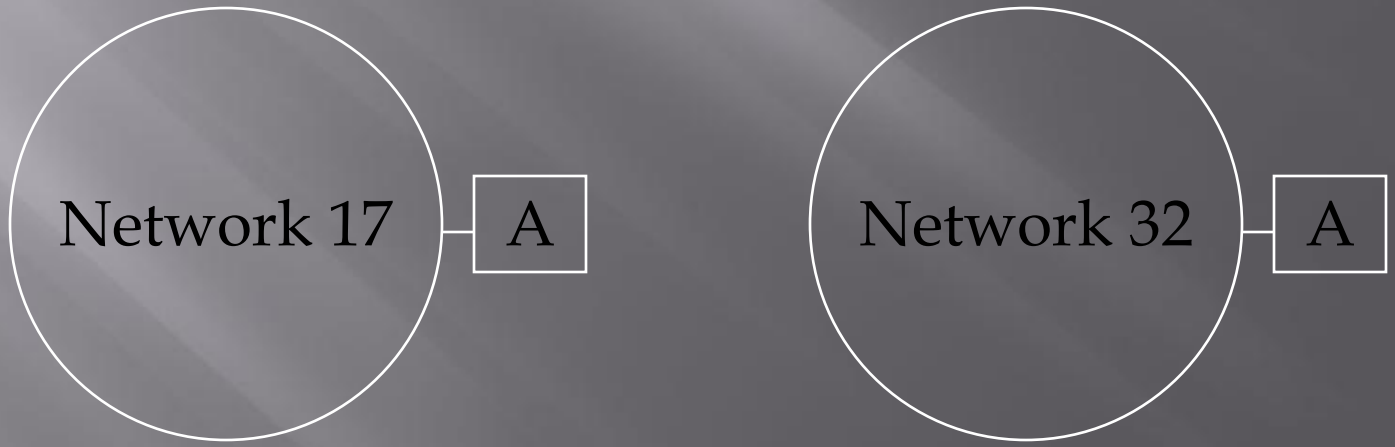
Subnet and Supernet Extensions

- Recall: each physical network must have its own unique netid
- Problem: the number of physical networks grew so fast that all netids would be exhausted (especially class B)
- Solutions (to be discussed later):
  - Subnetting – allows multiple physical networks to share the same netid
  - Supernetting – allows more complete utilization of the address space

Weaknesses on Internet Addressing

- If a computer moves from one network to another, its IP address must change

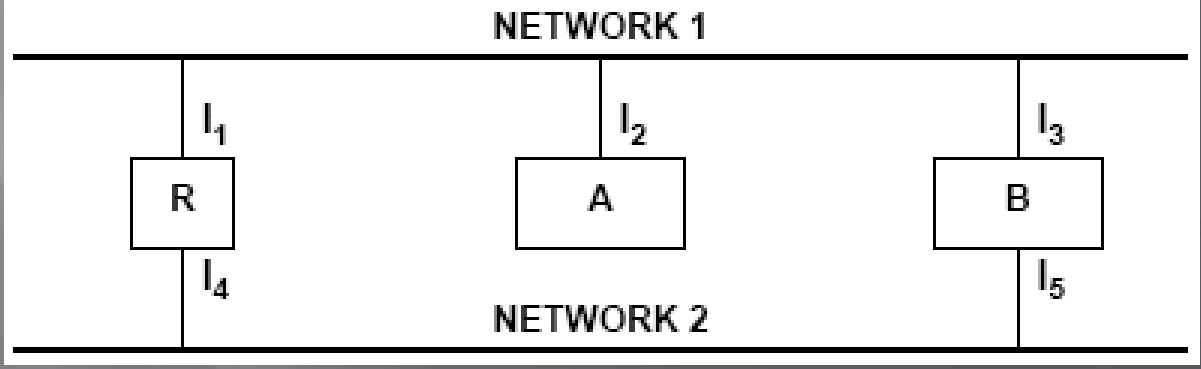


Weaknesses on Internet Addressing (cont)

- If a class C network grows to more than 255 hosts, it must have its address changed to a class B address
- Difficult:
  - Abruptly stop using one network address
  - Change the addresses of all machines
  - Resume operation using the new addresses
  - Debug problems with programs/services still using the old addresses

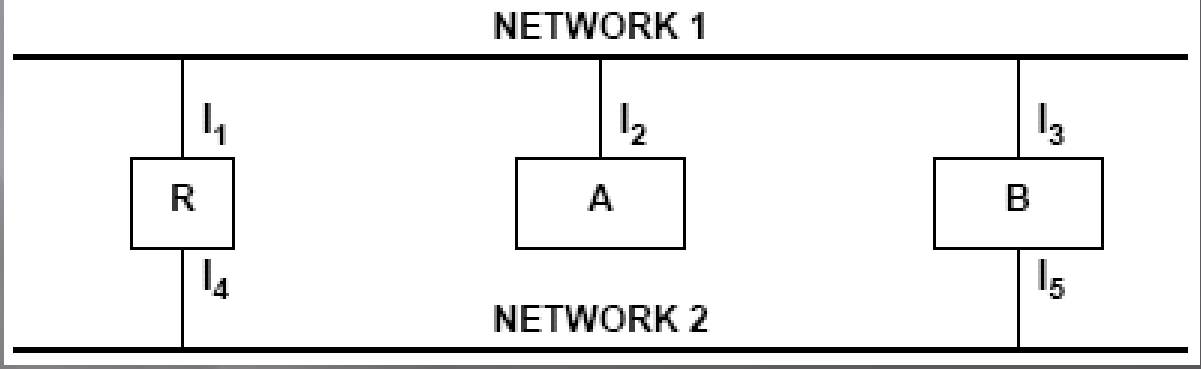
Weaknesses on Internet Addressing (cont)

- Recall: routers base routing decisions on the netid portion of the destination address
- Consider a host with two internet connections (and therefore two addresses):



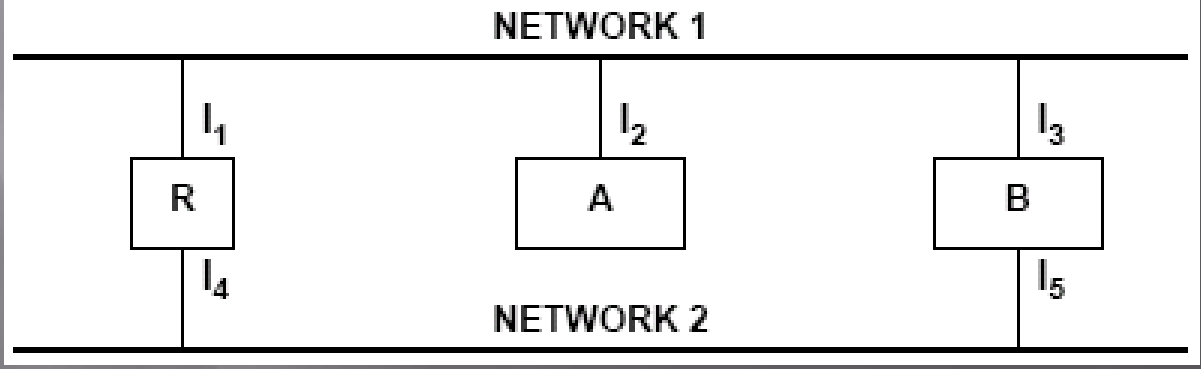
Weaknesses on Internet Addressing (cont)

- Result: the path taken by packets traveling to a host with multiple IP addresses depends on which address is used as the destination



Weaknesses on Internet Addressing (cont)

- Packets sent to the same machine using different addresses may behave differently
- A machine may be reachable by on of its addresses and unreachable by another



Dotted Decimal Notation

- To make them easier to read (and write) IP addresses are usually written as four decimal integers separated by decimal points
- Each decimal integer gives the value of one octet of the IP address
- Example:
  - 10000000 00000010 00000000 00001111 = 128.2.0.15

The Loopback Address

- Not all IP addresses have been assigned to classes
- In particular, netid 127, a value from the class A range, is reserved for *loopback*
- Used for testing TCP/IP and for inter-process communication

Internet Addressing Authority

- Network portion of the IP address must be unique
- Need a central authority to assign IP addresses
- Originally managed by the Internet Assigned Number Authority (IANA)
  - http://www.iana.org/

Internet Addressing Authority (cont)

- Now IANA allocates blocks of IP addresses to Regional Internet Registries:
  - APNIC (Asia Pacific Network Information Centre) - Asia/Pacific Region
  - ARIN (American Registry for Internet Numbers) - North America and Sub-Sahara Africa
  - LACNIC (Regional Latin-American and Caribbean IP Address Registry) – Latin America and some Caribbean Islands
  - RIPE NCC (Réseaux IP Européens) - Europe, the Middle East, Central Asia, and African countries located north of the equator

Network Byte Order

- Big Endian - lowest memory address holds the high-order byte of the integer

  297 = 00000001 00101001

- Little Endian - lowest memory address holds the low-order byte of the integer

  297 = 00101001 00000001

- Internet standard for byte order is Big Endian

Summary

- Internet addressing
  - 32-bit IP addresses serve as universal connection identifiers
  - Each IP address is composed of a netid (identifies the network) and a hostid (idetifies a host on that network)
  - The size of the netid and hostid is depends on whether the address is class A, B, or C
  - IP addresses were designed this way to make it easy for routers to quickly find and use the netid for routing