Lecture 3

Overview of Computer Networks (continued)

By

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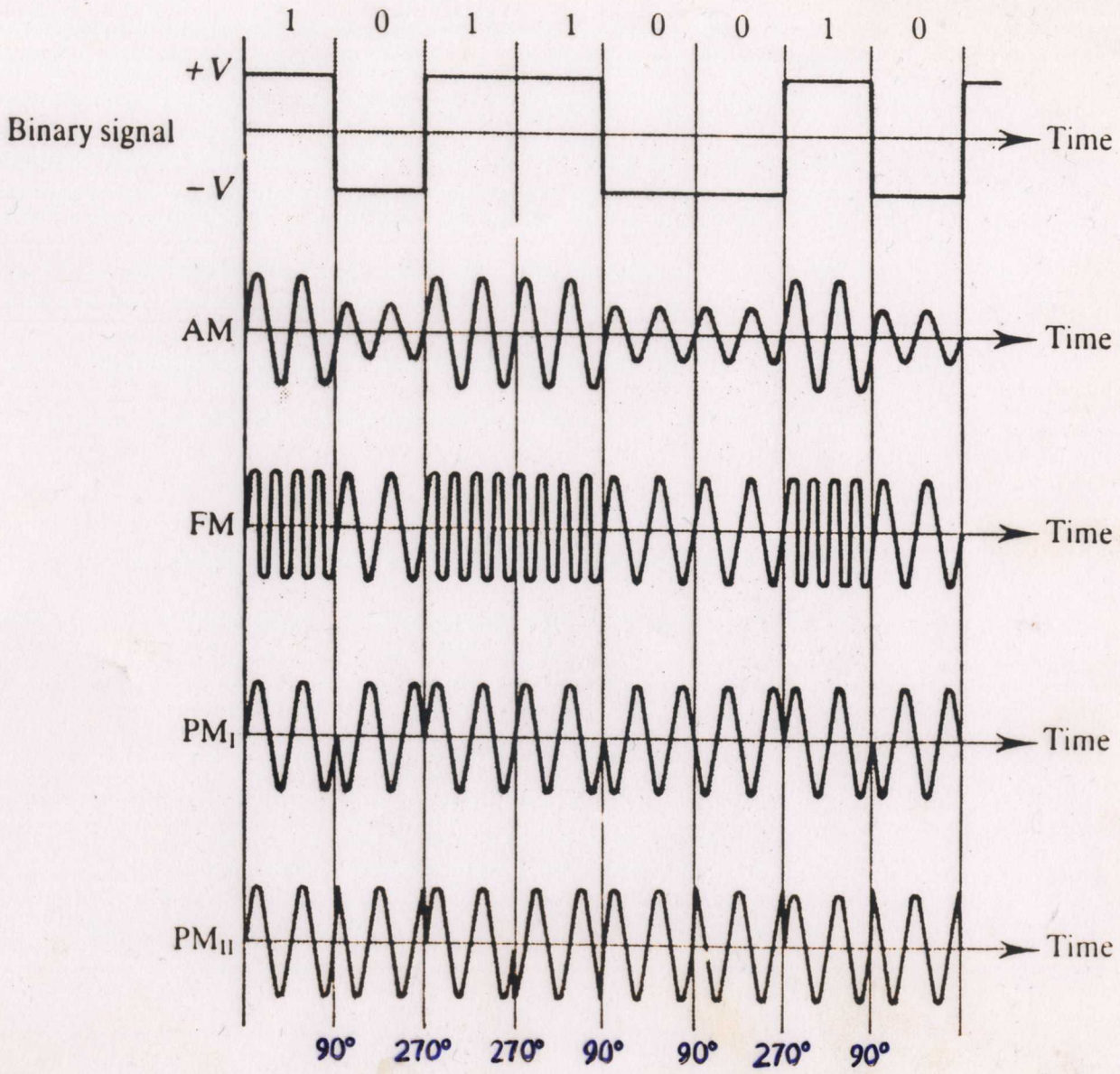
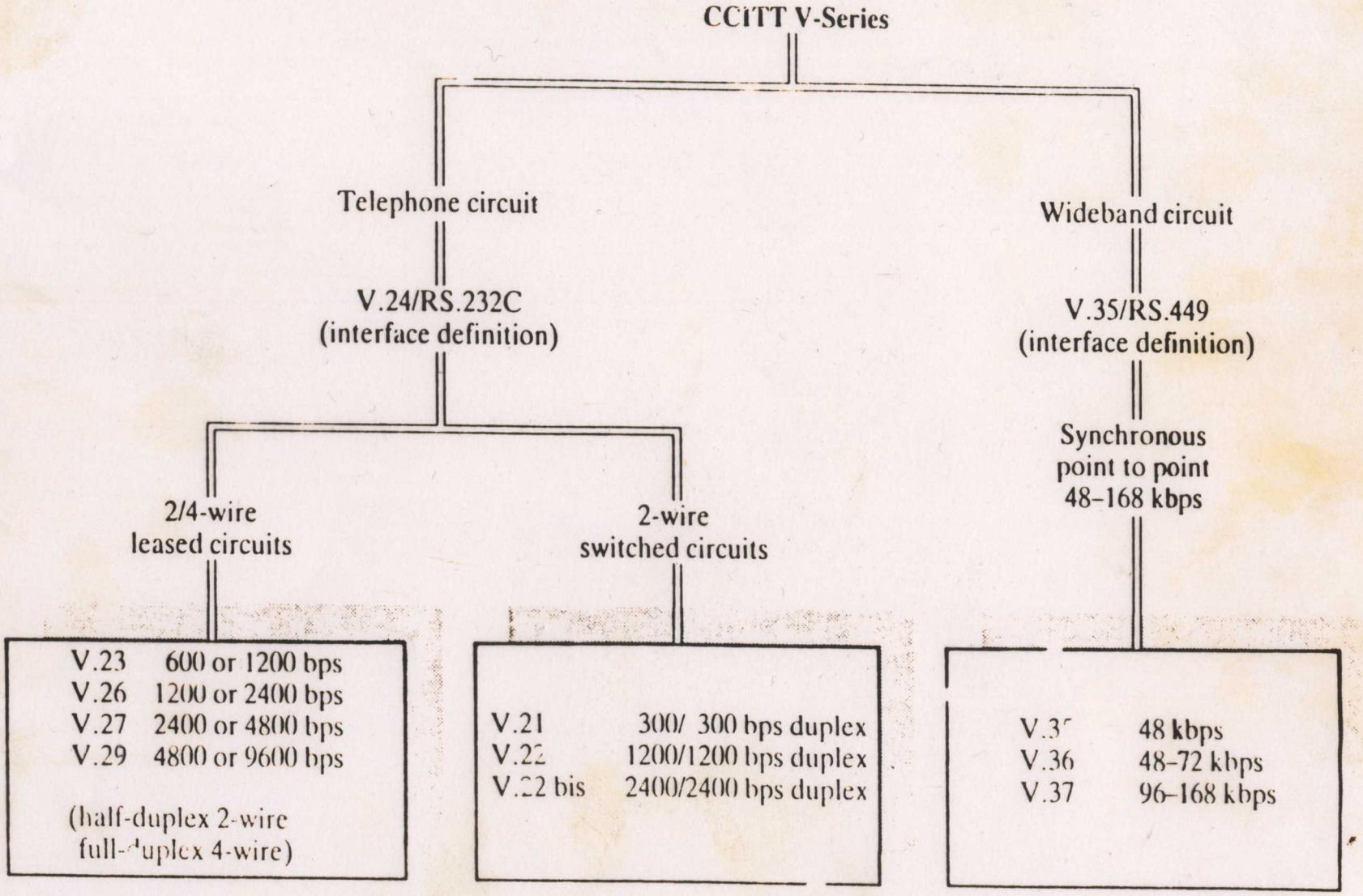

1 0 1 1 0 0 1 0
+V
Binary signal
−V
Time
AM
Time
FM
Time
PM$_I$
Time
PM$_{II}$
Time
90° 270° 270° 90° 90° 270° 90°


CCITT V-Series
Telephone circuit
Wideband circuit
V.24/RS.232C
(interface definition)
V.35/RS.449
(interface definition)
Synchronous
point to point
48–168 kbps
2/4-wire
leased circuits
2-wire
switched circuits
V.23 600 or 1200 bps
V.26 1200 or 2400 bps
V.27 2400 or 4800 bps
V.29 4800 or 9600 bps
(half-duplex 2-wire
full-duplex 4-wire)
V.21 300/ 300 bps duplex
V.22 1200/1200 bps duplex
V.22 bis 2400/2400 bps duplex
V.35 48 kbps
V.36 48–72 kbps
V.37 96–168 kbps

C. INTERCONNECTION OF COMPUTERS

- Purpose of a Computer Network
- Simple Link Connection
- Enhanced Link Connection
- Multiple Link Connection
- Requirements for Computer Interconnection

PURPOSE OF A COMPUTER NETWORK

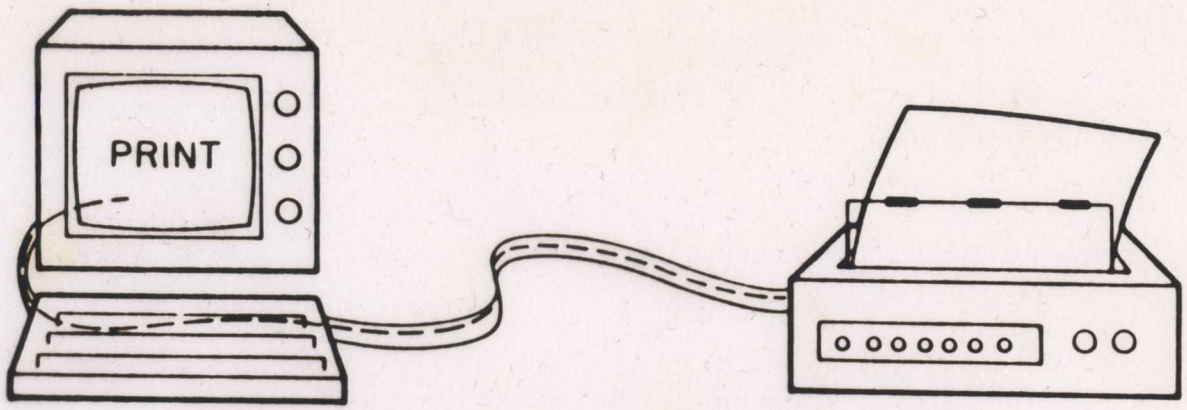
Basic function of a computer network is

to provide *access paths*
so that an *end user* can access another *end user*
at another geographical location

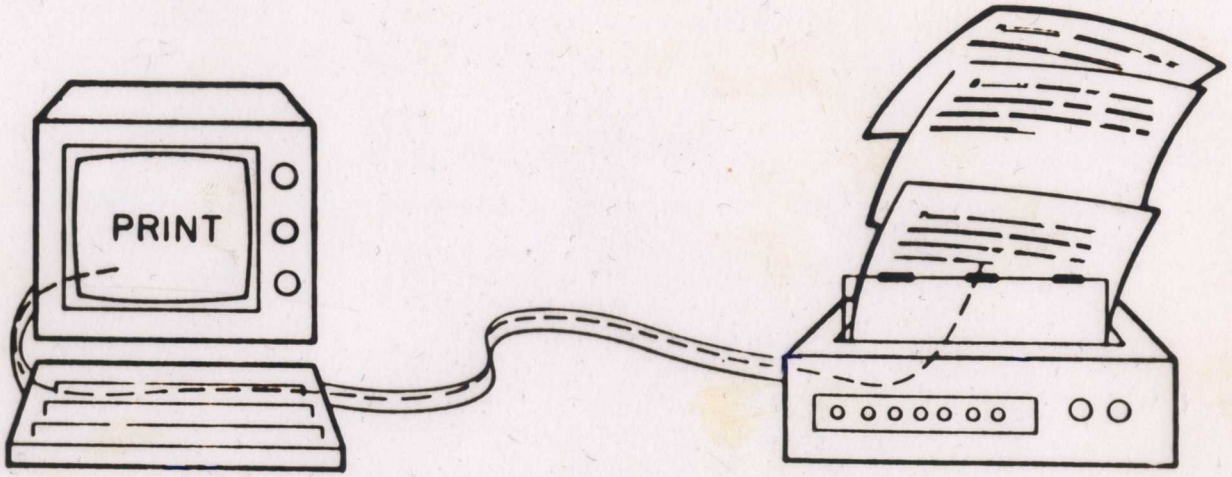
physical connection bet. 2 end users
+ communication bet. 2 end users

(despite differences
in speed
in format
in patterns of intermittency
despite errors of various types)

terminal user
or application program
or certain file



Connectivity lets a device transmit data to another device.

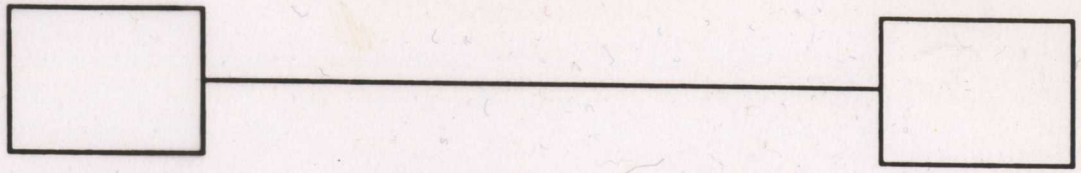


Interoperability lets a device *communicate* with another device.

Connectivity versus Interoperability

SIMPLE LINK CONNECTION

Processor-Based Resource
user terminal
H/W resource
host
application



Processor-Based Resource
user terminal
H/W resource
host
application

Requirements

1 - Establish physical link bet source and destination — *physical connection*

2 - Detect errors (due to transmission) & correct them (if possible)
3 - Adjust flow rate over link (user & printer are slow host & application are fast) — *bits are exchanged entirely without error*

4 - Indicate start of message & its end
Indicate start of submessage (e.g. characters) & its end — *organized exchange of information*

5 - Resolve differences in information format on both sides — *understandable exchange of information*

6 - Allow activation of functions at destination & reception of destination responses by source — *process-to-process communication*

CONNECTIVITY

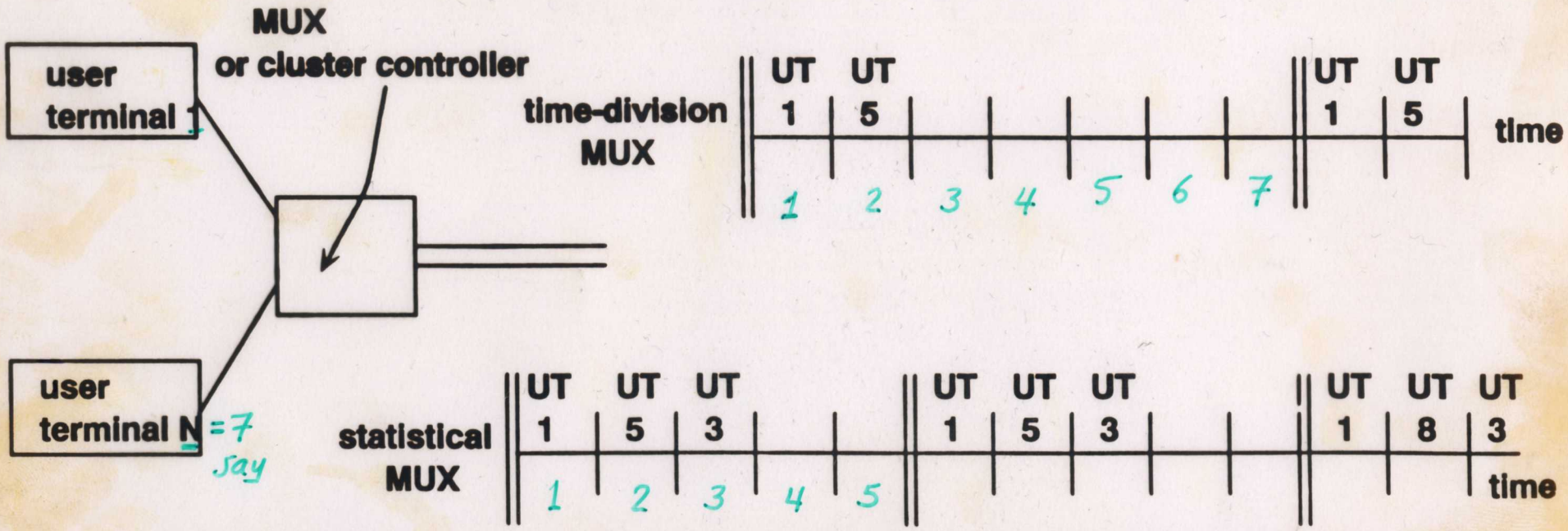
INTEROPERABILITY

ENHANCED LINK CONNECTION

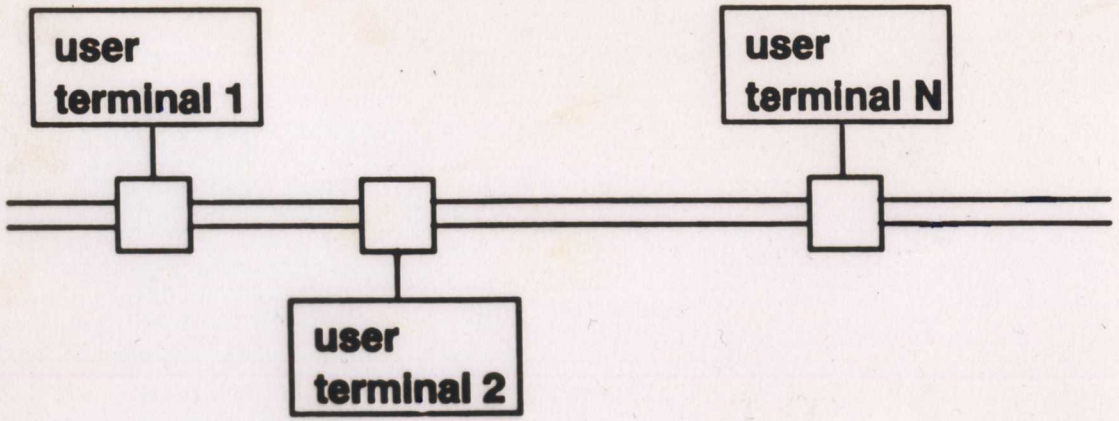
Some processes (e.g. user terminal) have intermittent ("bursty") traffic

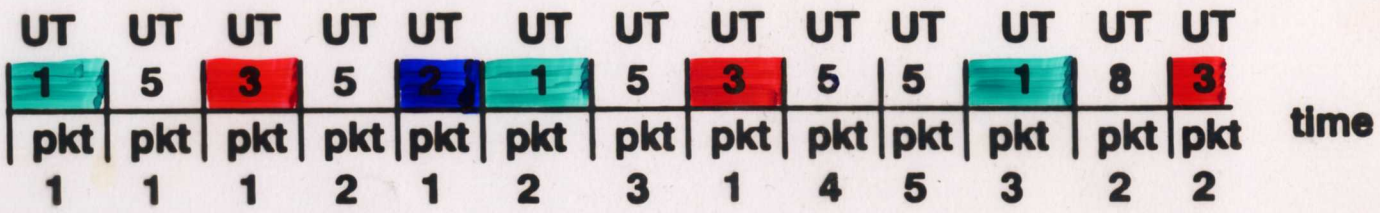
====> need for economical sharing of communication resources

use of dial-up lines — ***use of fast circuit switching*** — ***use of packet switching***



CIRCUIT SWITCHING **same time slot is reserved for same UT until complete message is sent**





PACKET SWITCHING **segments of a message are transmitted as separate entities**

Requirement

Assign address to each process connected to the shared link

MULTIPLE LINK CONNECTION

If source and destination nodes are far apart,

THEN connection is via several links & one (or more) intermediate nodes exist between source and destination

==> each link should carry traffic exchanged bet. *several* sources and destinations
(for economical sharing of resources)

& *packet switching increases the benefit still further*

a number of routes may exist bet. a given source and destination, depending on topology of network
(is preferred for reliability & availability reasons)

==> a suitable route has to be chosen

Requirements

1 - Determine a route *for interconnecting* a source to a destination

2 - Select one (out of several) routes, *in case of multiple routing*

3 - Switch from one route to another, *in case of congestion and/or link/node failure*

4 - Adjust flow rate into intermediate nodes, *to reduce network congestion*

REQUIREMENTS FOR COMPUTER INTERCONNECTION

1 - To provide a physical transmission path bet. processes

2 - To transfer bits bet. source and destination in whole and without errors

3 - To share communication resources efficiently

4 - To send messages to correct node and correct subaddress within node.

5 - To bypass failed line or node.

6 - To resolve mismatch bet. actual & accommodatable flow rates

7 - To accommodate end user intermittancy pattern

8 - To accommodate end user format, code and language requirements

9 - To perform the job (application), for which the connection is made.