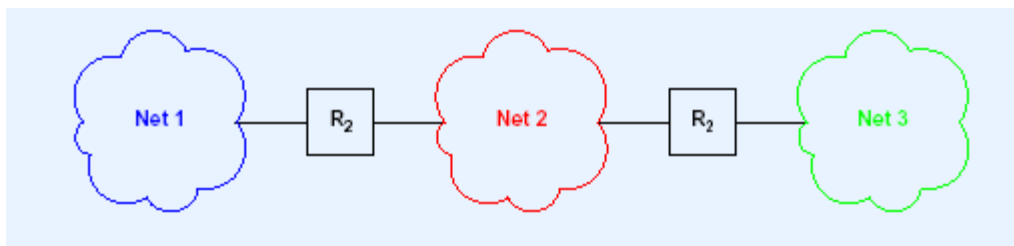


Internet Architecture and IP Addresses

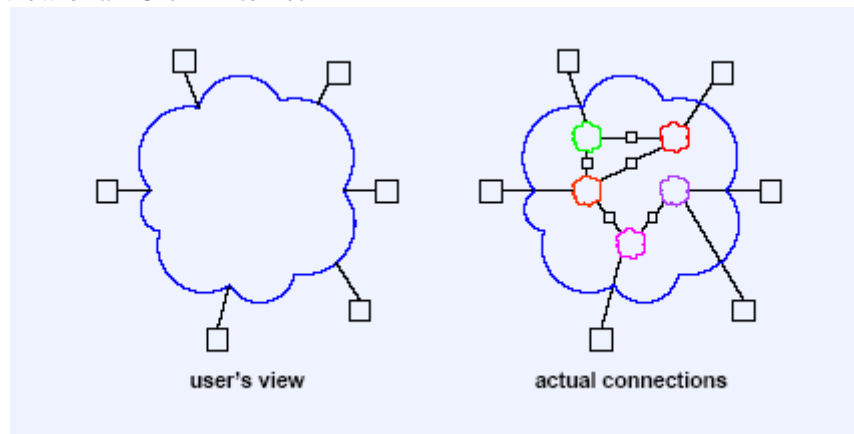
(1) Introduction of TCP/IP Internet

❖ Internet Architecture

- Physical network: computers on the same physical network are physically connected.
- Computers on different physical networks are not physically connected.
- *IP router (or IP gateway)*: dedicated systems that connect two or more networks.
- *Host*: end-user system. It connects to physical networks, and there are possibly many hosts per network



❖ The two view of a TCP/IP Internet



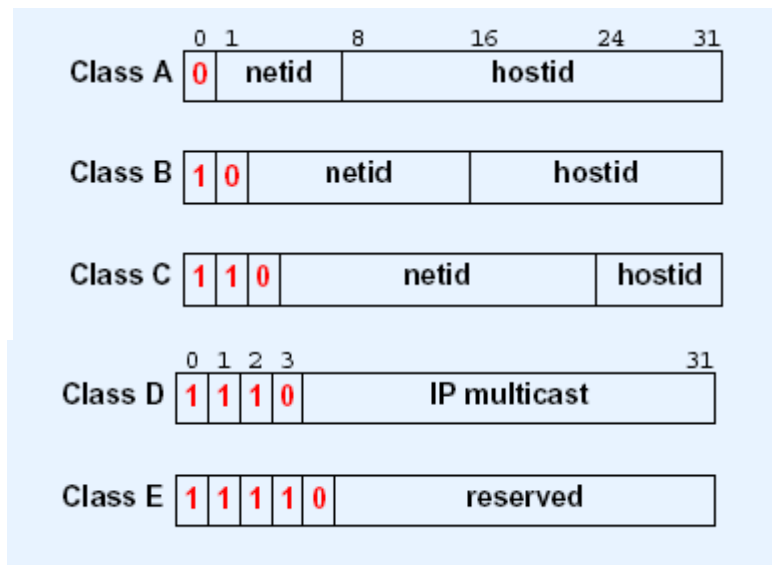
❖ Packet Transmission

- Source Host:
 - If the destination is on the same physical network, deliver it directly
 - Otherwise, send it to a router
- Intermediate Routers:
 - The destination is not on the same physical network, forward the packet to another router
- Final Router
 - The destination is physically connected to this final router, so send the packet directly to the destination.

- ❖ How do routers work?
 - Routers need to find the right routes when forwarding packets.
 - Routers' decision is based on the routing information they have
 - Routing table: use destination network, not the destination host; otherwise, the table will be huge.
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(2) IP Address

- ❖ Overview
 - 32 bit binary value
 - Unique value assigned to each host
 - Values chosen to make routing efficient
- ❖ Dotted Decimal Notation:
 - Binary: 10000000 11100110 00000001 00001100
 - Dotted decimal notation: 128.230.1.12
- ❖ Classful Addressing Scheme (The original scheme, didn't last long)



- ❖ Classes
 - A: 1.0.0.0 --- 126.0.0.0
 - B: 128.1.0.0 --- 191.255.0.0
 - C: 192.0.1.0 --- 223.255.255.0
 - D: 224.0.0.0 --- 239.255.255.255
 - E: 240.0.0.0 --- 255.255.255.254
 - Example: IBM (9.0.0.0), AT&T (12.0.0.0), Syracuse University (128.230.0.0)

- ❖ Properties of the classful addressing scheme?
 - They are self-identifying: the boundary between netid and hostid is self-explained from the address. This can benefit routing because the entries of routing tables store mainly use netid, not the entire IP address.

 - ❖ Special Addresses
 - 255.255.255.255: Limited broadcast (local net)
 - 0.0.0.0: this host. Can only be used as source address. It is used during bootstrap before a computer knows its IP address. "0" means THIS.
 - net + all 1s: directed broadcast for net
 - 127.anything (often 1): loopback.

 - ❖ Classless Addressing Scheme (Devised in 1990s)
 - Allow the division between prefix and suffix to occur at an arbitrary point.
 - Allow more complete utilization of the address space.
- (2) CIDR: Classless Inter-Domain Routing
- a) Internet Part + Local Part
 - b) Internet Part + Physical Network + Host
 - i) Example: IP:128.230.211.195. Netmask FFFFF800
 - ii) 128 = 1000 0000, 230 = 1110 0110, 211 = 11010011
 - iii) What is the CIDR representation? What are the lowest IP and highest IP addresses?
 - iv) Is Apollo (128.230.208.46) on the same subnet? 208 = 1101 0000
- (2) Reserved address prefixes
- a) 10/8 10.0.0.0 - 10.255.255.255
 - b) 172.16/12 172.16.0.0 - 172.31.255.255
 - c) 192.168/16 192.168.0.0 - 192.168.255.255
 - d) 169.254/16 169.254.0.0 - 169.254.255.255