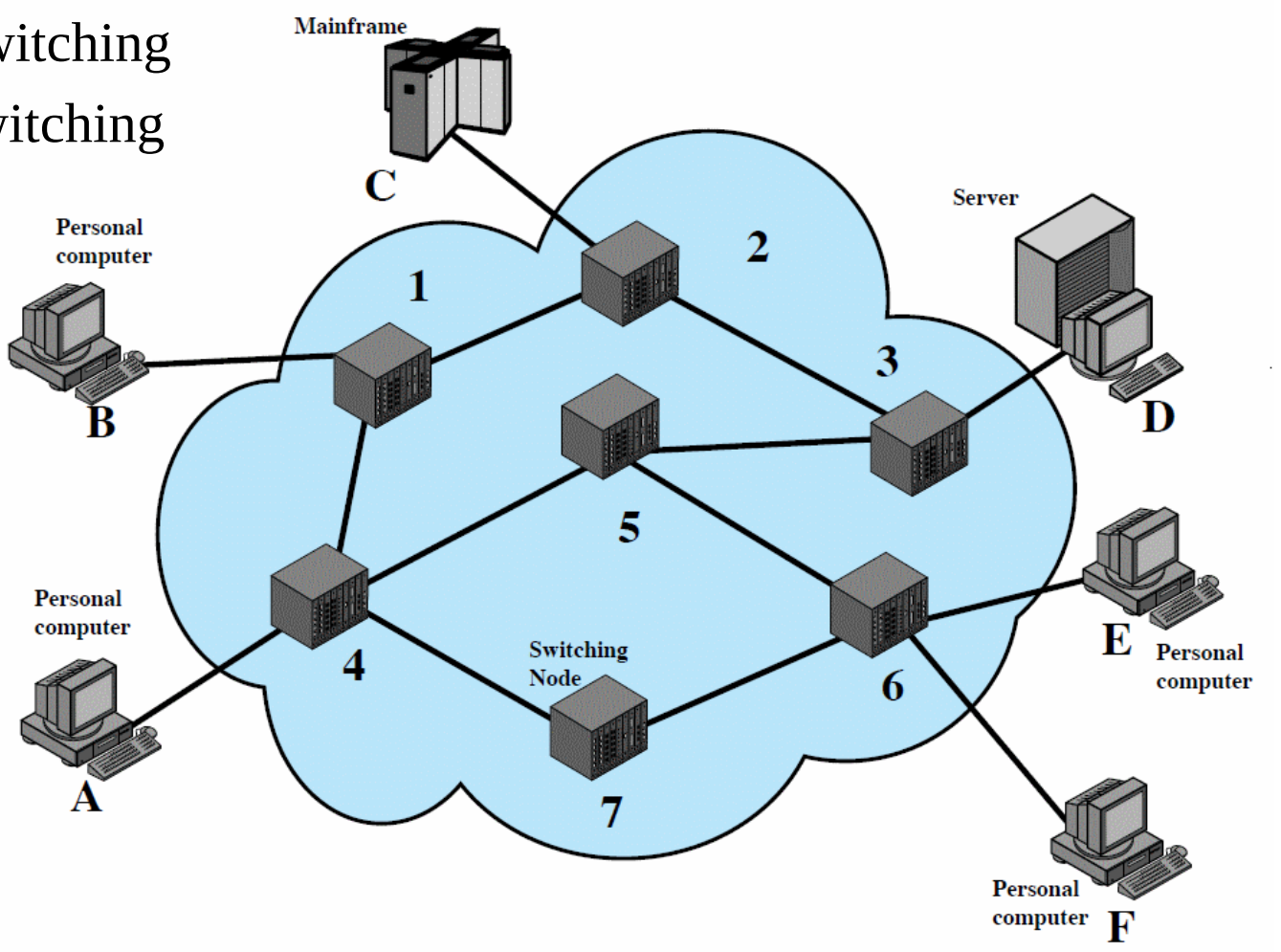
Chapter 9

Packet Switching

Simple Switching Network

- Switching Technology
  - Circuit Switching
  - Packet Switching

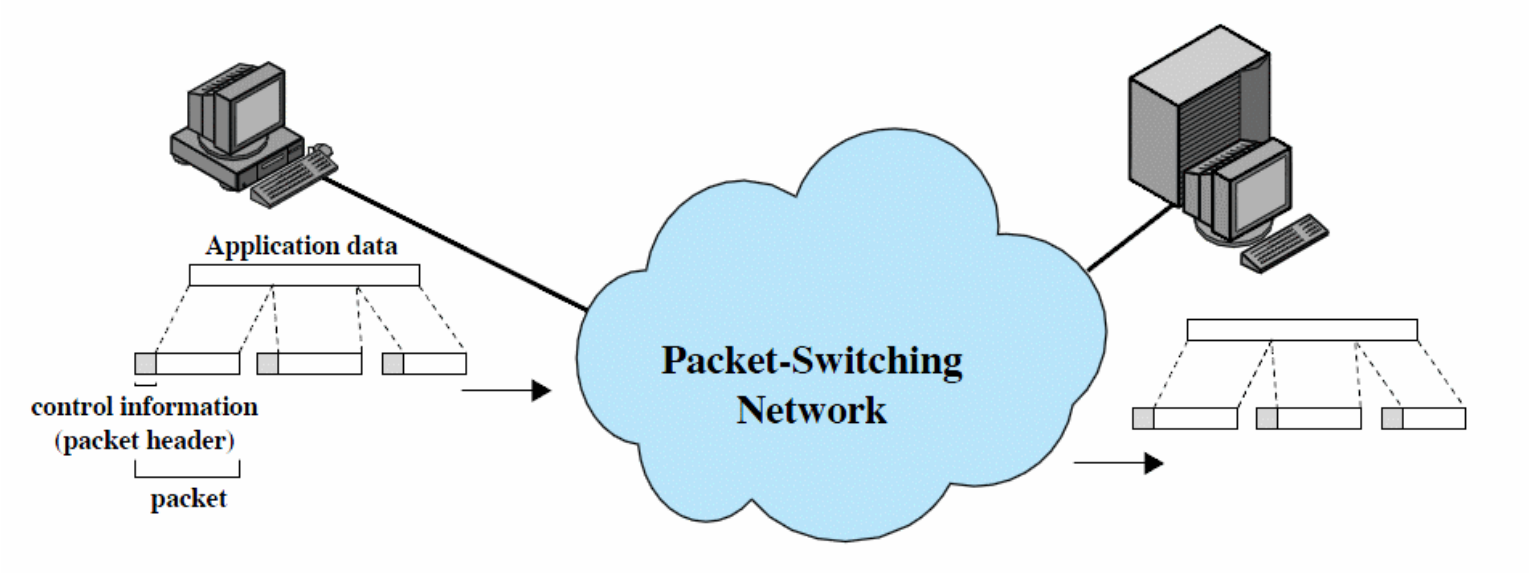


Circuit Switching

- During communication, a dedicated communication path exists between sender and receiver (e.g., telephone system)
- Communication involves 3 phases:
  - circuit establishment
    - Allocation of dedicated resource
  - data transfer
  - circuit disconnect
- Disadvantages
  - inefficient use of link capacities, especially with bursty intermittent traffic
- Advantages
  - Low delay once circuit is established

Packet Switching (1/2)

- Data is transmitted in small packets
  - Typically 1000 octets
  - Longer messages split into series of packets
  - Each packet contains a portion of user data plus some control information (routing (addressing) info)
- Packets are received, stored (buffered) and past on to the next node: Store and Forward



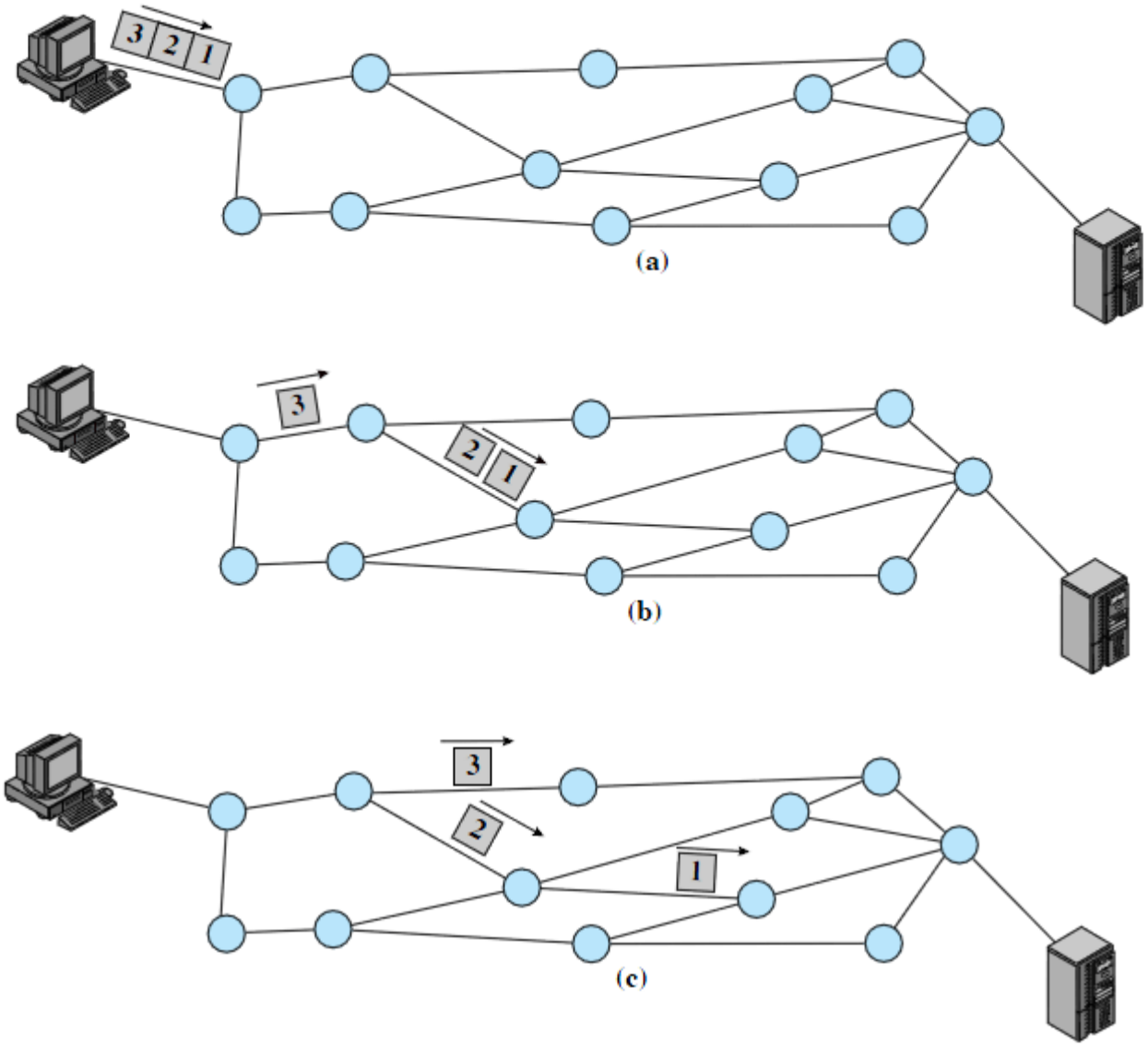
Packet Switching (2/2)

- Advantages
  - Line efficiency
    - Single node to node link can be shared by many packets over time
  - Packets are accepted even when network is busy
    - Delivery may slow down
  - Priorities can be used
- Two approaches
  - Datagram
  - Virtual circuit

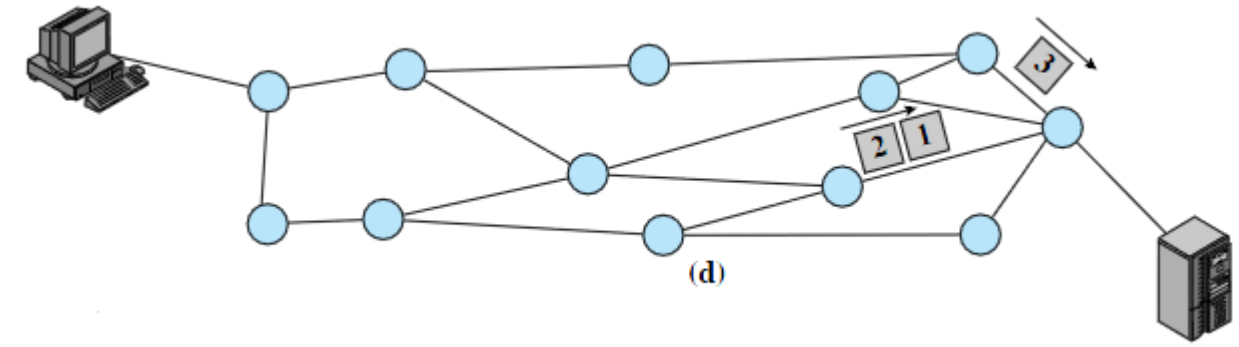
Datagram Approach

- Each packet treated independently
- Packets can take any practical route
- Packets may arrive out of order
- Packets may go missing
- Up to destination host to re-order packets and recover from missing packets

Example of Datagram (1/2)



Example of Datagram (2/2)



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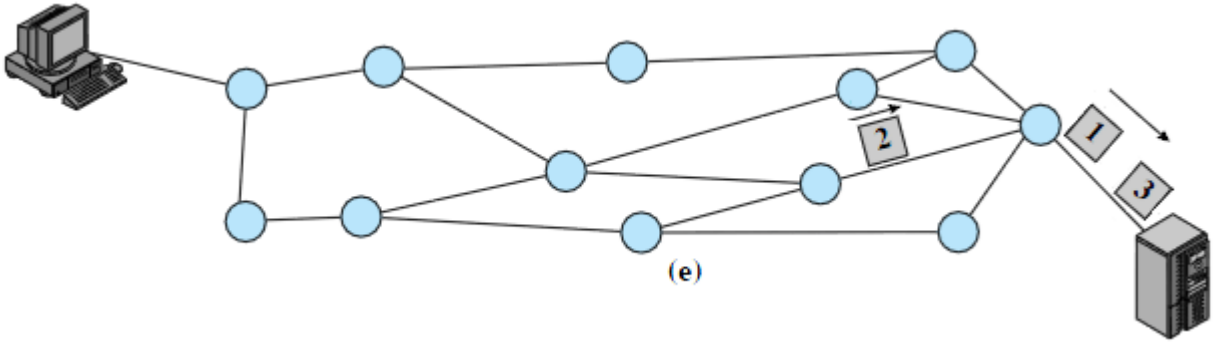
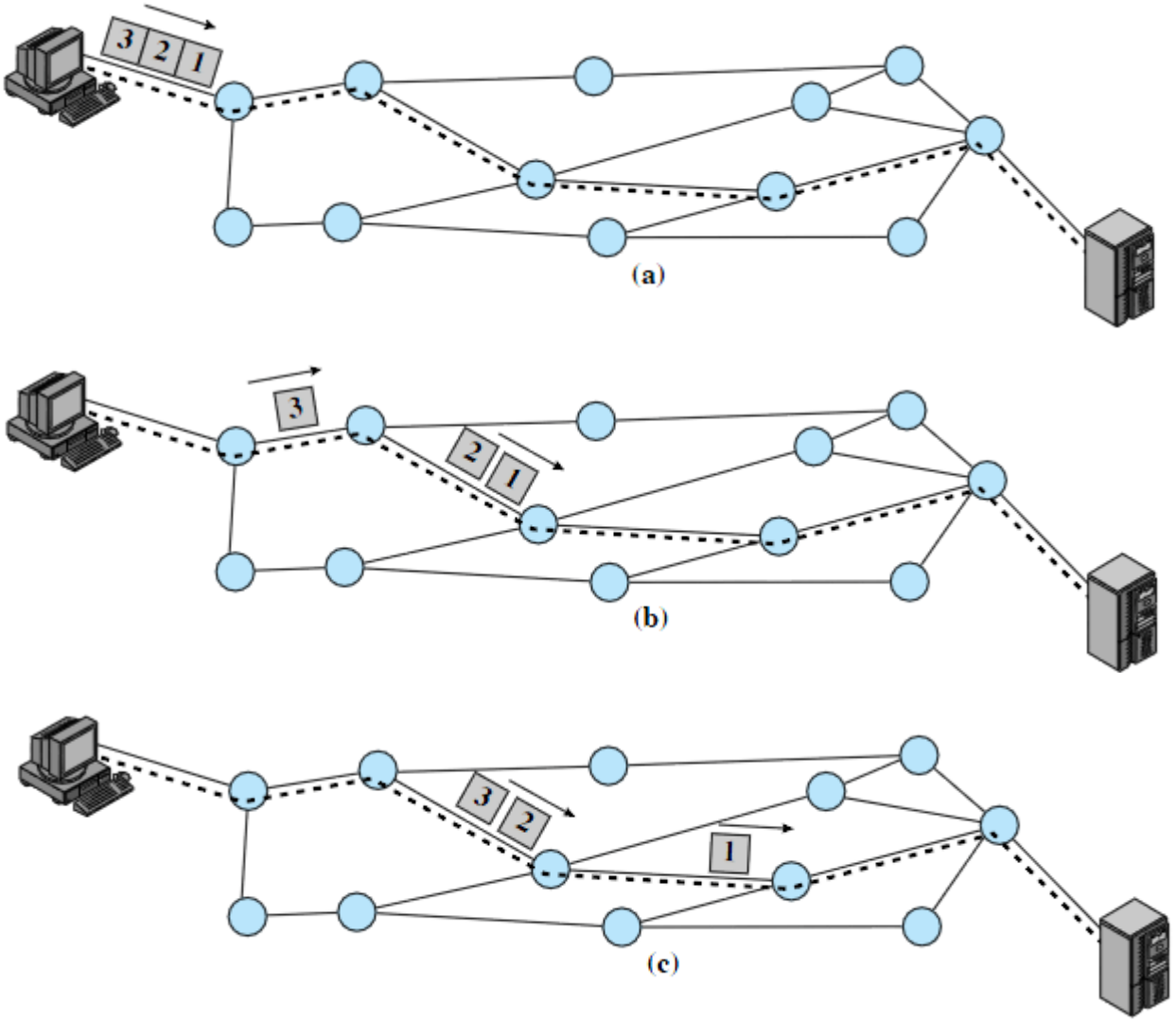


(e)

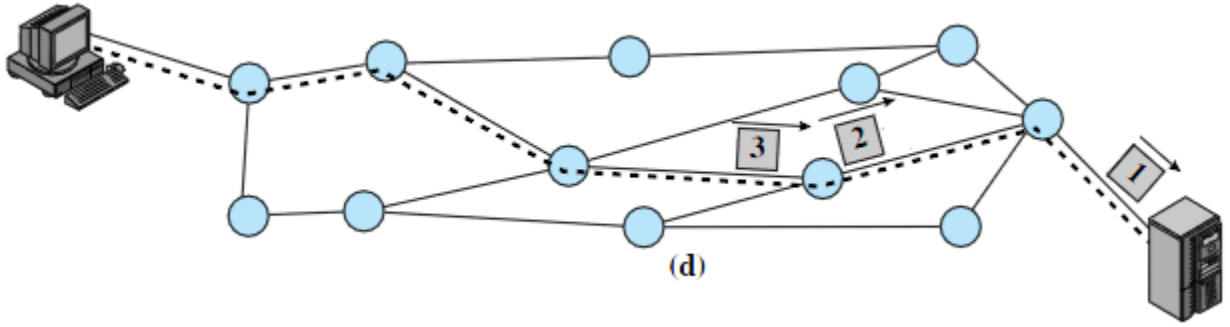
Virtual Circuit Approach

- Preplanned route (virtual circuit) is established before any packets are sent
  - Connection request and connection accept packets establish connection (handshake)
  - No allocation of dedicated resource: not a dedicated path
- Each packet contains a virtual circuit identifier instead of destination address
- No routing decisions required for each packet
- Clear request to drop a virtual circuit

Example of Virtual Circuit (1/2)



Example of Virtual Circuit (2/2)



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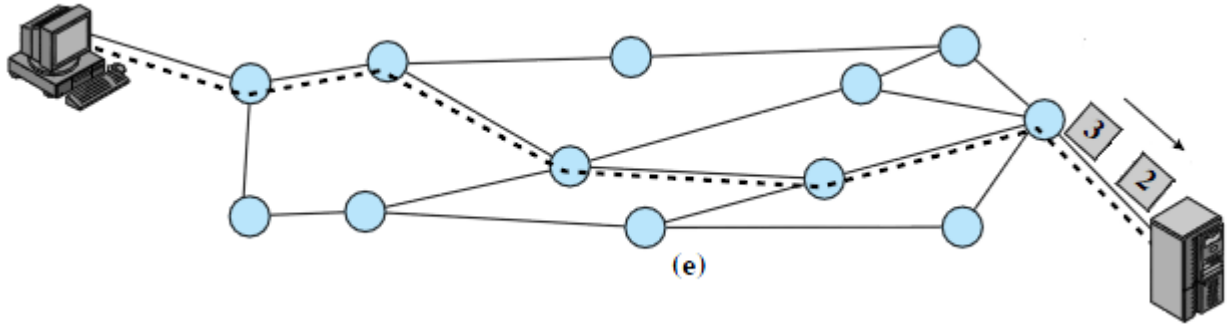

(e)

Virtual Circuit vs Datagram

- Virtual circuits
  - In-sequencing
  - No routing decision for packets
  - Less reliable
    - Loss of a node looses all virtual circuits through that node
- Datagram
  - No call setup phase
    - can be better if few packets
  - More flexible
    - Routing can be used to avoid congested parts of the network