IP addressing overview

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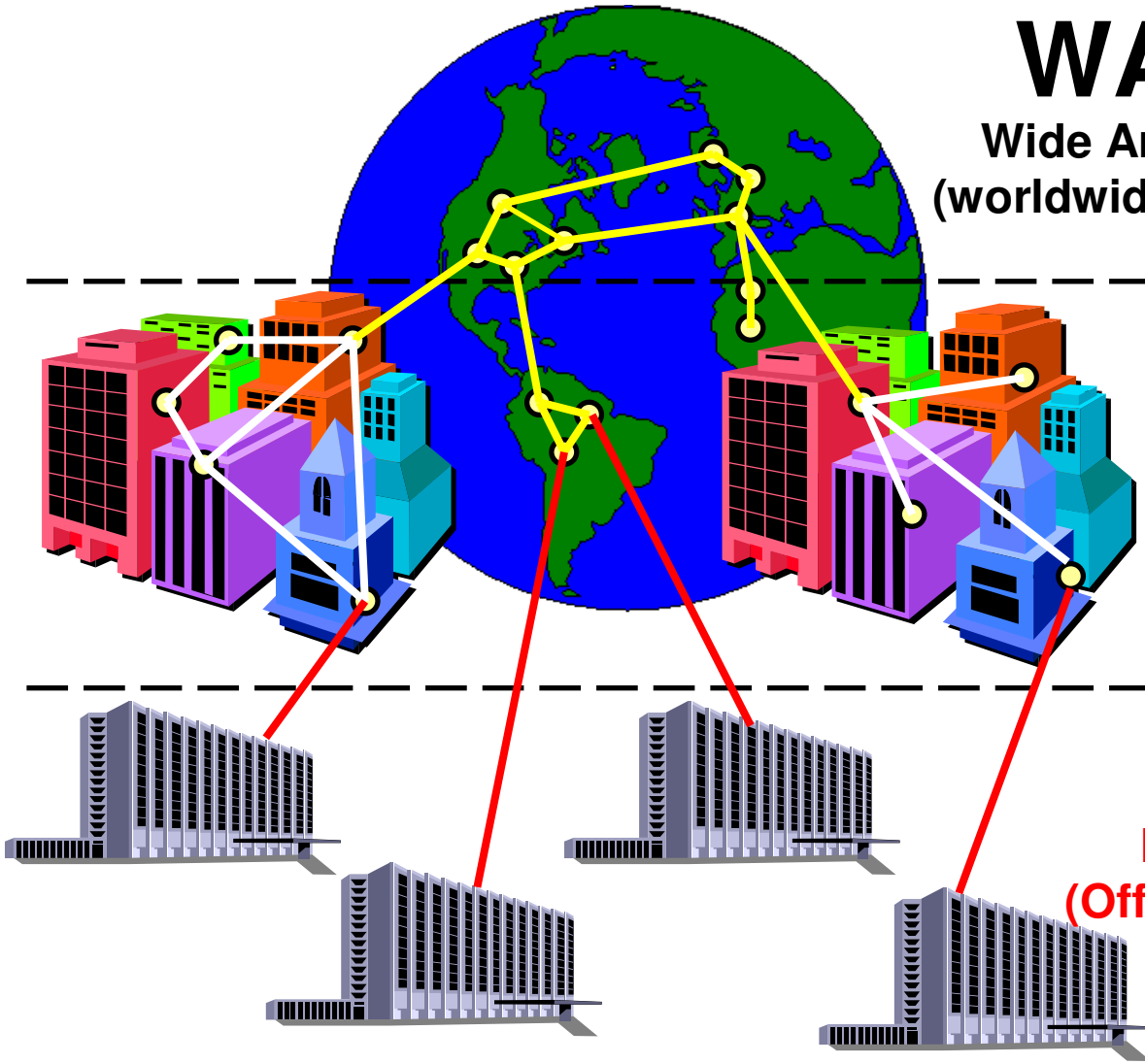
Network structure



WAN

Wide Area Network
(worldwide networking)

MAN

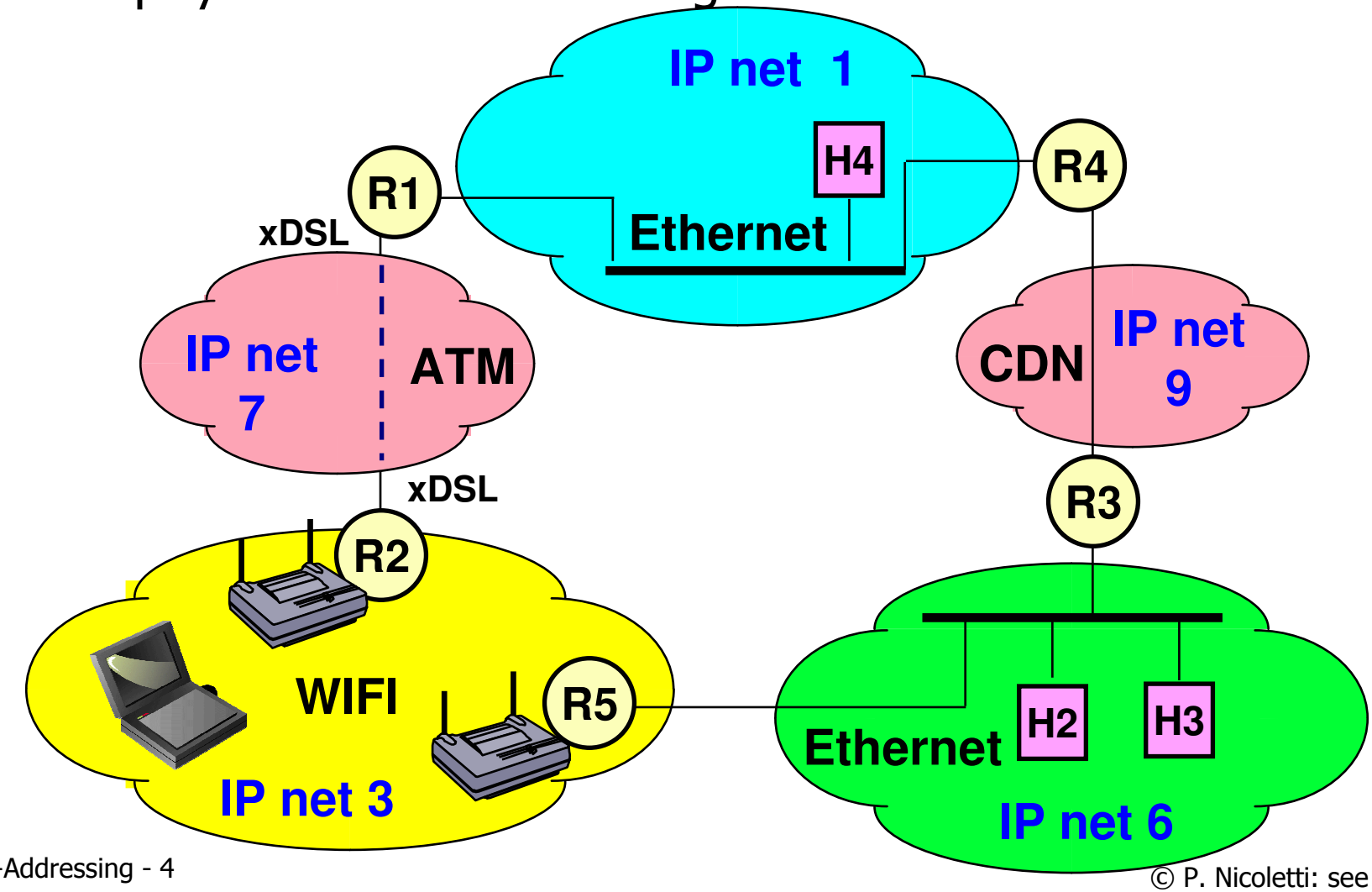
Metropolitan Area Network (in the Town and around)

LAN

Local Area Network (Office, Building, Campus)

IP architecture

- 1 physical network = 1 logical IP network



IP: Internet Protocol

- Forward and route frames between hosts member of same IP network or different IP networks
- IP terms:
  - Host = computer o terminal equipment
  - Router or Gateway = equipment witch route message between different IP networks
  - Subnet

IP addressing

- At any computer or host must assigned an IP address
- IP addresses are grouped in a network (like the telephone numbers are with a prefix)
  - hosts members of the same IP network can communicate directly
  - host members of different IP networks need to be routed by router
- IP address are based on 32 bits (4 bytes):
  - As in the telephone numbering the fist part of address is the Network Prefix number (*network field*) and the second part is host or station number (*host field*)

How to write IP address

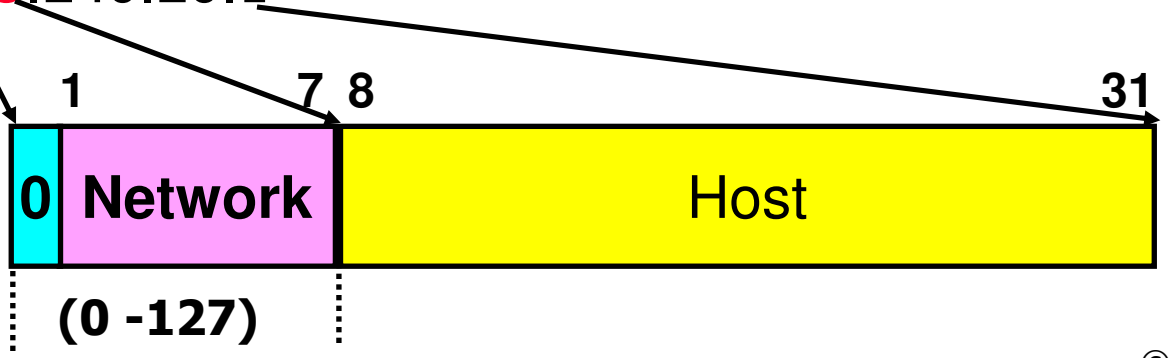
- 4 assembly separated by a dot. Any assembly represent a byte value
  - Any number assembly may have a value between 0 and 255
  - IP address example: 195.36.220.24

IP address and class

- Initially the address class determine the limit of network and host field
  - Class A
  - Class B
  - Class C
  - Class D (multicast)
- Later have been inserted the Subnetting and Netmask to realize a flexible and useful addressing system.
  - Actual addressing system

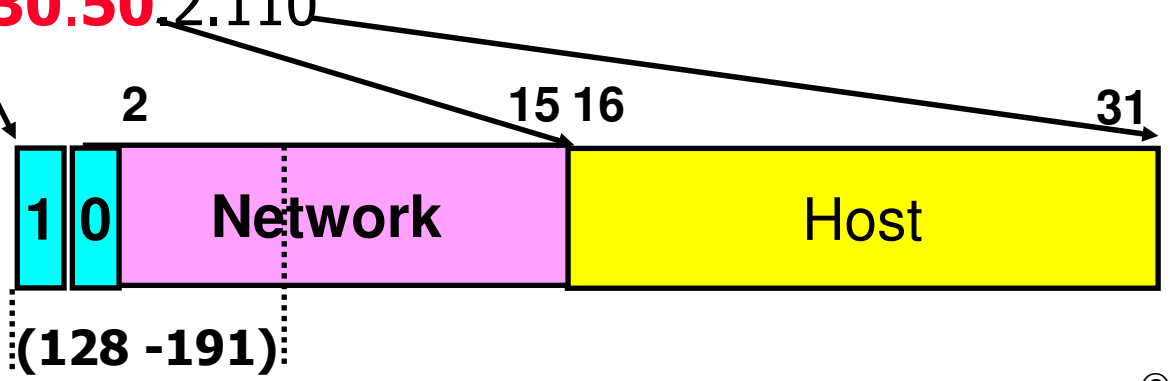
Class A

- Network field
  - First 8 bit
  - max 128 network prefix
  - values between 0 and 127 on the first byte
- Host field
  - 24 bit
  - max 16M host addresses
- Class A address example:
  - **10**.240.20.1



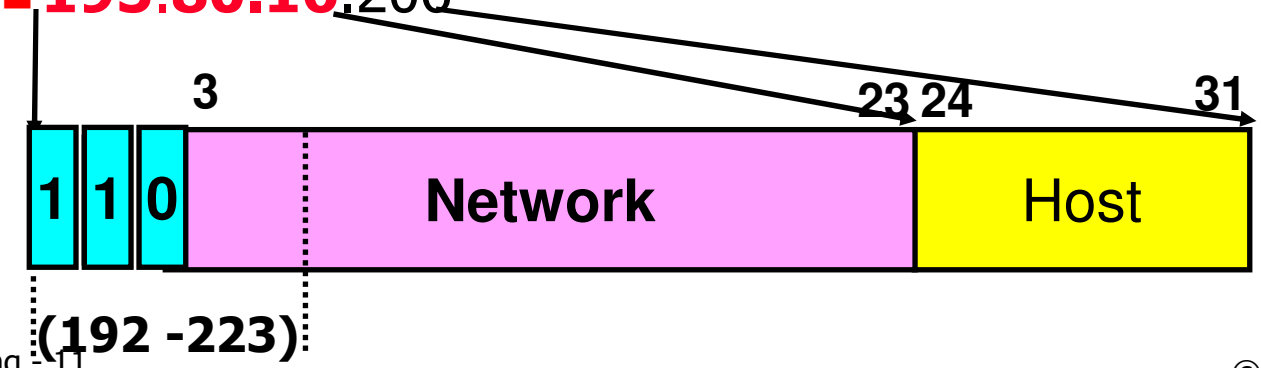
Class B

- Network field
  - First 16 bit
  - max 16K network prefix
  - values between 128 and 191 on the first byte
- Host
  - 16 bit
  - max 64K host addresses
- Class B address example:
  - **130.50**.2.110



Class C

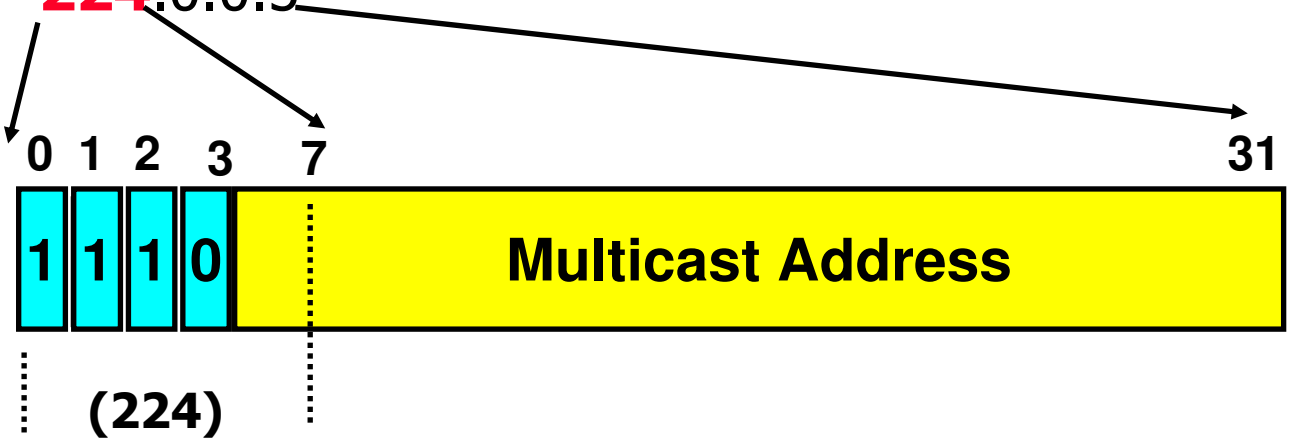
- Network field
  - First 24 bit
  - max 2M network prefix
  - values between 192 and 223 on the first byte
- Host
  - 8 bit
  - max 256 Host addresses
- Class C address example:
  - **195.80.16**.206



Class D

- Multicast purpose
  - Class D address example:

224.0.0.5



Host field

- Not all binary combination can be used
  - All ones reserverd for specific broadcast on the IP network
    - Example of spefic broadcast address: 192.168.1.255
  - All zeros reseverd to identify and address a IP network
    - Used by the router for network reachability information
    - Example of network address: 192.168.1.0

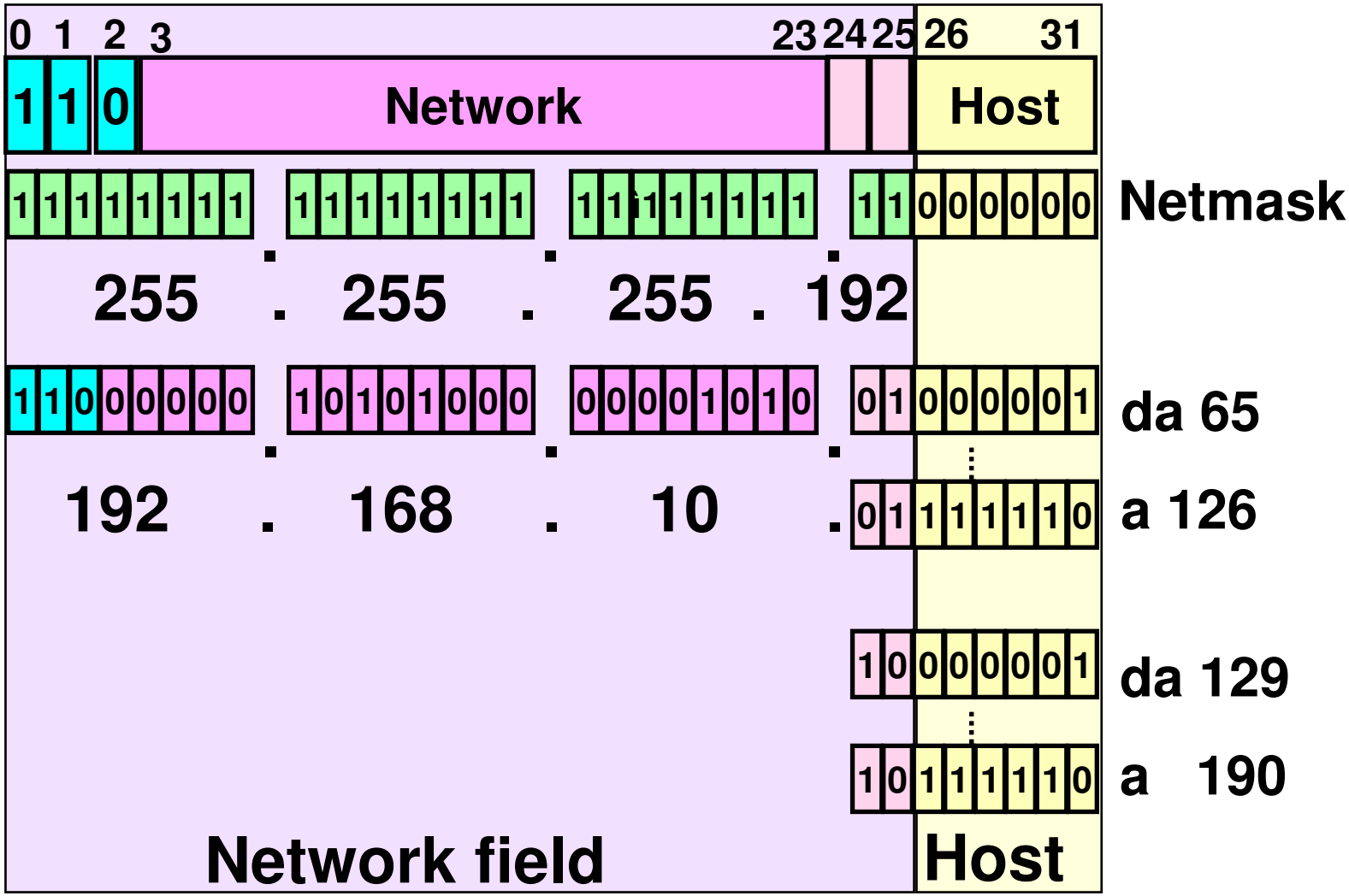
Netmask

- Permit to extend or reduce the network limit
  - Subnetting when netmask extend the limit of network field
  - Supernetting when reduce the limit of network field
- Netmask is associated with IP address
- Netmask format
  - Contiguous sequence of *one* determine the *network field* length
  - Contiguous sequence of *zero* determine the *host field* length
- Natural netmask of classes
  - Class A = 255.0.0.0
  - Class B = 255.255.0.0
  - Class C = 255.255.255.0

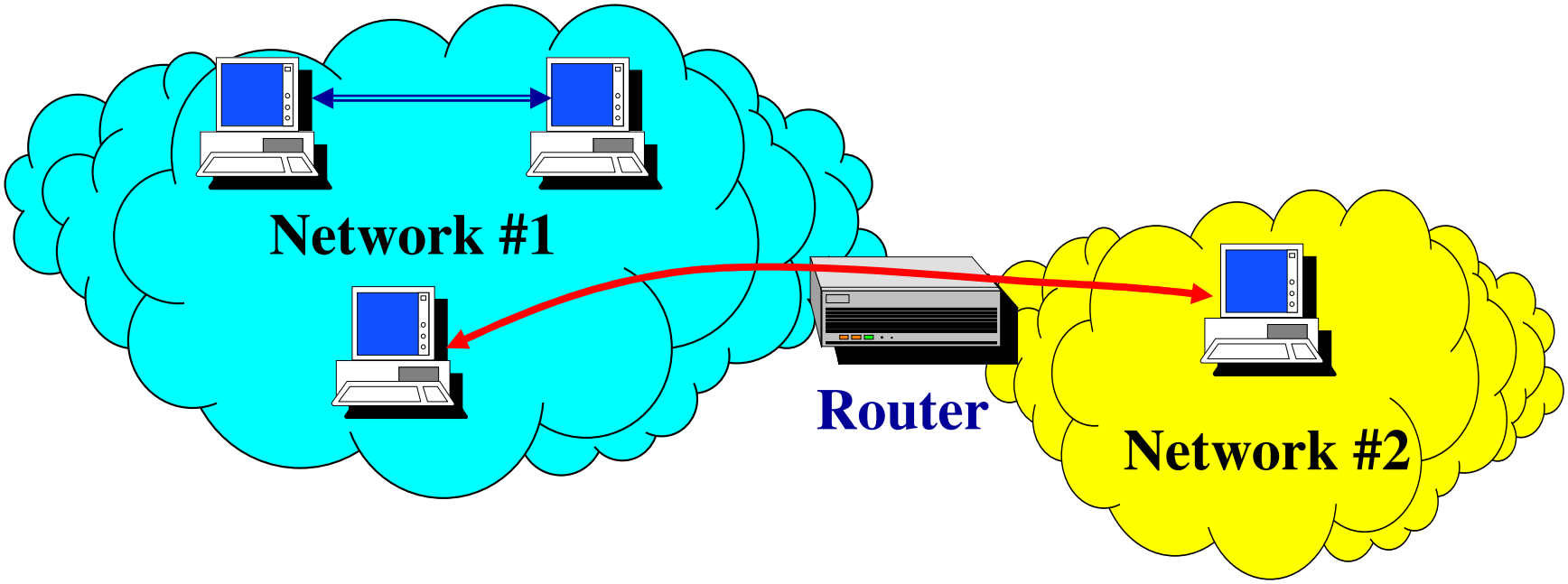
Netmask value

- Only those values represent contiguous sequence of one and zero bits
  - 0 0000 0000
  - 128 1000 0000
  - 192 1100 0000
  - 224 1110 0000
  - 240 1111 0000
  - 248 1111 1000
  - 252 1111 1100
  - 254 1111 1110
  - 255 1111 1111

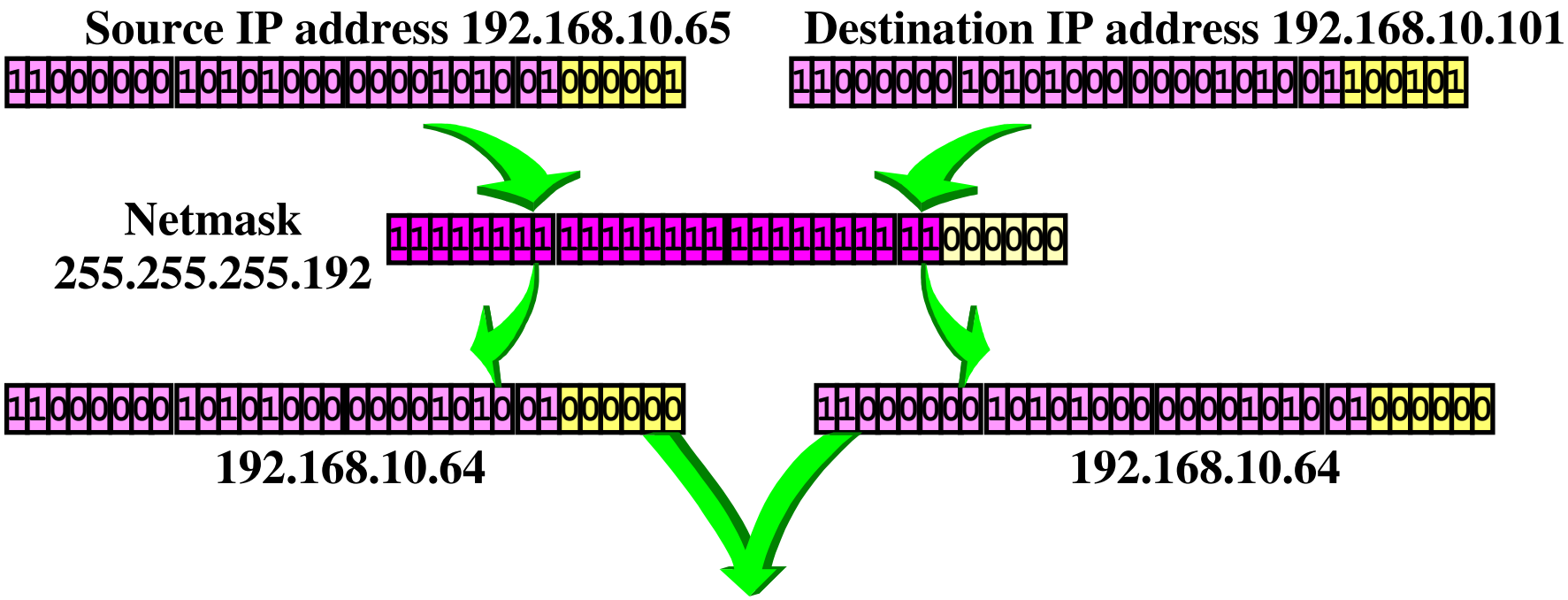
Netmask & subnetting examples



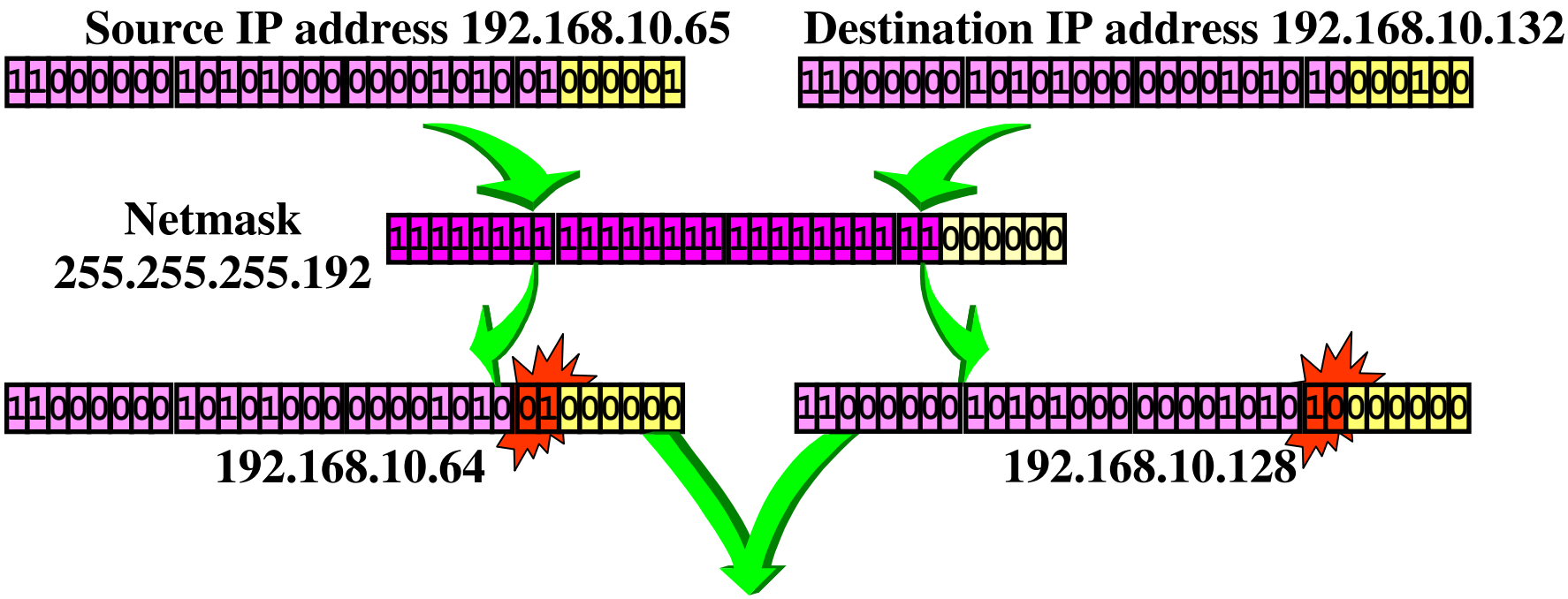
IP Communication



Same IP network: direct communication



Host in different IP network: communication trough router



Different IP networks: communication trough router