Lecture 3

Overview of Computer Networks (continued)

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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

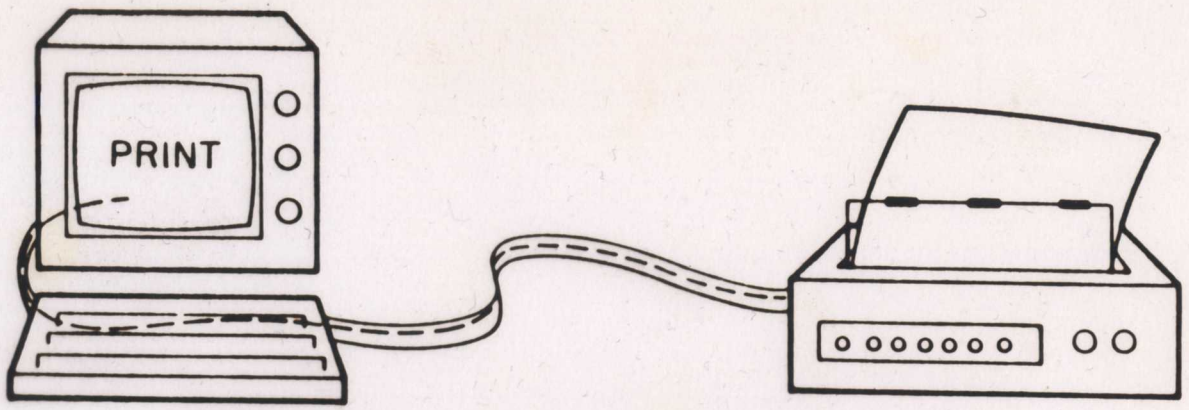
Basic function of a computer network is

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

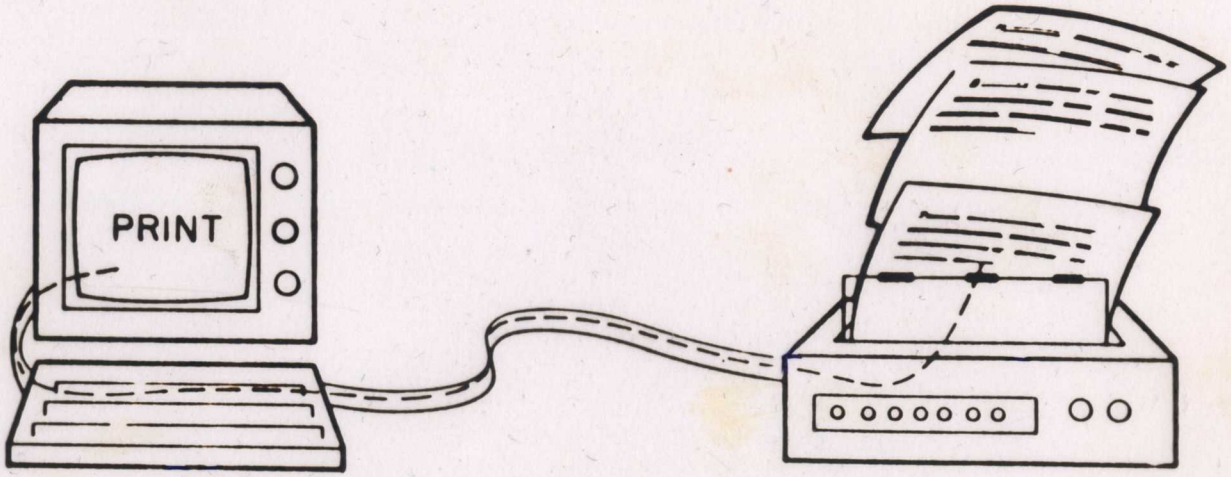
physical connection bet. 2 end users
+ communication bet. 2 end users

terminal user
or application program
or certain file

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



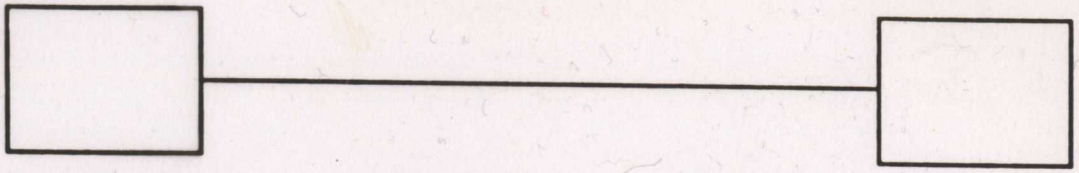
Connectivity lets a device transmit data to another device.



Interoperability lets a device *communicate* with another device.

Connectivity versus Interoperability

SIMPLE LINK CONNECTION



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

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user terminal
H/W resource
host
application

Requirements

- **Establish physical link bet source and destination** — *physical connection*
- **Detect errors (due to transmission) & correct them (if possible)** — *bits are exchanged entirely without error*
- **Adjust flow rate over link (user & printer are slow host & application are fast)** — *bits are exchanged entirely without error*
- **Indicate start of message & its end**
  Indicate start of submessage (e.g. characters) & its end — *organized exchange of information*
- **Resolve differences in information format on both sides** — *understandable exchange of information*
- **Allow activation of functions at destination & reception of destination responses by source** — *process-to-process communication*

CONNECTIVITY

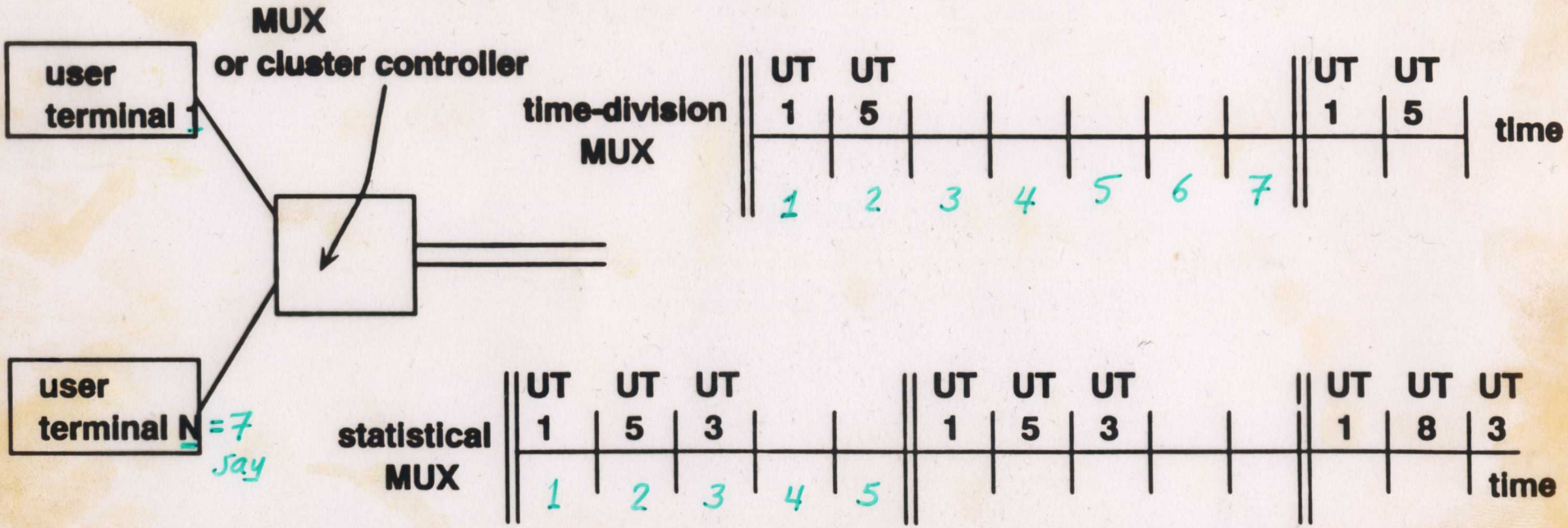
INTEROPERABILITY

ENHANCED LINK CONNECTION

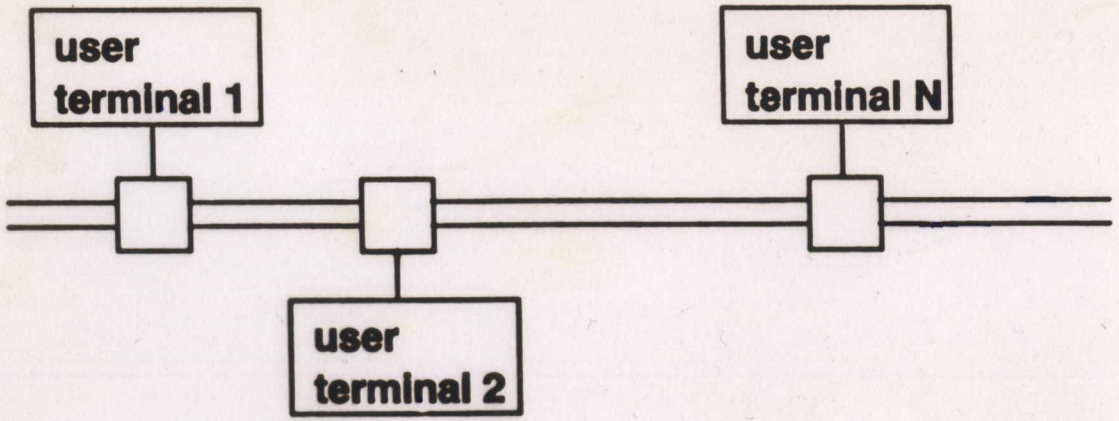
Some processes (e.g. user terminal) have intermittent ("bursty") traffic

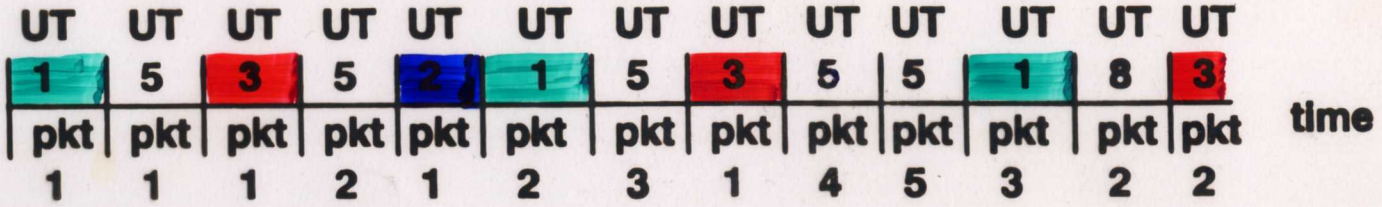
====> need for economical sharing of communication resources

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.