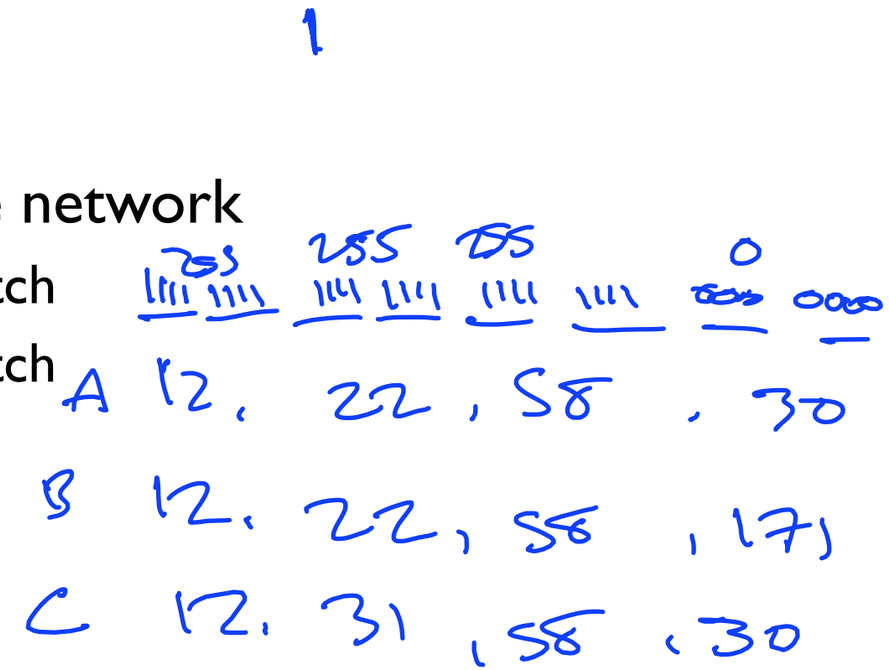
Names and Addresses: IPv4

Goal of Internet Protocol Addresses

- Stitch many different networks together
- Need network-independent, unique address
  - Well, these days it can be only mostly unique -- see NATs, anycast, etc.

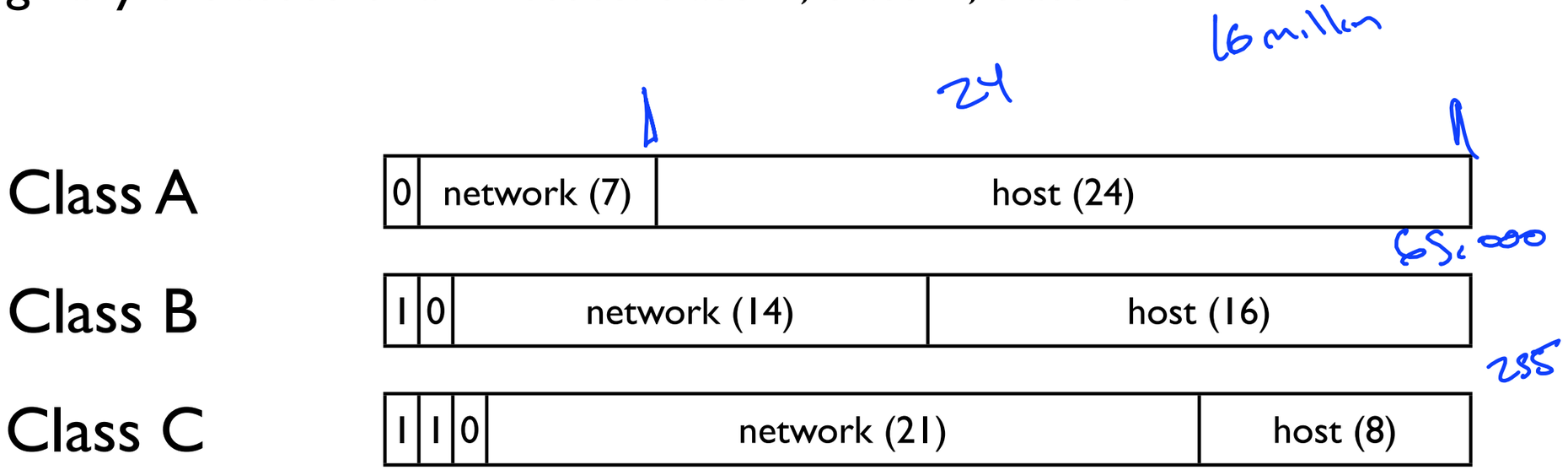
Internet Protocol, Version 4

- An IPv4 address identifies a device on the Internet
  - Layer 3 (network) address
- 32 bits long (4 octets): a.b.c.d
  - Example: 171.64.64.64
  - Example: 128.30.76.82
  - Example: 12.22.58.30
- Netmask: apply this mask, if it matches, in the same network
  - Netmask of 255.255.255.0 means if the first 24 bits match
  - Netmask of 255.255.252.0 means if the first 22 bits match
  - Netmask of 255.128.0.0 means if the first 9 bits match
  - Smaller netmask (fewer 1s) means larger network



Address Structure (historical)

- Originally hierarchical: network + host
  - Network to get to correct network (administrative domain)
  - Host to get to correct device in network (within administrative domain)
- Originally 3 classes of addresses: class A, class B, class C



Address Structure Today

- Still assign contiguous ranges of addresses to nearby networks
  - Class A, B, C is too coarse grained (e.g., MIT dorms!)
  - http://news.stanford.edu/news/1999/january27/itss127.html
- Classless Inter-Domain Routing (CIDR)
  - Address block is a pair: *address,count*
  - Counts are powers of 2, specify netmask length
  - 171.64.0.0/16 means any address in the range 171.64.0.0 to 171.64.255.255

Example: My iMac

- Turn on wireless
- Obtain, through the Dynamic Host Configuration Protocol (DHCP):
  - IPv4 address
  - IPv4 subnet mask
  - IPv4 next hop router
  - IPv4 address of Domain Name Service (DNS) server to use (maps names like www.cnn.com to an address)

IPv4 Address Assignment

- IANA: Internet Assigned Numbers Authority
  - Internet Corporation for Assignment of Names and Numbers (ICANN)'s job
- IANA gives out /8s to Regional Internet Registries (RIRs)
  - Ran out in February 2011, in special end case of giving 1 to each RIR
- RIRs responsible for geographic regions, each has own policy
  - AfriNIC: Africa
  - ARIN: U.S.A., Canada, Carribean, Antarctica
  - APNIC: Asia, Australia, New Zealand
  - LACNIC: Latin America, Carribean
  - RIPE NCC: Europe, Russia, Middle East, Central Asia