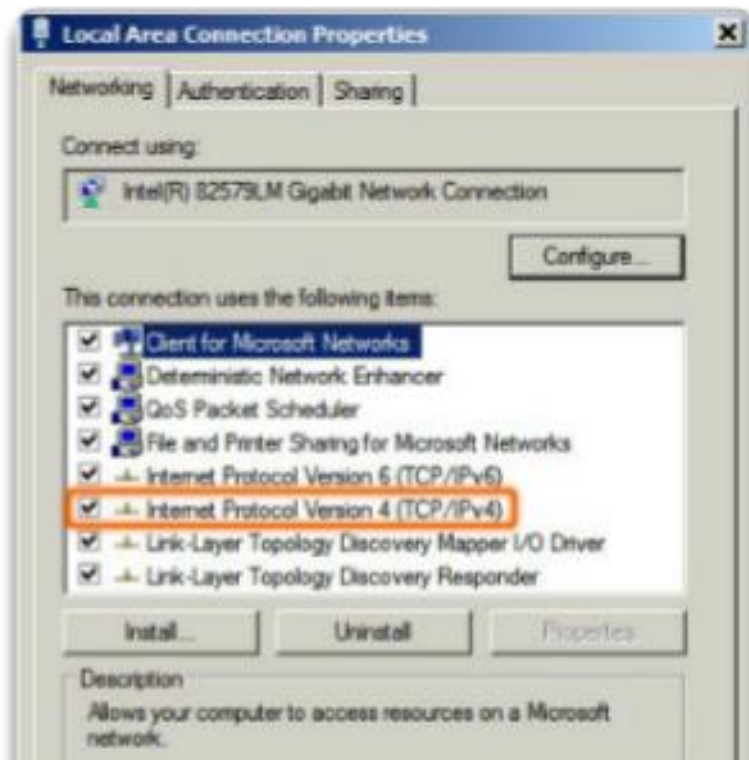


Network Portion			Host Portion	
10	1	1	1	FIRST HOST
00001010	00000001	00000001	00000001	All 0s and a 1 in the host portion
10	1	1	254	LAST HOST
00001010	00000001	00000001	11111110	All 1s and a 0 in the host portion

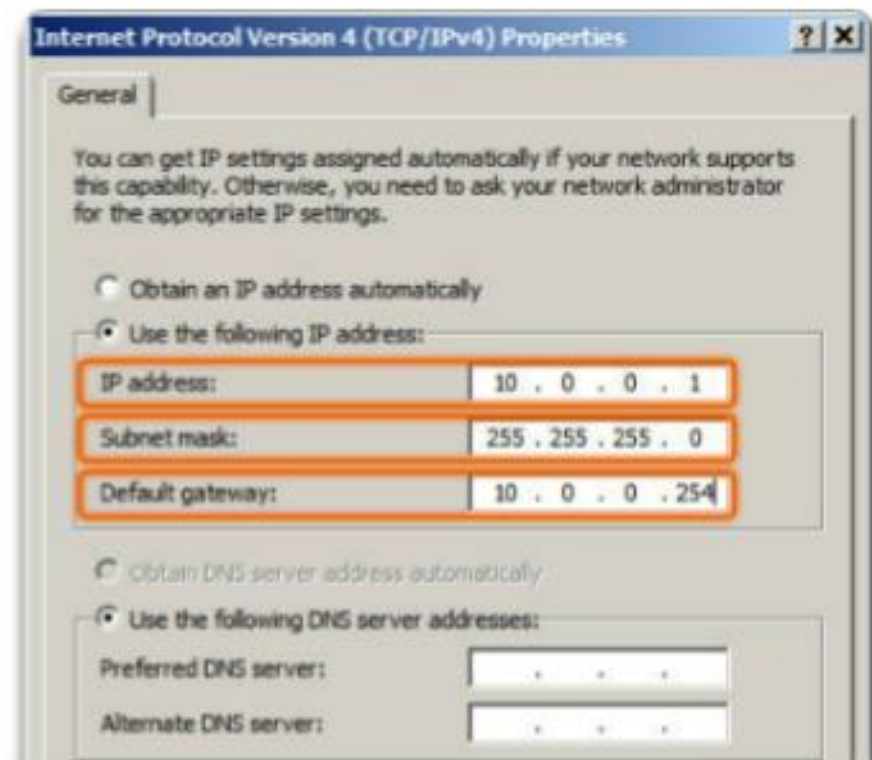
Assigning Static IP to a Host

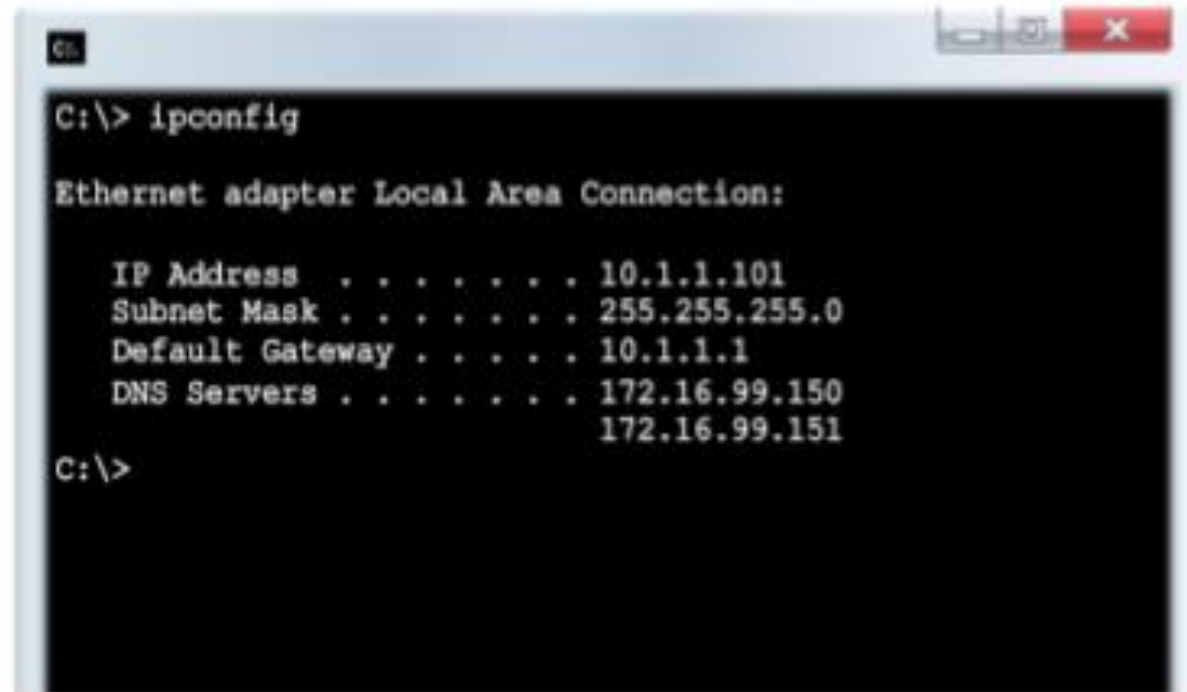
- Windows example

LAN Interface Properties



Configuring a Static IPv4 Address



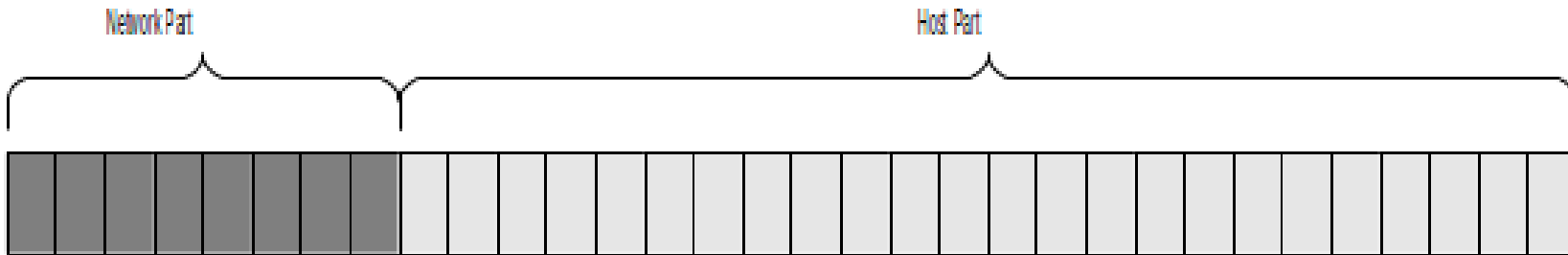


Assigning a Dynamic IP address

- DHCP - preferred method of “leasing” IPv4 addresses to hosts on large networks, reduces the burden on network support staff and virtually eliminates entry errors

Internet Addressing History

- Originally, it was thought 256 networks would be more than enough
 - Assumed a few very large (16,777,216 hosts) networks
- 8 bit network part, 24 bit host part



IP Address Classes

- Reality was much more than 256 networks
 - with many fewer hosts than 224
- Solution was to create address classes
 - But no medium size networks
- Class A/B addresses depleted quickly

Class A	Network	Host		
Octet	1	2	3	4

Class B	Network		Host	
Octet	1	2	3	4

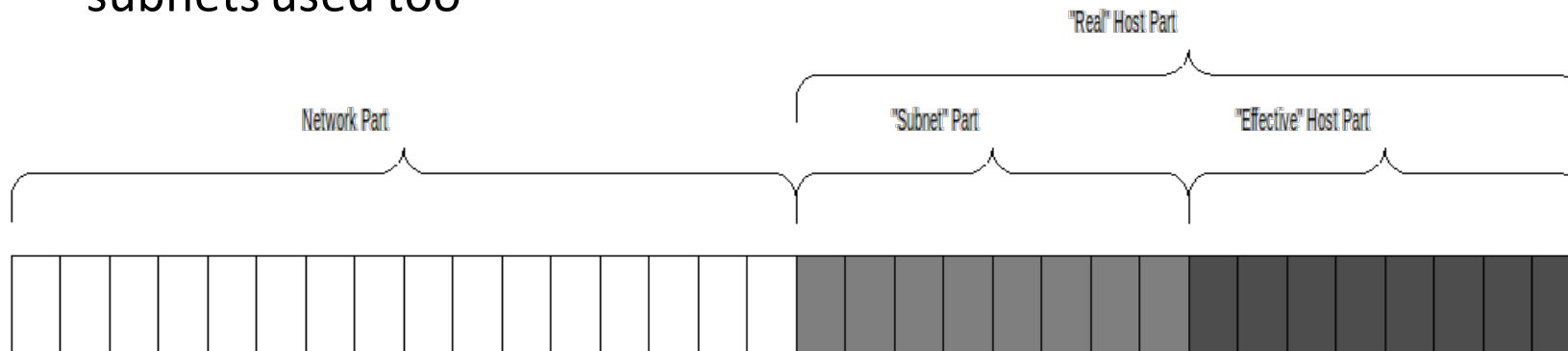
Class C	Network			Host
Octet	1	2	3	4

Class D	Host			
Octet	1	2	3	4

Address Class	First Octet Range	Number of Possible Networks	Number of Hosts per Network
Class A	0 to 127	128 (2 are reserved)	16,777,214
Class B	128 to 191	16,348	65,534
Class C	192 to 223	2,097,152	254

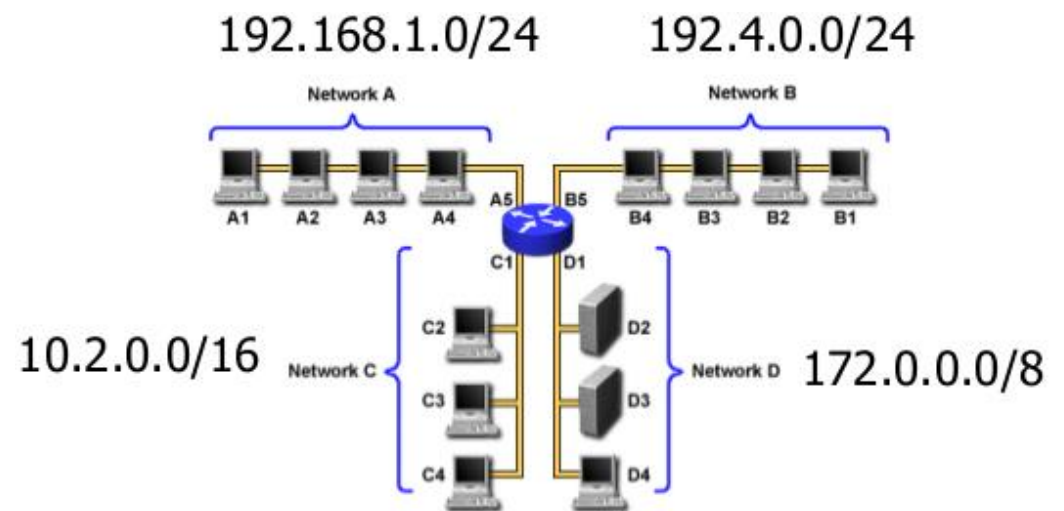
Subnetting

- Classful addressing was a better fit than original
 - but class A and B networks not practical
- Solution: partition large networks internally into sub-networks (subnets)
 - Typically “class C” (8 bit host part) sized subnets although variable length subnets used too



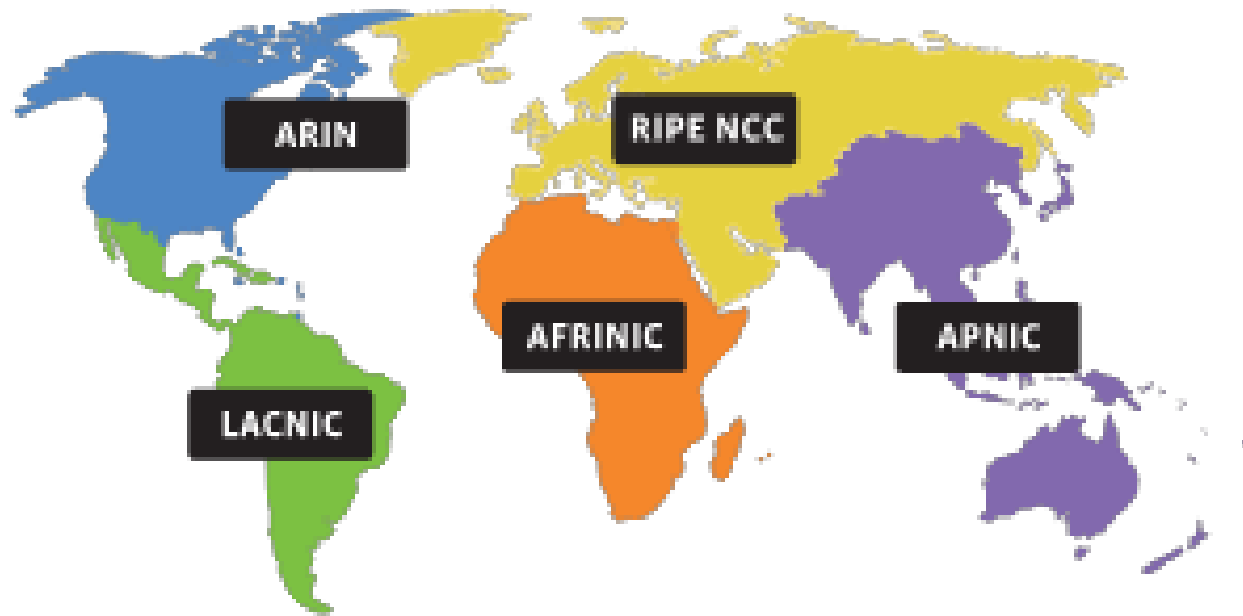
Better Solution - Classless Addressing

- Class-based addressing fallen out of favour
- Use variable length subnetting
 - Host on a network can only communicate directly with devices if they have the same network ID, i.e. same network or same subnet.
 - The subnet mask determines the network portion and the host portion.
 - Network address cannot be used as an address for any device that is attached to the network, such as hosts, router interfaces, etc.



IP Address Assignment

- IANA responsible for global coordination of the Internet Protocol addressing systems. Regional-based and hierarchical...



Private IP addresses

- Private address blocks are:
 - Hosts that do not require access to the Internet can use private addresses
 - 10.0.0.0 to 10.255.255.255 (10.0.0.0/8)
 - 172.16.0.0 to 172.31.255.255 (172.16.0.0/12)
 - 192.168.0.0 to 192.168.255.255 (192.168.0.0/16)
- Shared address space addresses:
 - Not globally routable
 - Intended only for use in service provider networks
 - Address block is 100.64.0.0/10

Special Use IPv4 addresses

- Network and Broadcast addresses - within each network the first and last addresses cannot be assigned to hosts
- Loopback address - 127.0.0.1 a special address that hosts use to direct traffic to themselves (addresses 127.0.0.0 to 127.255.255.255 are reserved)
- Link-Local address - 169.254.0.0 to 169.254.255.255 (169.254.0.0/16) addresses can be automatically assigned to the local host
- TEST-NET addresses - 192.0.2.0 to 192.0.2.255 (192.0.2.0/24) set aside for teaching and learning purposes, used in documentation and network examples
- Experimental addresses - 240.0.0.0 to 255.255.255.254 are listed as reserved