Switching

- Topologies are impractical and wasteful when applied to large networks.

Reasons:

1) Majority of links would be idle
2) Number and length of links require heavy infrastructure.
3) Not Cost Effective.

Switched Network → series of interlinked nodes, called switches.

↓

Can create temporary connections between 2/more devices linked to switch

---

* Switching is a better solution than topologies. We would have a switched Network.

Switching: Methods → Circuit Switching

↓ ↳

1) Circuit Switching:

- Each link divided into 'n' channels by using FDM / TDM.

what are the phases? → setup phase
data-transfer phase
tear down -11-

what happens in setup phase?

- Dedicated circuit has to be established for 2 parties to communicate.
- Connection setup means establishing dedicated channels between switches.

What happens in data transfer phase?
—— -11- teardown phase?

Data transfer phase issues:

1) Delay
   1) Propogation time
   2) Request signal time transfer
   3) propogation of acknoledgement from destn
   4) transfer time of acknowledgement.

2) Efficiency:
   - Inefficient as connection has dedicated resources till tear down.

Packet Switching:

- Message divided into fixed (default) or variable size
- No resource allocation (bandwidth, etc) in advanced, allocation done in FCFS.

Datagram Networks

- Datagram switching done on Network Layer.

- Each Packet treated independently of others.
- Packets here referred as datagrams.

→ Datagrams may arrive out of order at destination, packets might be lost as well. Upper layer takes care of synchronization.

→ Routing Tables:

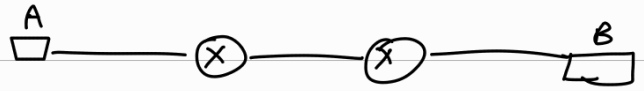
→ Each switch has Routing table, based on destination address.
→ table has destination port and corresponding output port.

Issues:

1) Delay (for ppt diagram.

Total Delay = $3T + 3\tau + w_1 + w_2$

w_1, w_2 → waiting times
T → Transmission Time
τ → Propogation Delay.



2) Efficiency:

- Resources allocated only when packets are to be transferred.

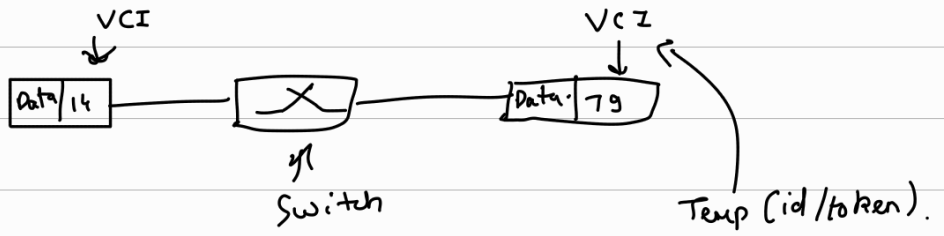
Virtual Circuit Network:

Fig 8.10 VCN

- Cross between, circuit switched & datagram.
  Normally implemented in data link layer.

Virtual Circuit Identifier:

- When frame arrives at switch with VCI, it's VCI changes.



* Switching in TCP/IP

Physical → Only circuit switching. No packets exchanged.

Data link → done using virtual-circuit approach

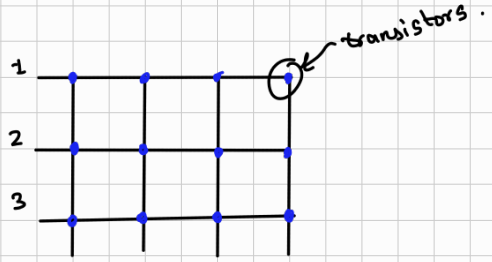
Network layer → either virtual circuit approach / datagram approach

Application layer → Only message switching.

- Structure of switch:

① Cross Bar Switch

- n inputs to m outputs in a grid using electronic microswitches (transistors) at each crosspoint
- Only 1 cross point active at a time



Disadvantage:
- High hardware cost

② Multistage switch

N - Number of input lines. (*)

k - no. of crossbar in middle stage (*)

Total crosspoints = $2kN + k\left(\frac{N}{n}\right)^2$

$k = 4$

$n = 20$

$N = 200$

crosspoints = $2 \times 4 \times 200 + 4\left(\frac{200}{20}\right)^2$

$= 1600 + 4(10)^2$

$= 1600 + 400$

$= 2000$

for single stage switch there would be,
$200 \cdot 200 = 40000$ crosspoints.

First stage we have $\frac{N}{n}$ i.e. 10 crossbars

Second stage we have 4 crossbars

Third stage we have 10 crossbars.

¥ CLOS criteria

In a non blocking switch, number of middle stage switches must be at least $2n-1$.