BET603
TELECOMMUNICATION SWITCHING NETWORKS

- UNIT -I SWITCHING SYSTEMS
  Introduction
- -Message switching
- -Circuit switching
- -Manual switching-
- Functions of switching system- Strowger step by step system
- -Register translator-Senders
- -Distribution frames-Cross bar systems-General trunking-Electronic switching-Reed electronic systems
- -Digital switching systems.

UNIT- II TIME DIVISION SWITCHING

- Introduction-Space and time switching
- Time division switching networks-grades of services
- Time division switching networks-non blocking networks-synchronization.

UNIT -III TELECOMMUNICATION TRAFFIC

- Introduction-Unit of traffic
- -Congestion-Traffic measurement
- -A mathematical model-Local call systems
- -Queuing systems.

UNIT -IV TELECOMMUNICATION SIGNALLING

- Introduction-Customer line signaling
- - Audio frequency junction and trunk circuits
- -FDM carrier systems-PCM signaling
- - Inter register signaling
- - Common channel signaling principles
- -CCITT signaling, CCITT signaling, Digital customer line signaling.

UNIT-V TELECOMMUNICATION NETWORKS

- Introduction-Analog networks
- -Integrated digital networks
- -Integrated service digital networks
- -Cellular radio networks
- -Intelligent networks
- -Private networks
- -numbering
- -charging
- -Routing
- -Network management.

Switching

- Problem:
  - each user can potentially call any other user
  - can't have direct lines!
- Switches establish temporary *circuits*
- Switching systems come in two parts: switch and switch controller

Switching: what does a switch do?

- Transfers data from an input to an output
  - many ports (up to200,000 simultaneous calls)`
  - need high speeds
- Some ways to switch:
  - *space division*

The importance of switching in communication

- The cost of switching is high

Definition:

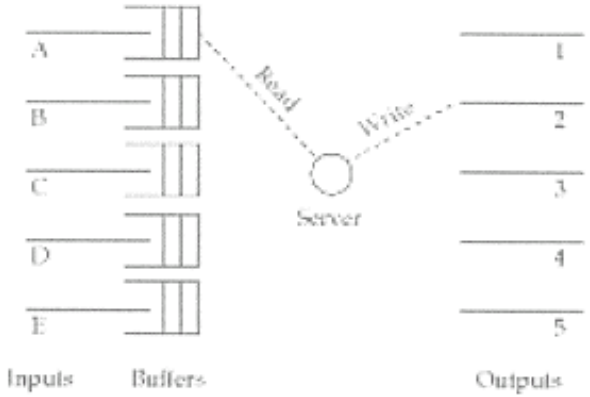
- *Transfer input sample points to the correct output ports at the correct time*

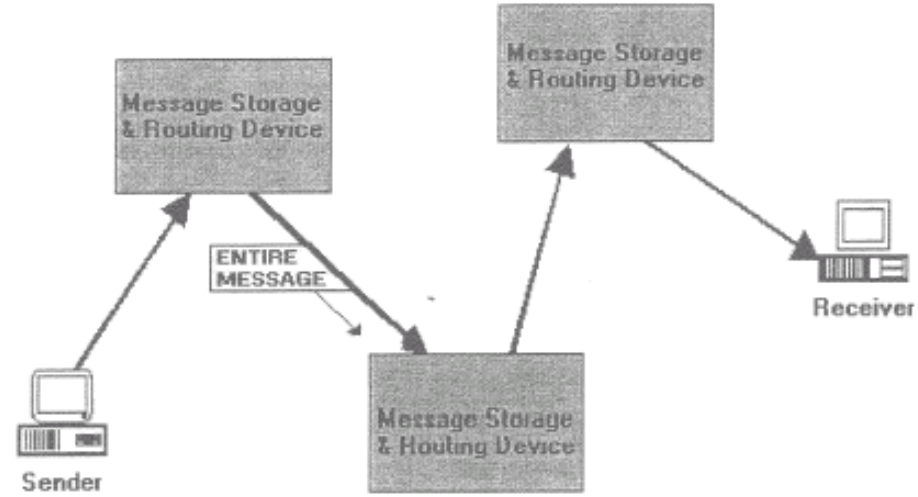
Terminology

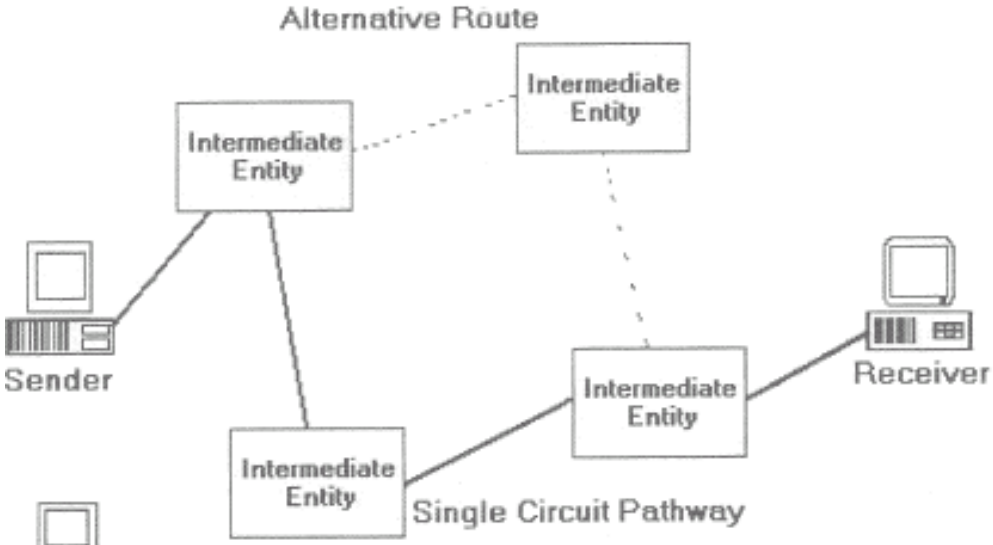
- Switching
- Digital switching (sample points amplitudes are 0's and 1's)
- PABX
- Circuit
- Circuit switching
- Packet switching

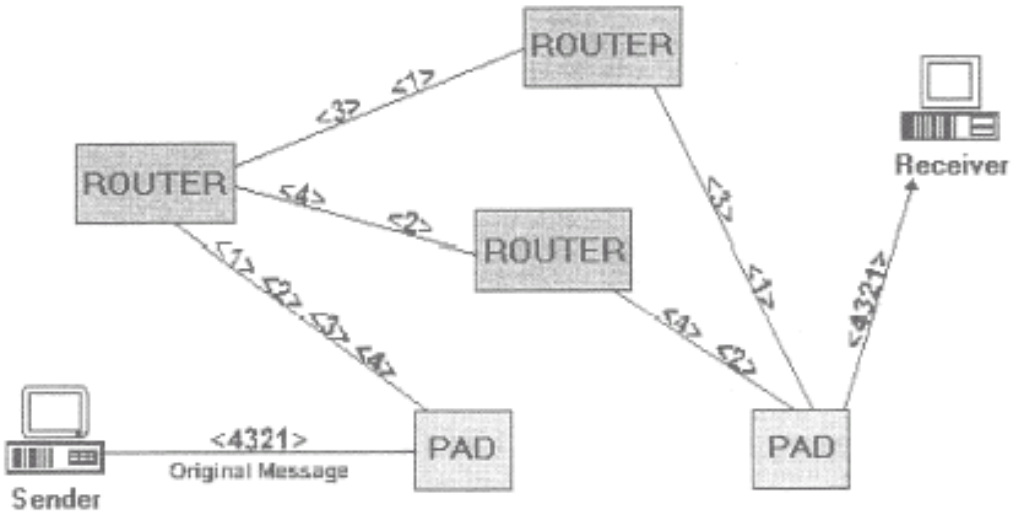
Space division

- Another way to switch
  - *time division (time slot interchange* or *TSI)*
  - also needs a schedule (why?)




Message Storage & Routing Device
Message Storage & Routing Device
ENTIRE MESSAGE
Receiver
Message Storage & Routing Device
Sender


Alternative Route
Intermediate Entity
Intermediate Entity
Sender
Intermediate Entity
Intermediate Entity
Receiver
Single Circuit Pathway

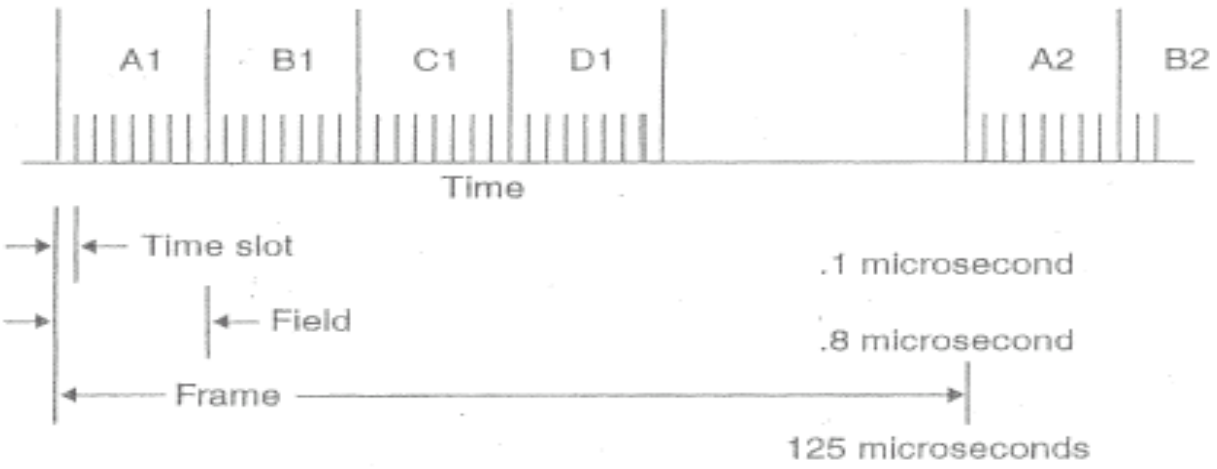

ROUTER
ROUTER
ROUTER
Receiver
<4321>
Original Message
PAD
PAD
Sender

Voice digitization:

- W=3KHz, sampling at 2*3=6 or 8KHz
- 256 levels for quantization (8 bits)
- Bit rate=64Kb/s

Telephone switching

- Time division multiplexing: time slot (0.1 ms), field, frame;
- 125ms/0.8=150 channels + time for synchronization and control



Switch architecture

- Sampling input signals, storing values in memory, placing values in the proper field and frame of the output sequence
- Need for more channels: hierarchical switching
- Combining time and space switching

General framework for switching

- time, space and frequency (broadband signals) switching
- synchronization (single clock) and buffering (memory)
- set-up time and delay (propagation time)
- "call duration" assignment vs. dynamic assignment
- in-band and out-of-band signaling

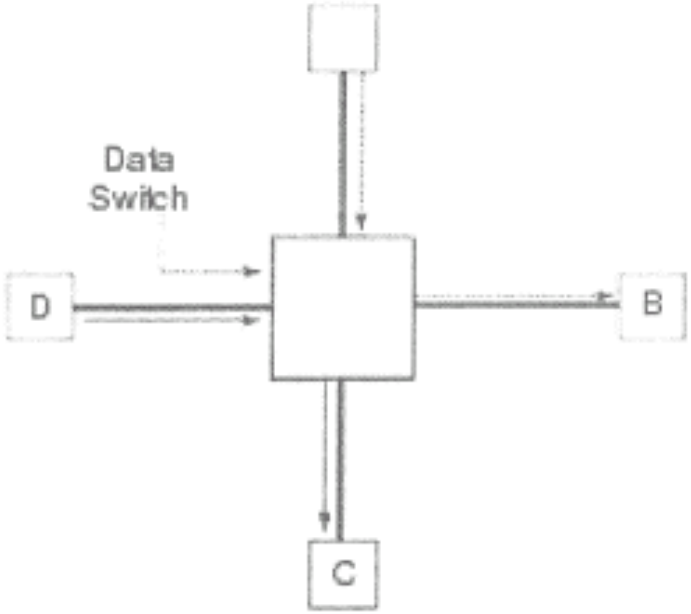
Circuit (synchronous) vs. packet (asynchronous) switching

- control and routing overhead, virtual packet switching

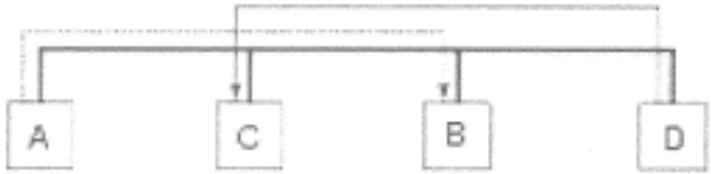
Switching techniques and networking

- *Switching is the technology allowing to get a message between the nodes of a network*
- Crossbar switching: mechanical (in the past) or electronic.
- Bus and cable switches: computer buses or cables (switching + transportation = network)
    - Token passing approach (similar to the locks used by multiprocessors connected by a bus)
    - Ethernet approach: cable or ring, packets, conflicts, resending
- Synchronization and Hub switch: star networks (no conflicts)

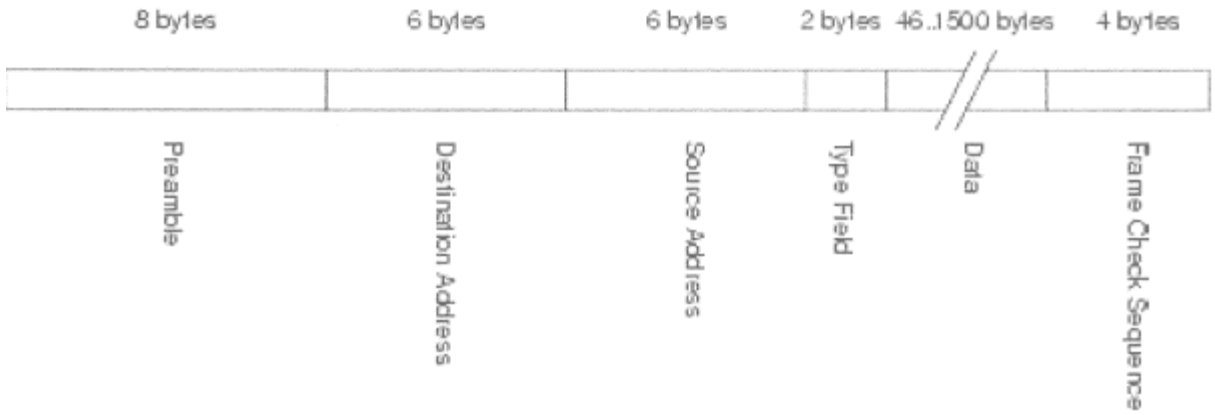
(a) Circuit Switching Based System

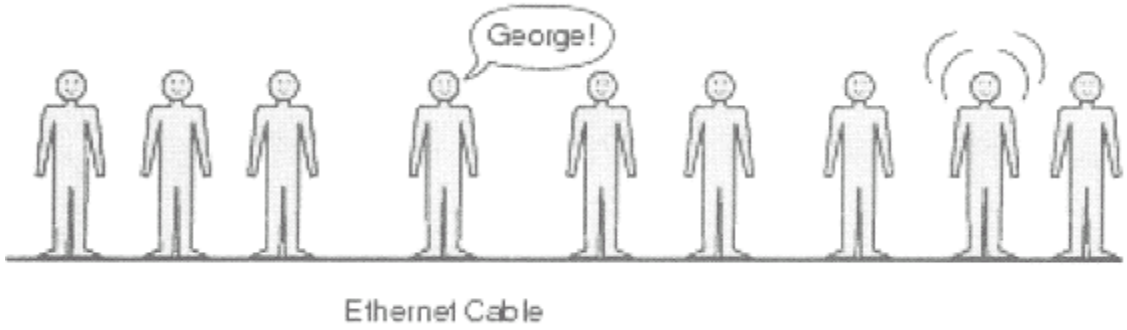


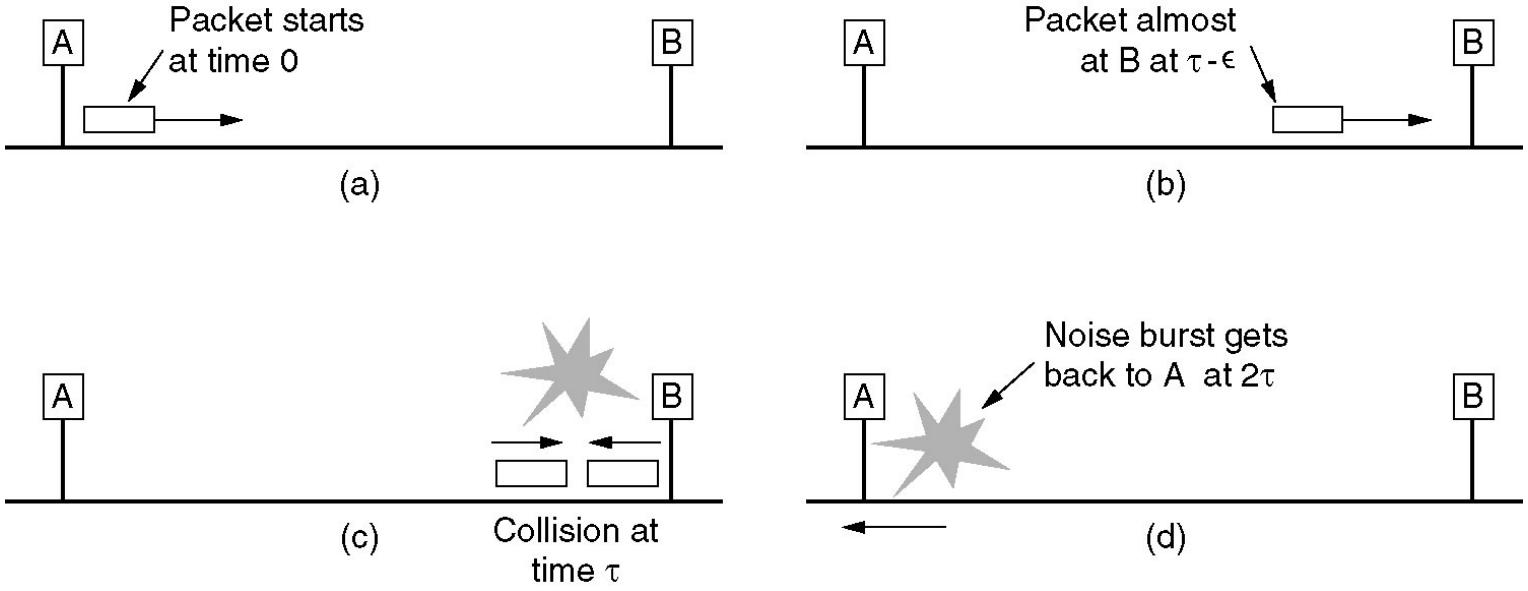
(b) Packet Switching Based System



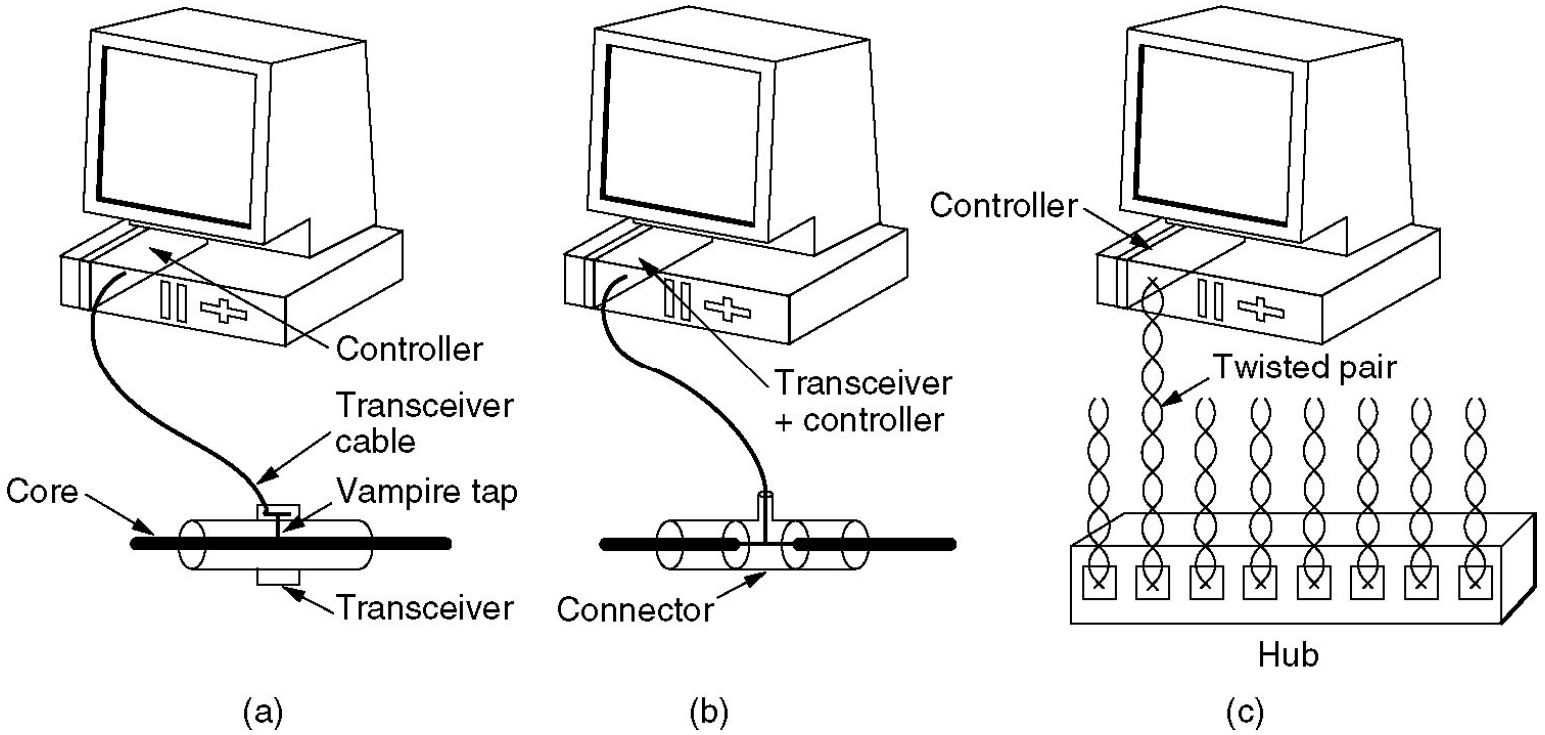
The Ethernet Datagram



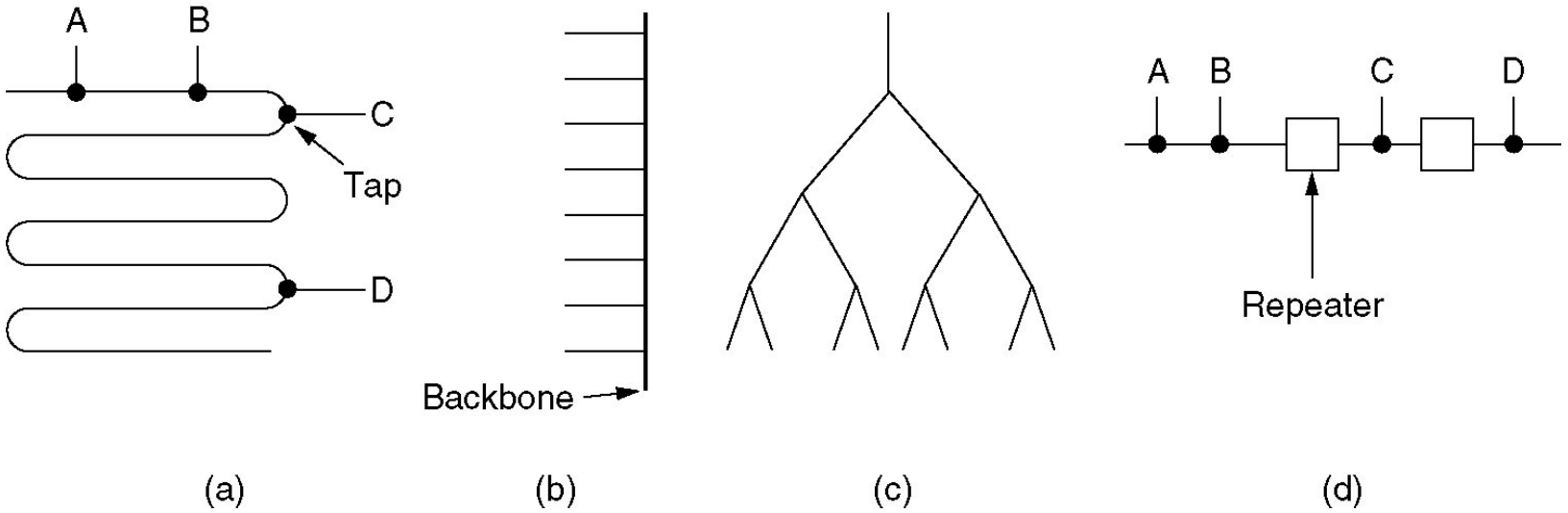

George!
Ethernet Cable


A
B
Packet starts
at time 0
(a)
A
B
Packet almost
at B at τ-ϵ
(b)
A
B
(c)
Collision at
time τ
A
B
Noise burst gets
back to A at 2τ
(d)

Ethernet Cabling

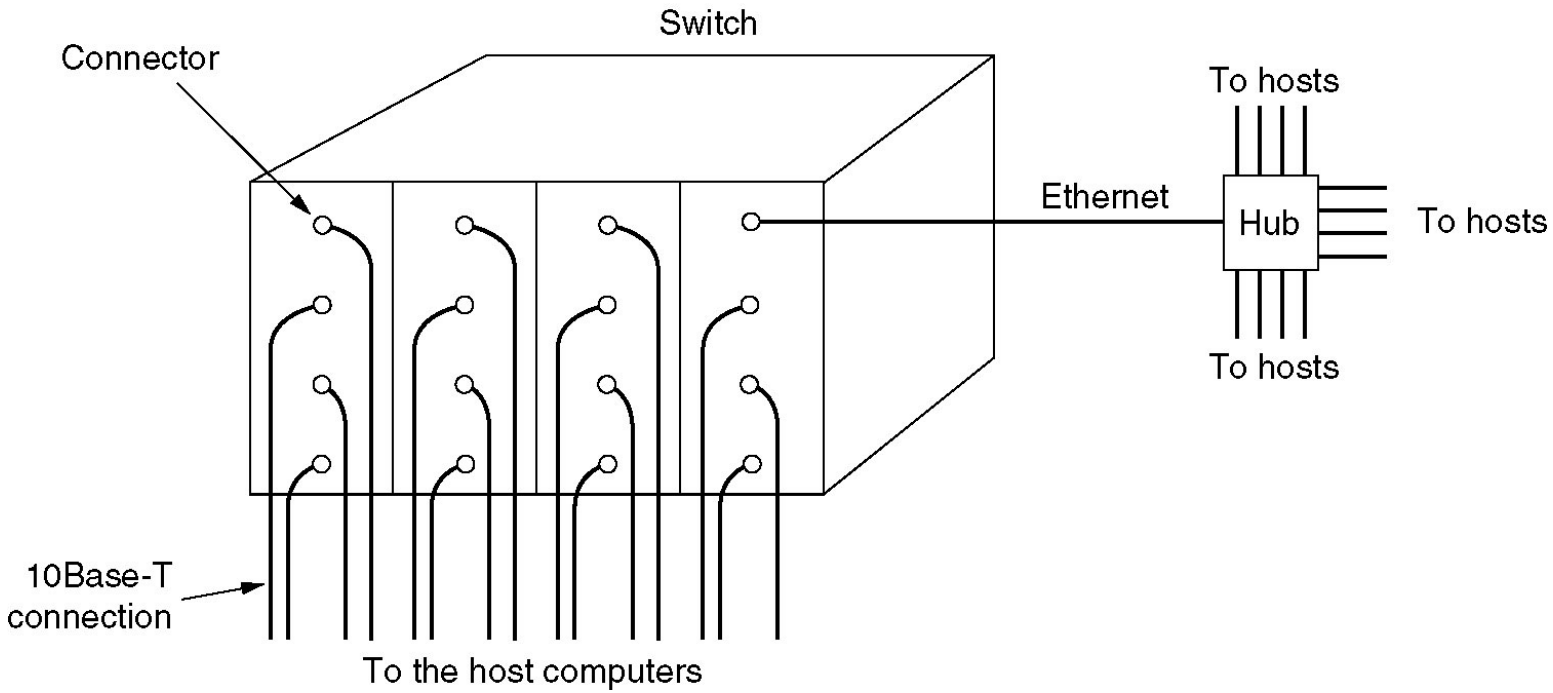


Ethernet Cabling

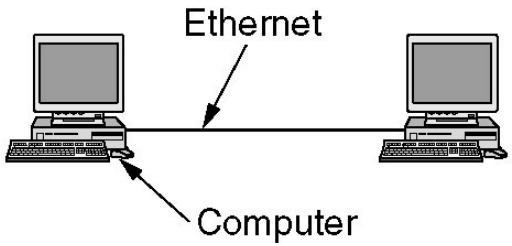


Cable topologies. (a) Linear, (b) Spine, (c) Tree, (d) Segmented.

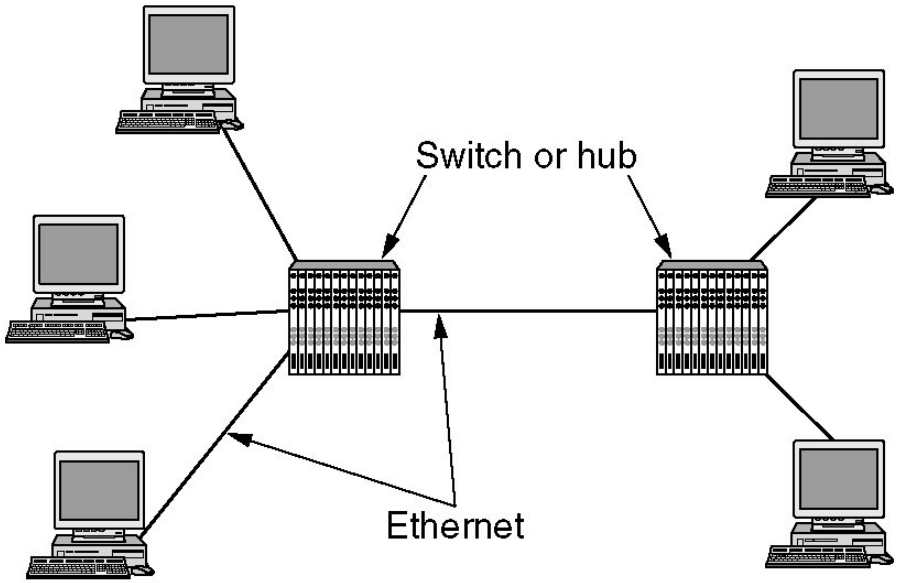
Switched Ethernet



A simple example of switched Ethernet.



(a)



(b)