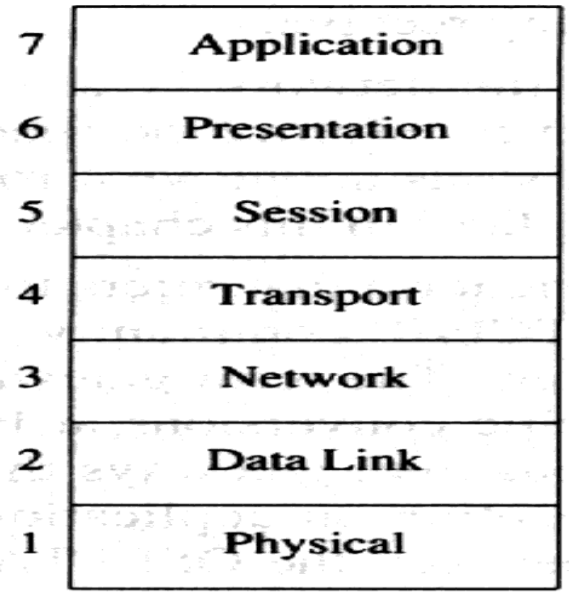
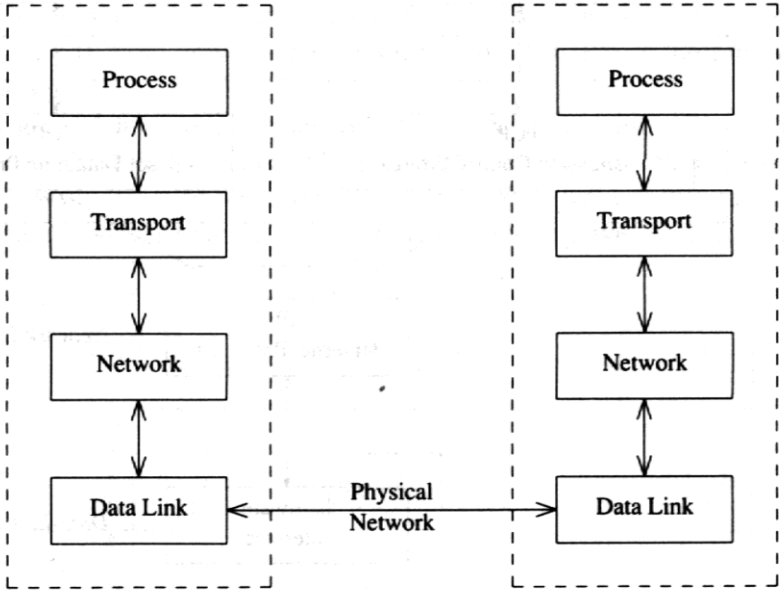
Computer Network Architecture

- Protocol: talk in the same language.
- OSI model:



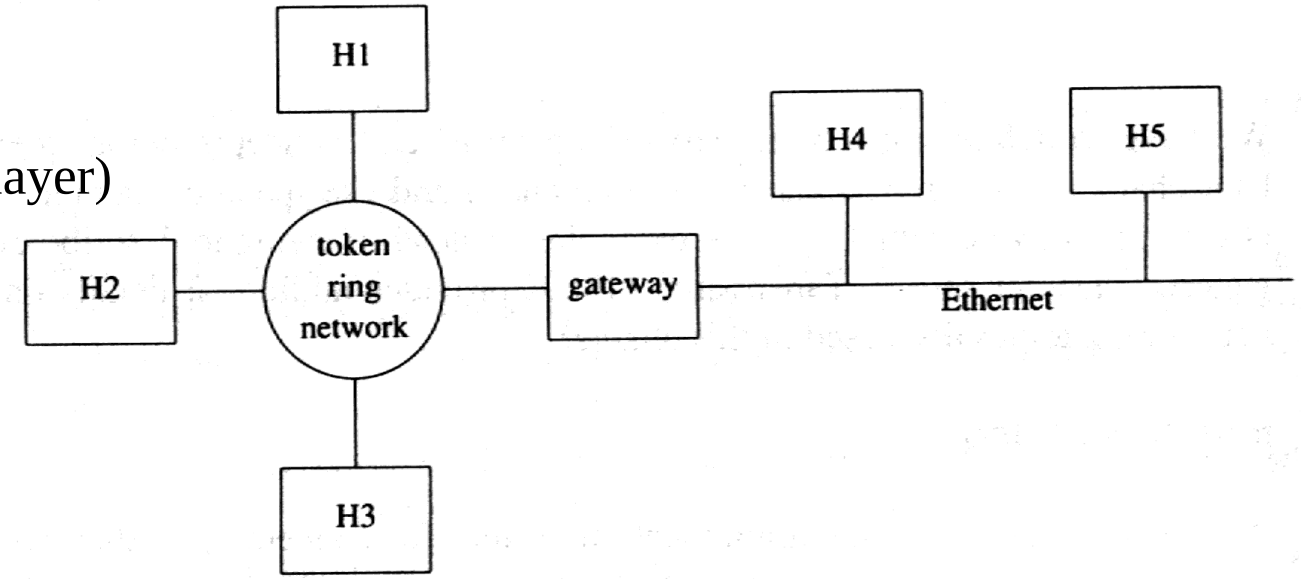


- Simplified 4-layer model

Internetworking

Terms:

- Networks: LAN,WAN
- Interconnections:
  - Repeater(layer 1)
  - Bridge(layer 2)
  - Router(layer 3)
  - Gateway(higher layer)



Four-Layer Model

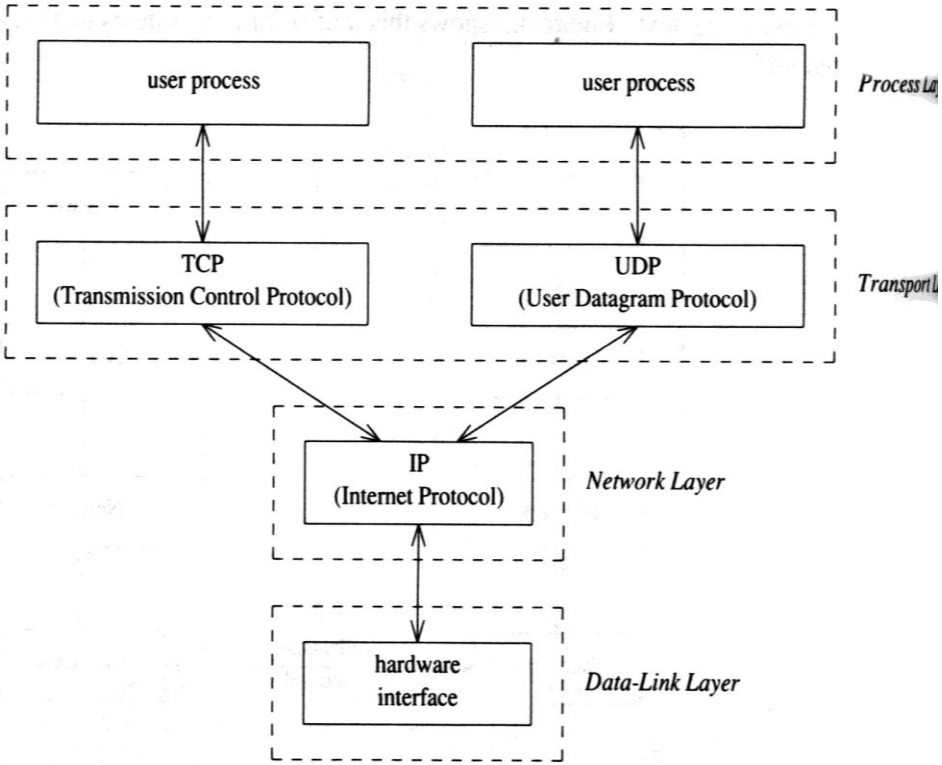


Figure 4.4 TCP/IP protocol suite using 4-layer model.

If we consider two hosts connected with an Ethernet, Figure 4.5 shows the four layers.

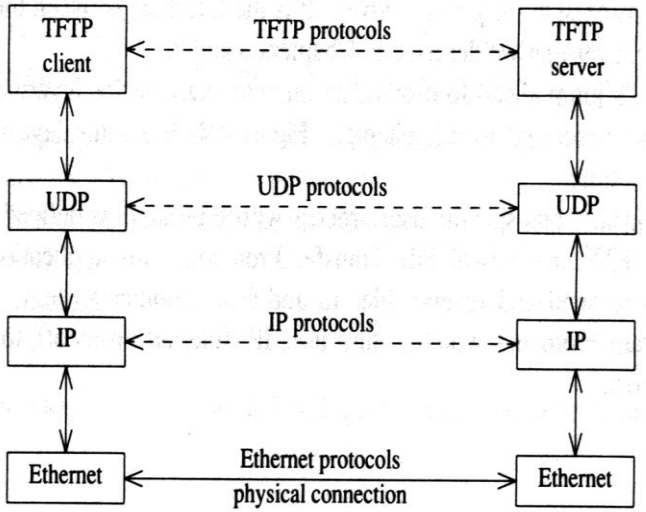
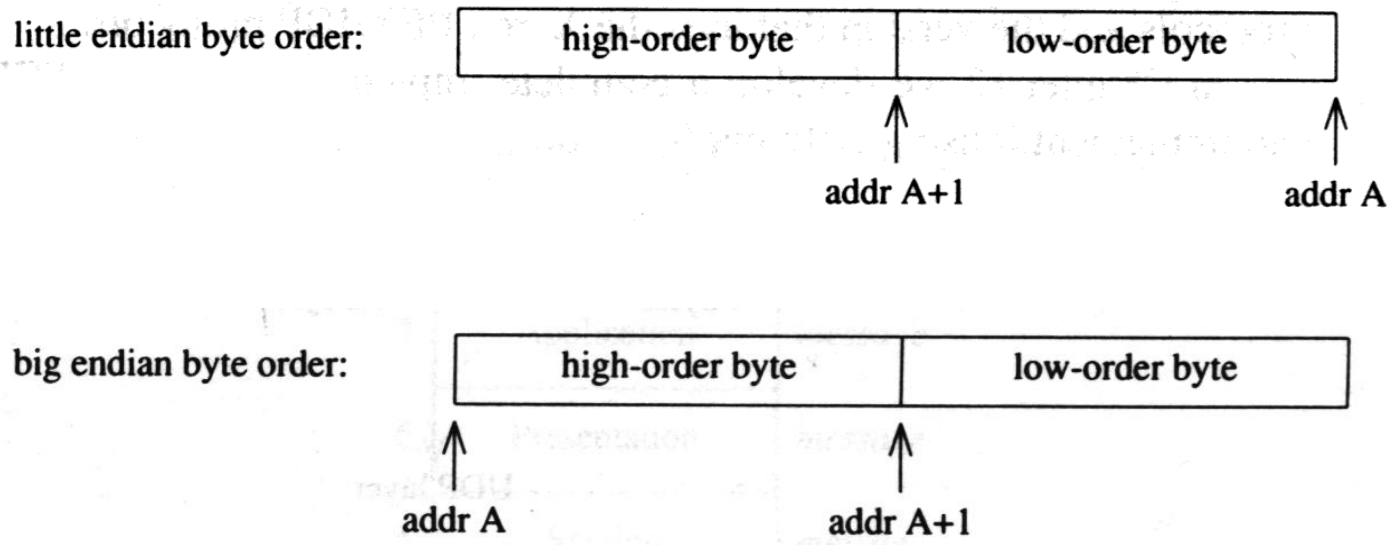


Figure 4.5 4-layer model for TFTP over UDP/IP on an Ethernet.

Network Issues -- (1)

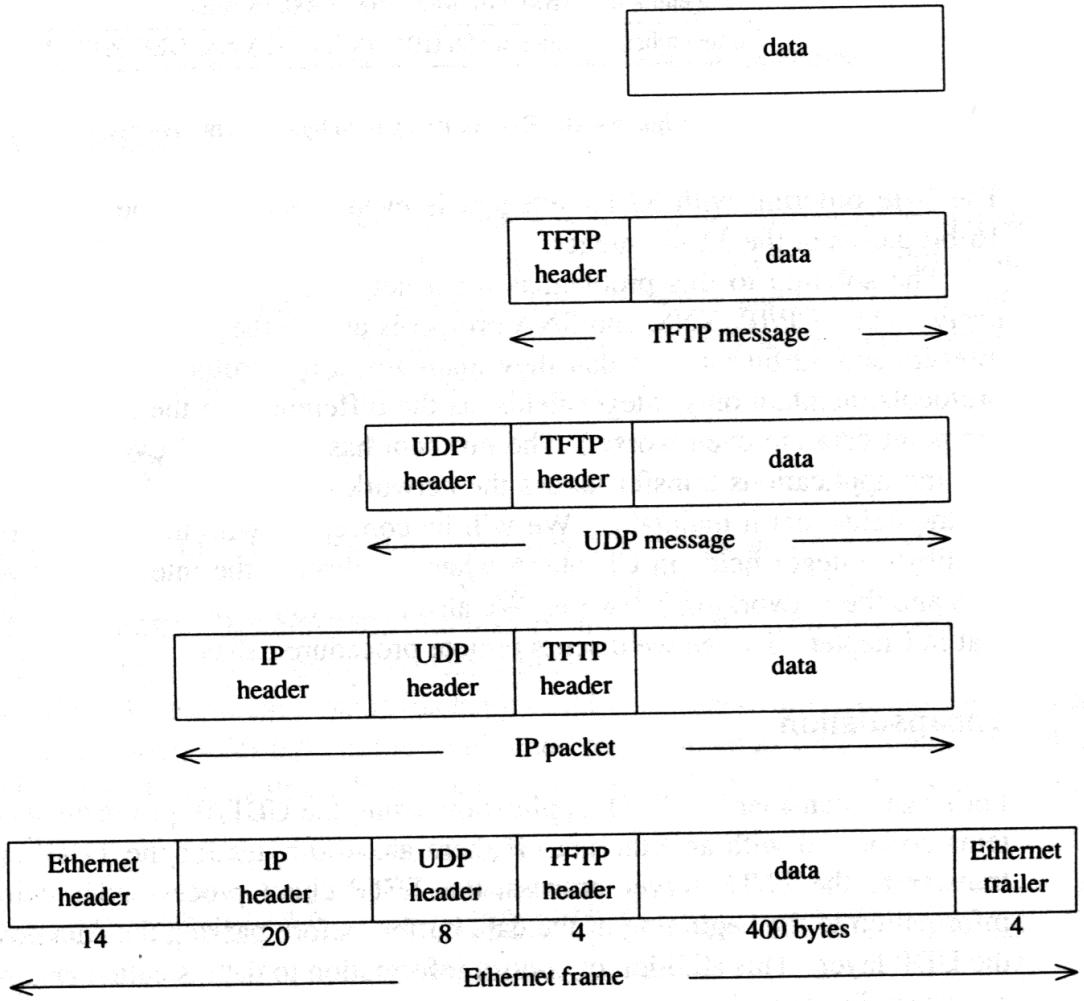
- Byte Order



big endian:	IBM 370, Motorola 68000, Pyramid
little endian:	Intel 80x86 (IBM PC), DEC VAX, DEC PDP-11

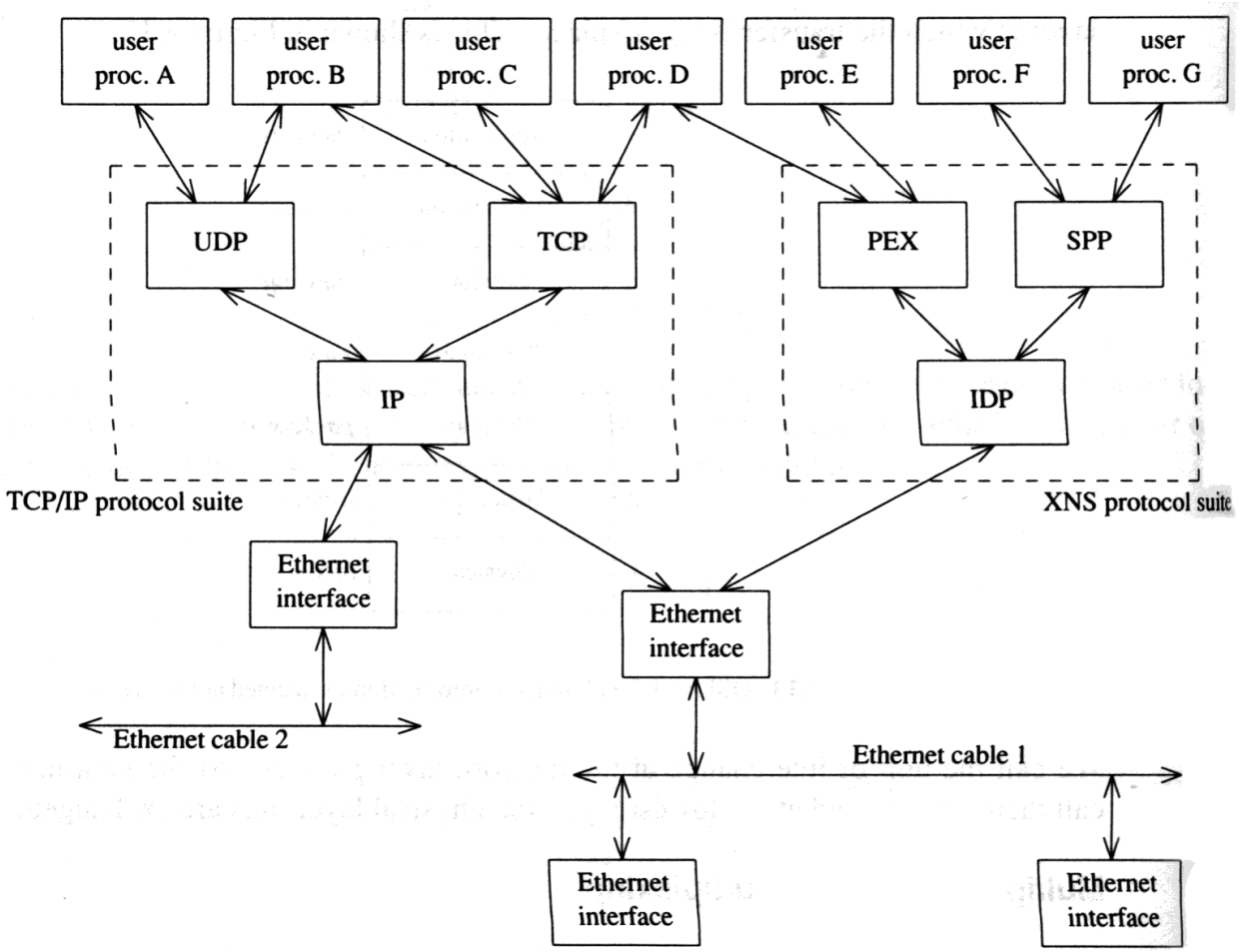
Network Issues -- (2)

- Encapsulation:



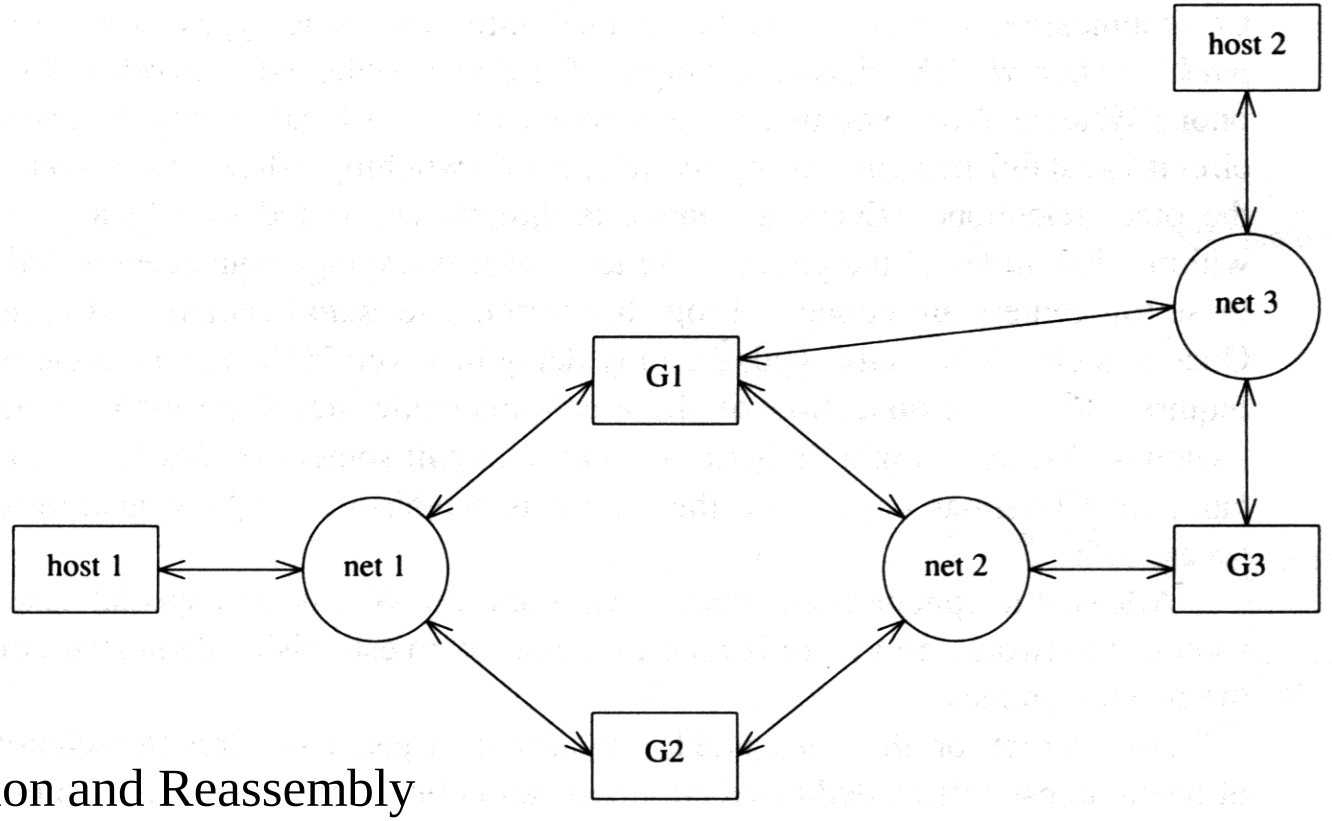
Network Issues -- (3)

- Multiplexing & Demultiplexing



Network Issues -- (4)

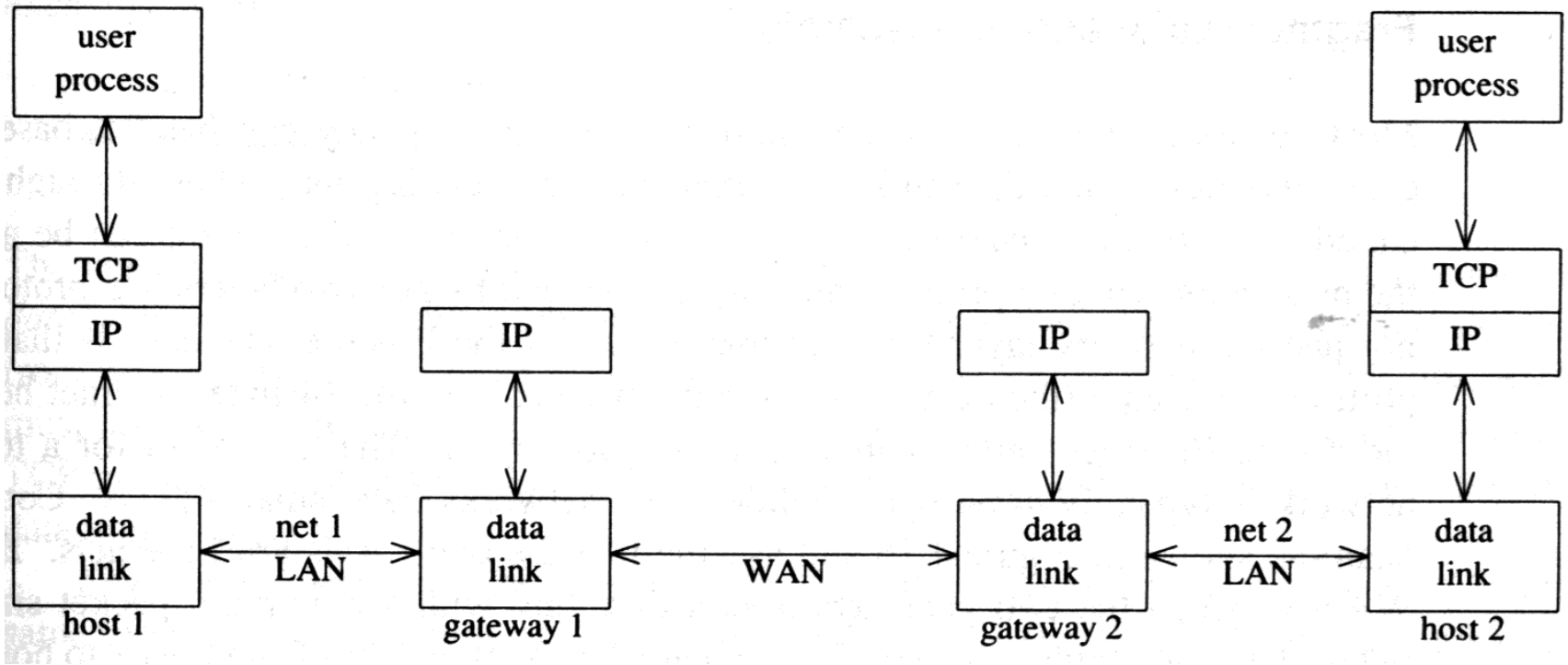
- Packet Switching, Circuit Switching, Virtual Circuit Switching



- Fragmentation and Reassembly

Network Issues -- (5)

- Gateway:

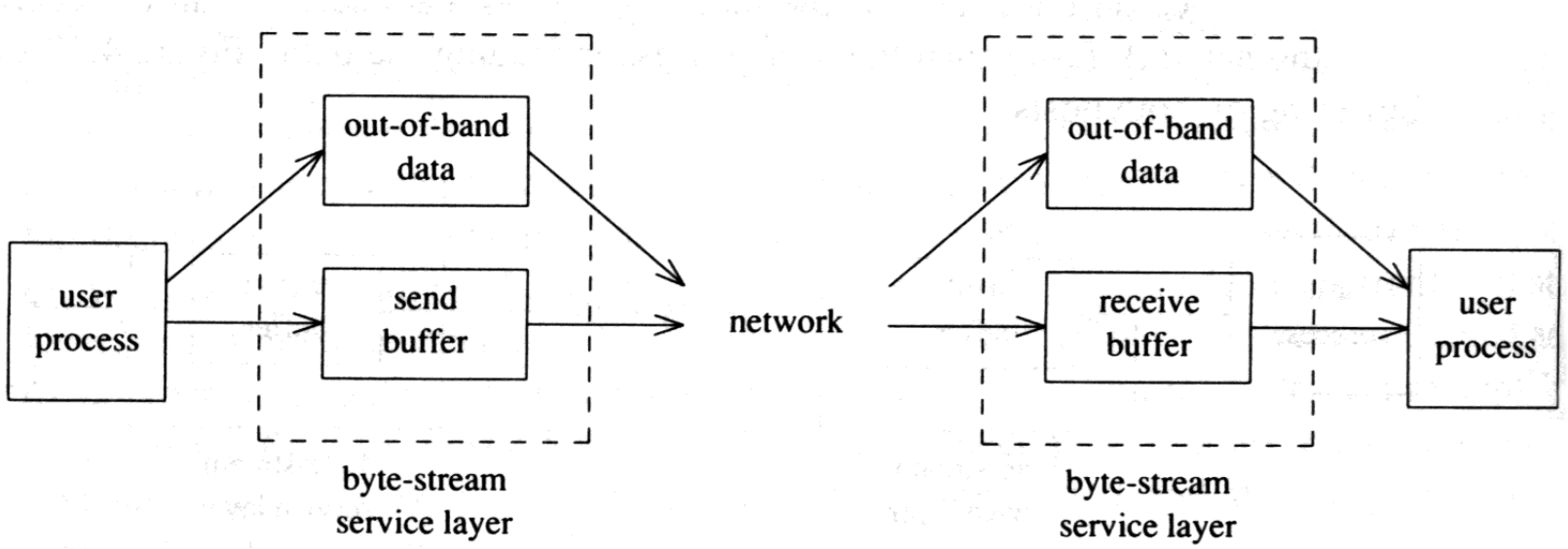


Network Issues -- (6)

- Model of Services:
  - connection-oriented or connectionless
  - sequencing
  - error control
  - flow control
  - stream v.s. messages
  - full-duplex v.s. half duplex

Network Issues -- (7)

- Buffering and Out-of-band Data



Network Issues -- (8)

- Broadcast and Multicast
- Routing
  - static routing
  - isolated dynamic routing
  - centralized dynamic routing
  - distributed dynamic routing
- Connections and Associations
  - Associations:{protocol,local-addr,local-port,foreign-addr,foreign-port}}
  - Half Assoc: {protocol,local-addr,local-port}

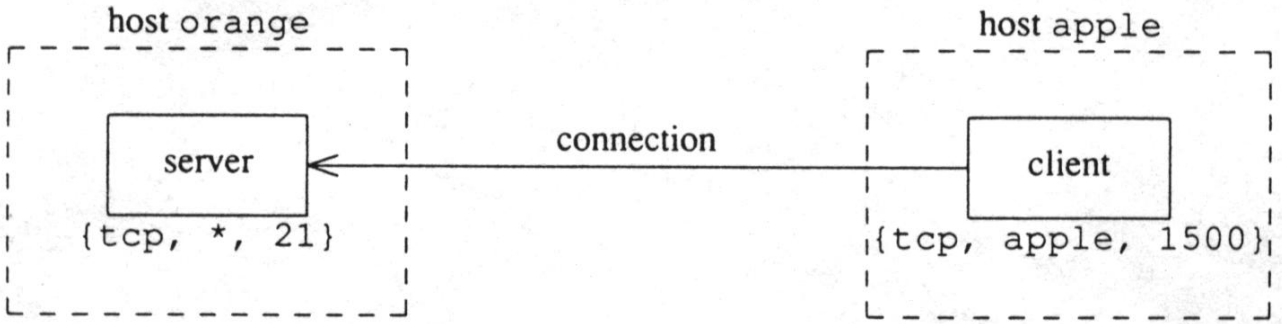


Figure 5.8 Connection from client to server.

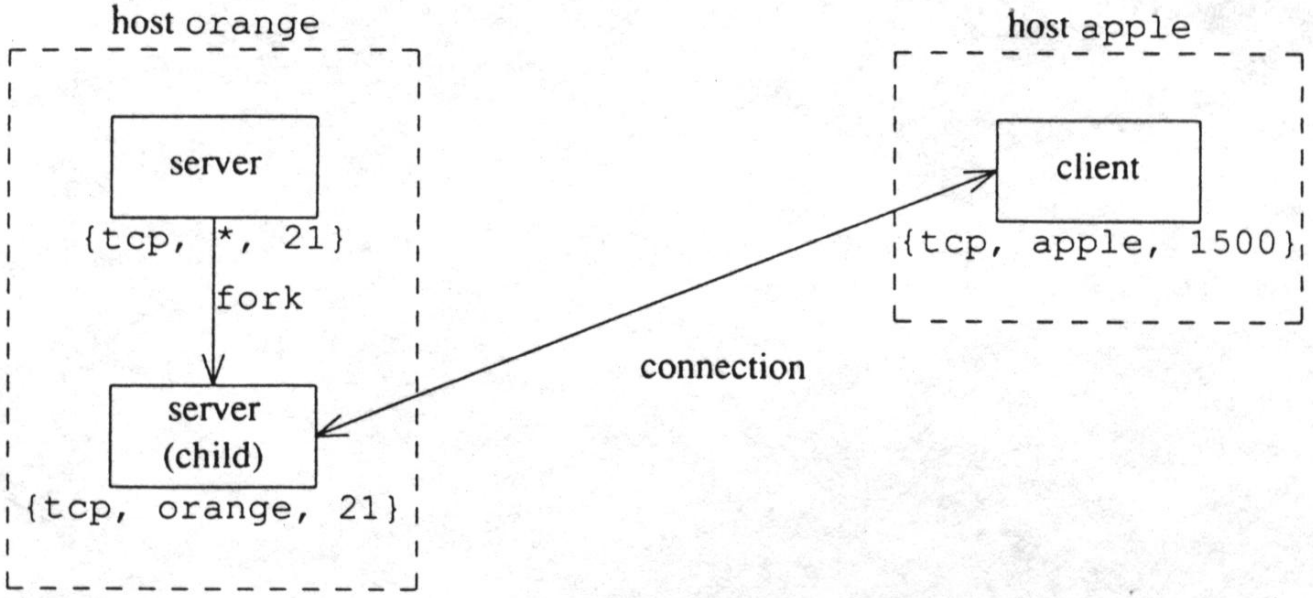


Figure 5.9 Concurrent server passes connection to child.

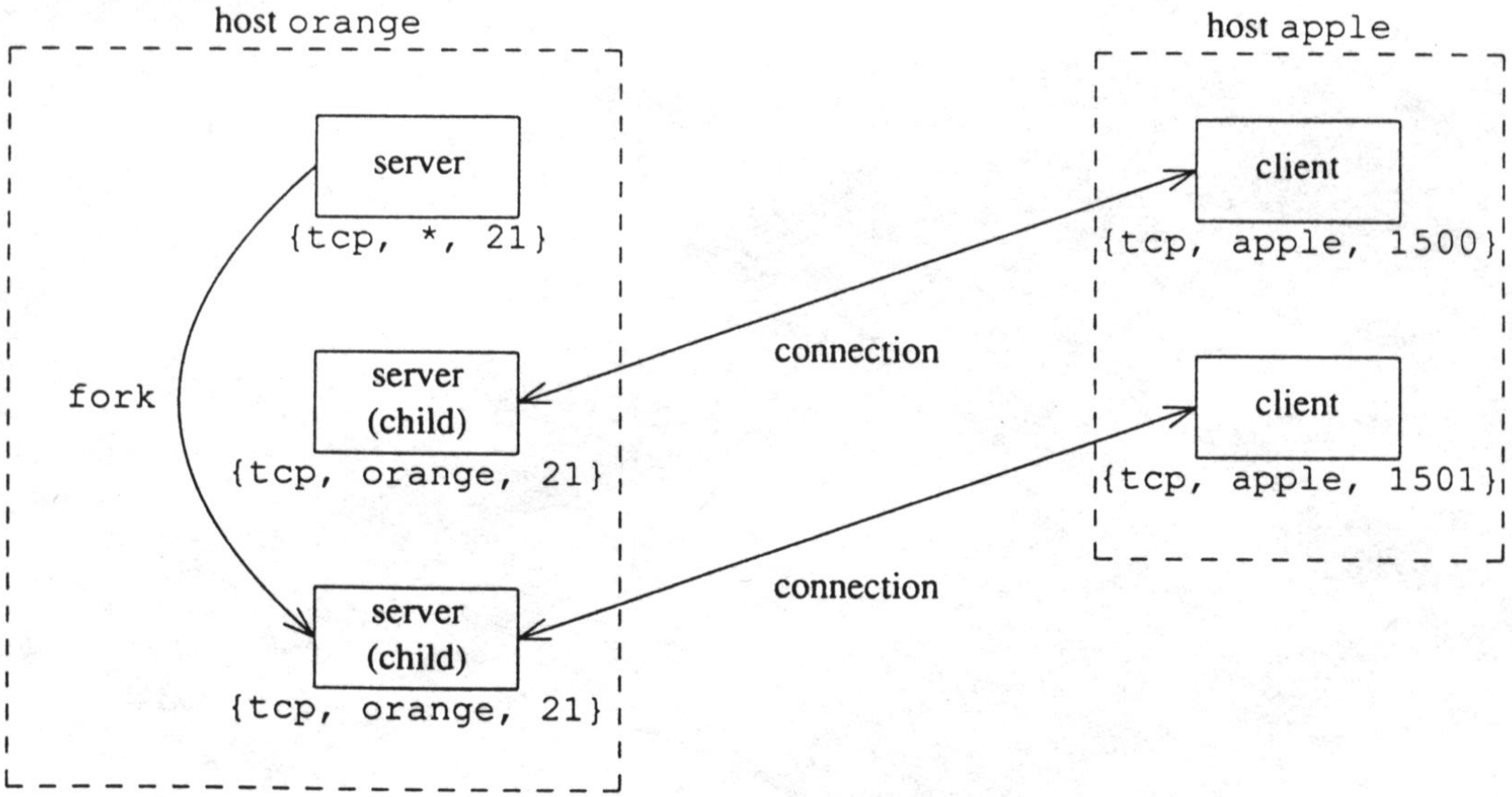


Figure 5.10 Second client connection passed to another child.

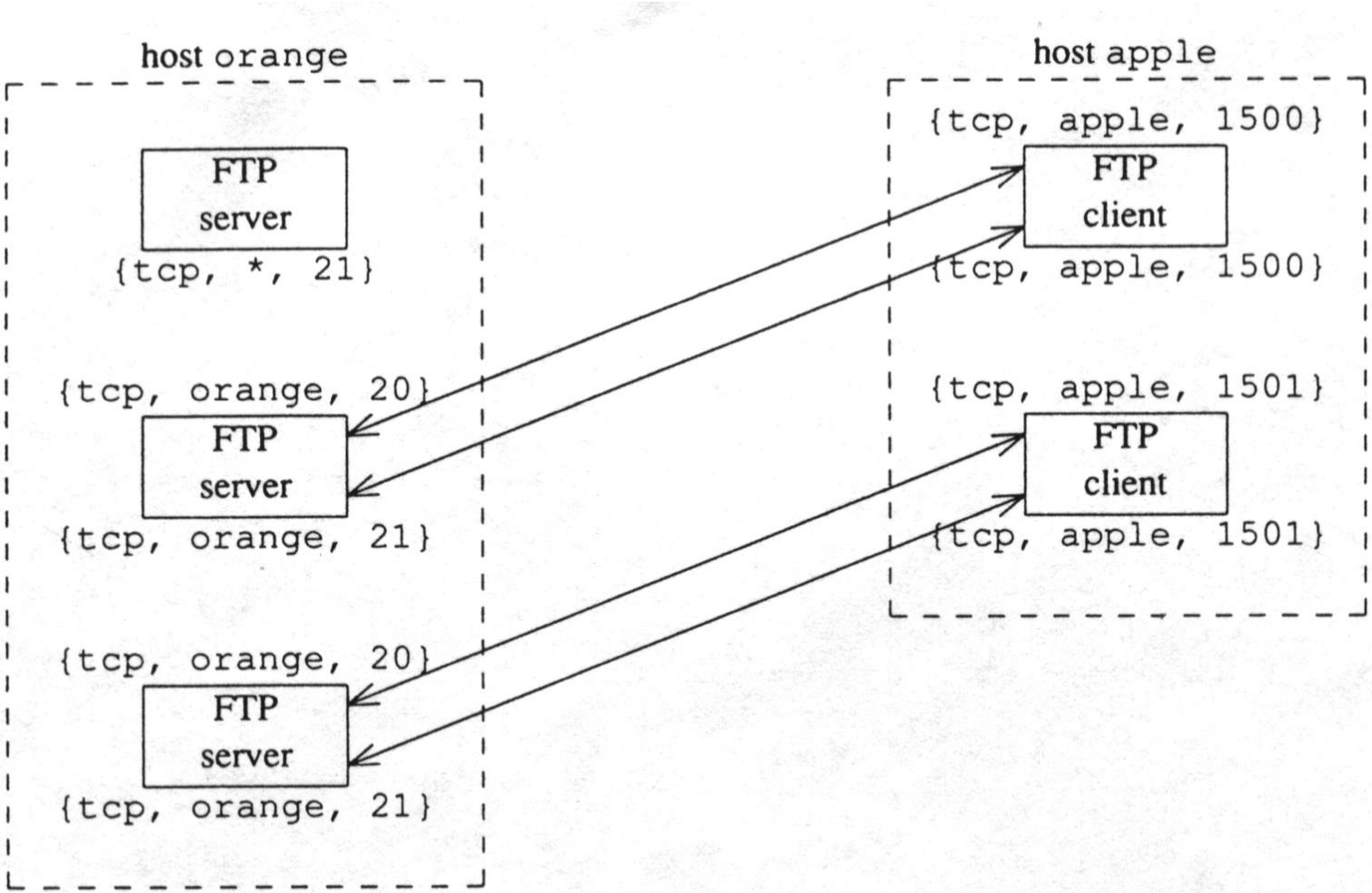
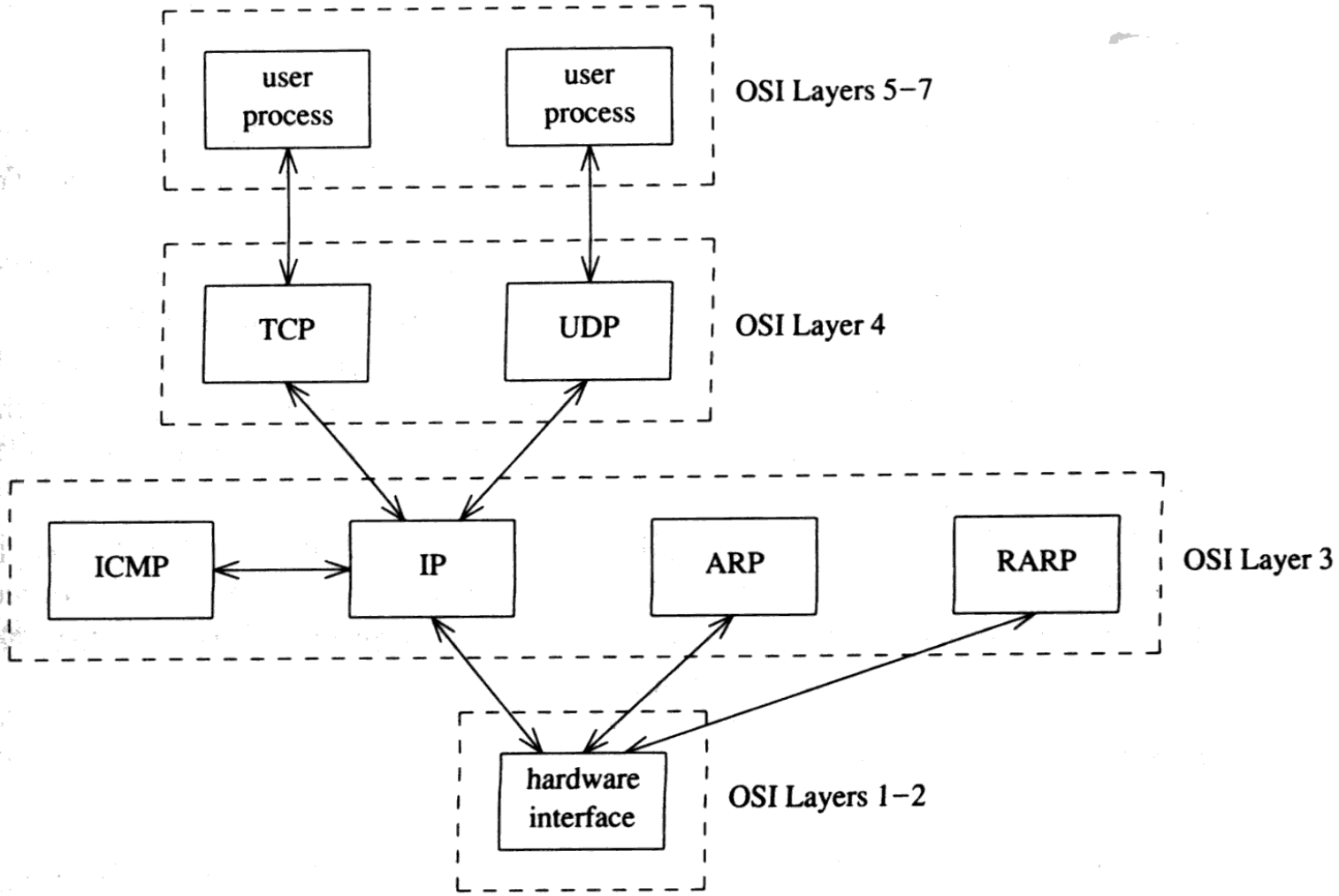
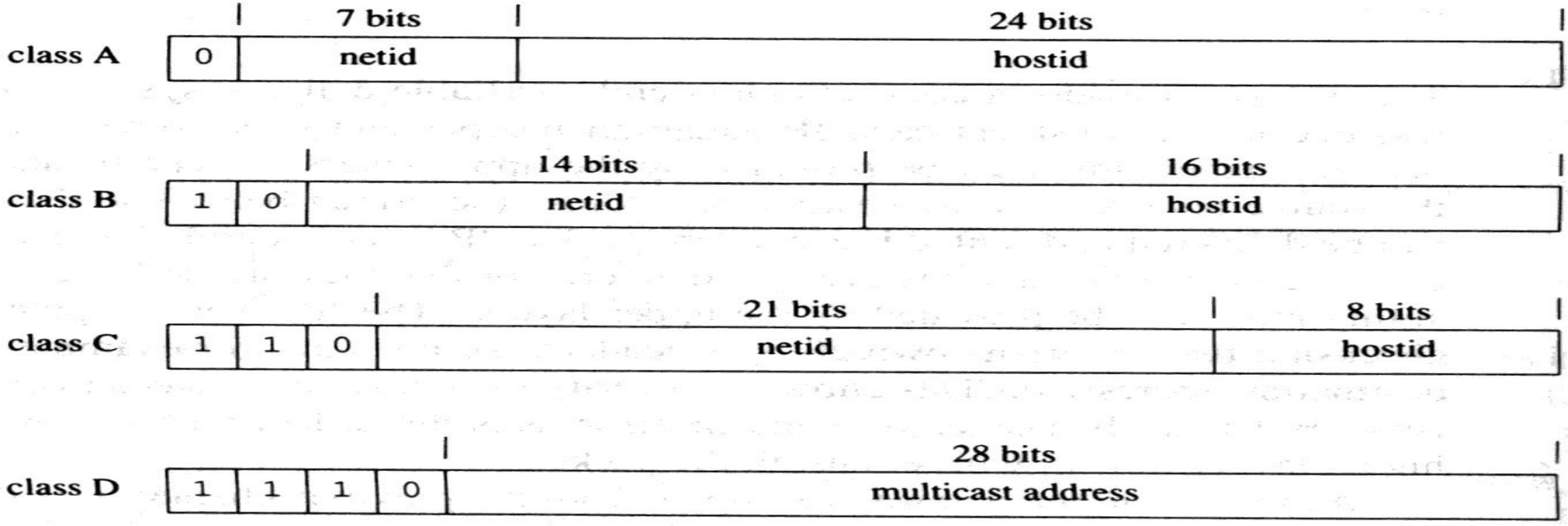


Figure 5.11 FTP example with two clients and two servers.

TCP/IP Overview

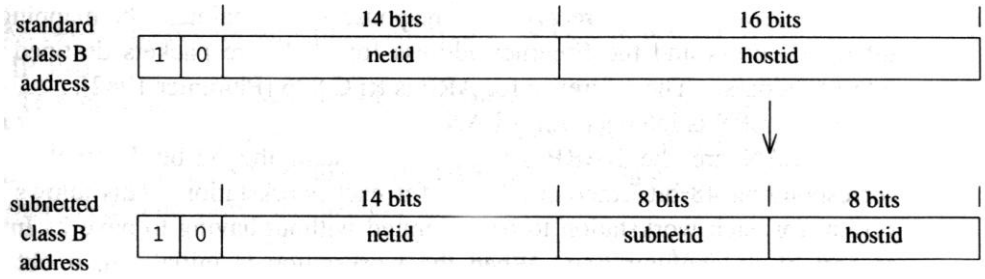


Internet Addresses



e.g. 130.175.1.10

140.113.214.63



Bob Metcalfe Eats His Words

(http://iw3c2.cs.ust.hk/WWW6/speakers/metcalfe.html)

- Bob will no doubt be providing his insightful yet acerbic comments on the events of the week. He also says he'll refer back to his WWW4 wrap-up in December of 1995 at which he promised to eat his 12/4/95 InfoWorld column if, in his judgement, the Internet did not collapse in 1996.
- It'll be interesting to see what he says to that...
- Happy eating, Bob!

Addresses Resolution

- IP address ⇒ Ethernet Address
  - Use ARP(broadcast)
- Ethernet Address ⇒ IP address
  - When a diskless workstation is initialized, use RARP(broadcast) to find its IP address.

- ARP protocols
  - Physical address:48-bits
  - ARP protocol maintains a routing table for converting to and from IP addresses.
  - If IP does not know the physical address of an IP address, it broadcasts an ARP packet to ask.
  - The node that matches this IP address responds.
  - If the node is not in the network, RIP and EGP gateway protocols will ensure the packet is routed correctly.