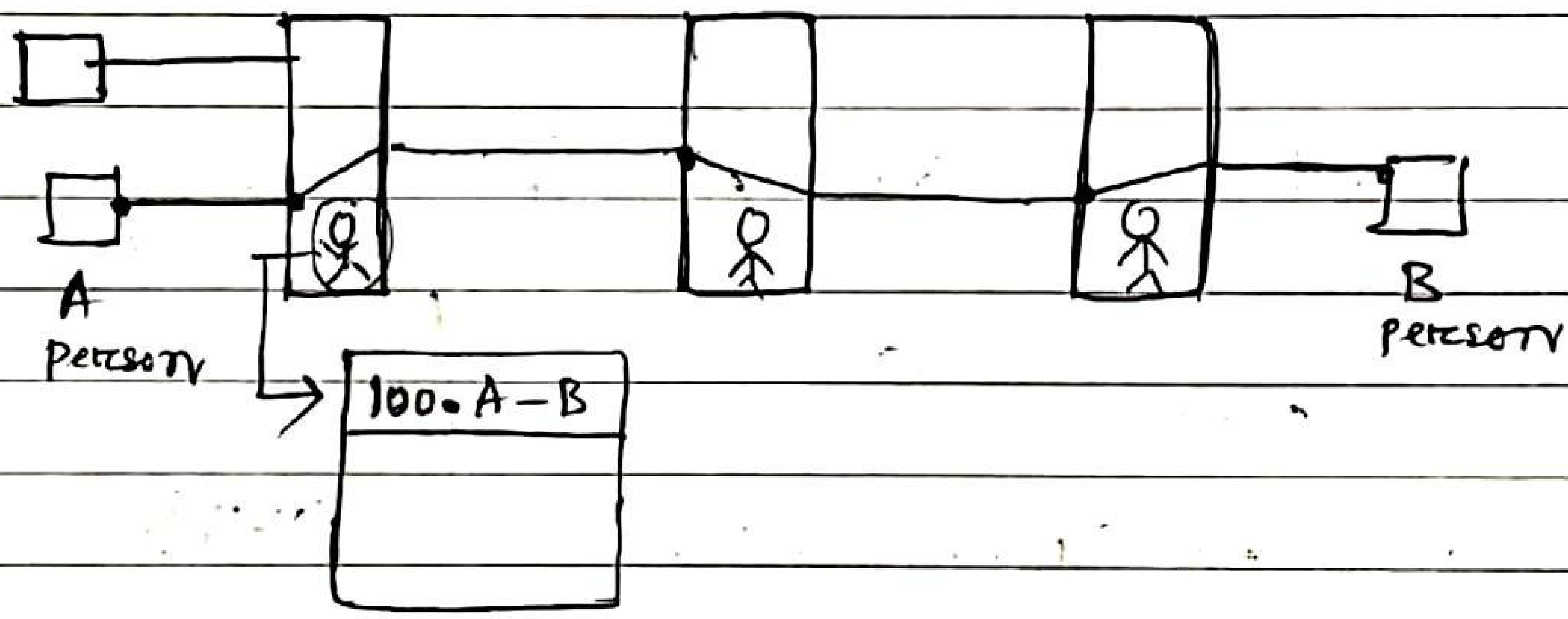
Switching

- ~~SS~~ Swithing
  - Circuit switching
  - Packet switching
    - virtual switching
    - Datagram
  - message switching

Circuit switching -



M-Message, BW, x-hop, d-each hop distance, v- velocity.

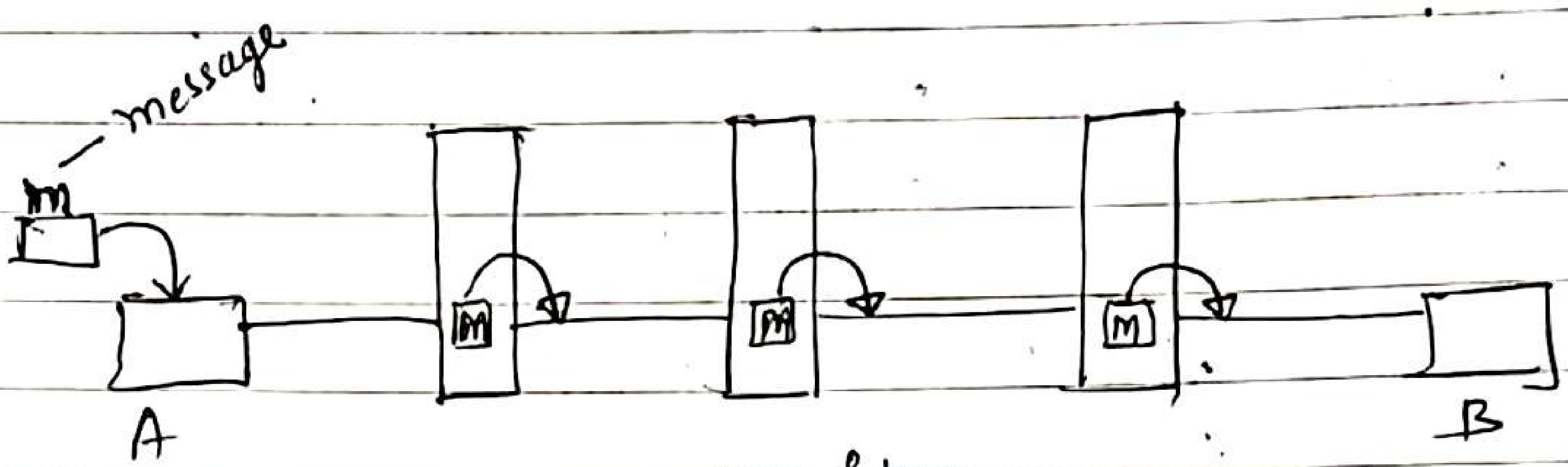
Total time to transfer a message,

$$TT = \text{setup time} + \underbrace{\frac{M}{B}}_{T_t} + \underbrace{\frac{xd}{v}}_{T_P} + \text{Tear down}$$

T_t - Transition time T_P - Propagation delay time.

(1) no Headers required. (Which direction to go)
(2) No reordering.
(3) It is applied at physical layer.
(4) It is Obsolete (no one use it now).

packet Switching -



$M, B, \overset{\text{no of hops}}{x}, d, V$

$$TT = \underbrace{x * \frac{M}{B}}_{T_t} + \underbrace{\frac{xd}{V}}_{T_p}$$

* Difference b/w circuit switching and packet switching.

	CS	PS
extra time →	Setup time + Teardown	$(x-1)\frac{W}{B}$
if message size is Big then →	best	not best.
size of message small →	not best	best.

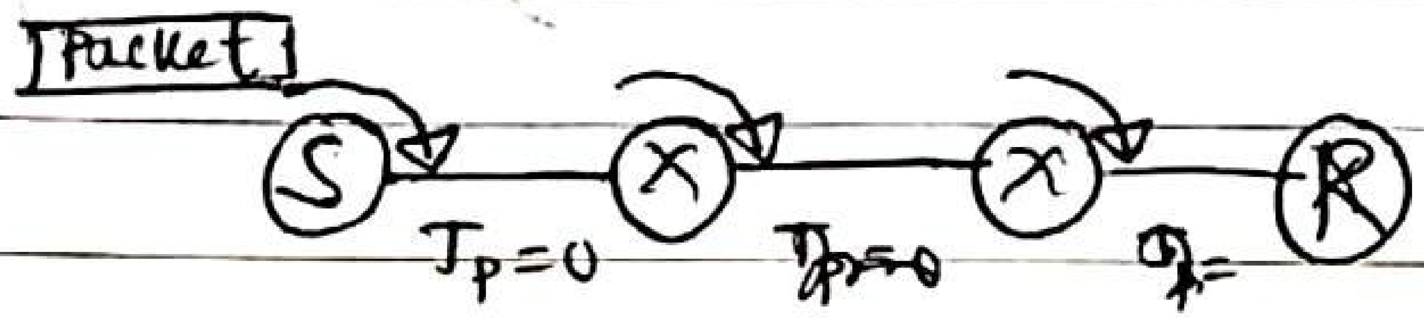
EX: Data = 1000 Bytes.

BW = 1 MBPS.

$= 10^6$ BPS

Header = 100 Byte

total time to ~~transmit~~ send data S to R.



$\Rightarrow$

Packet size = 1000 + Header
(PS)

$= 1000 + 100$

$= 1100$ B

$T_t = \frac{PS}{B} = 1.1$ msec → transmission time to send one packet.

$TT = 3 * T_t + T_p$

$= 3 * \frac{PS}{BW} + 0$

$= 3 * \frac{1100 B}{10^6} = \boxed{3.3 \text{ msec}}$ → time taken to send Data ~~one packet.~~ S to R

When,

No. of packet = 5

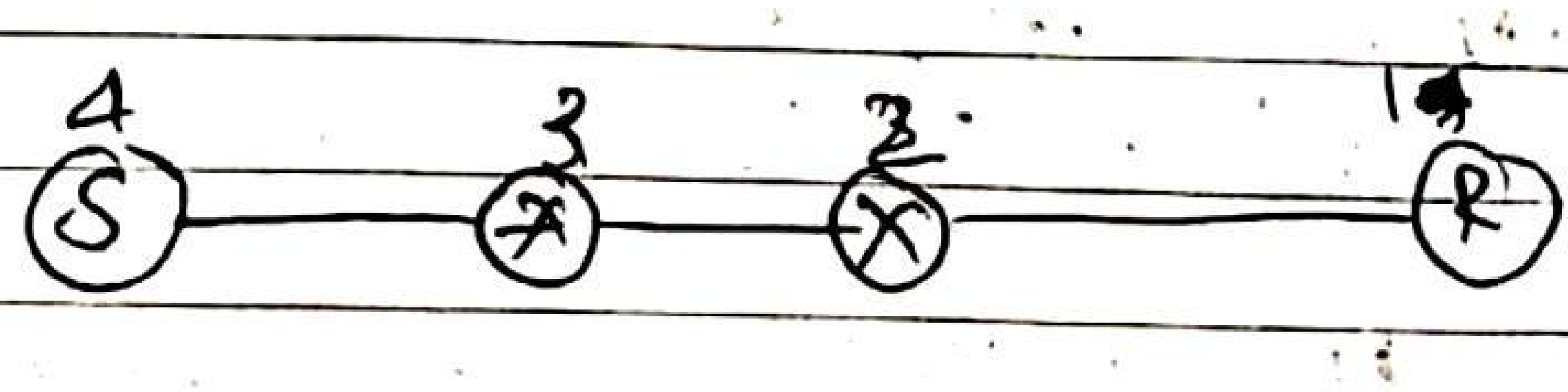
Data per packet $= \frac{1000}{5} = 200$ Bytes.

BW = 1MBPS

Header = 100 B

$\Rightarrow$ Packet size = 200 + 100 = 300 Bytes

$T_t = \frac{PS}{B} = \frac{300}{10^6} = 0.3$ mSec → transmission time for one packet.



applyed pipelining -

I packet time taken $= 3 * T_t = 3 * 0.3$
$= 0.9$ msec

4 " " " $= \cancel{9} * T_t = 4 * 0.3$
$=$ ~~[illegible]~~
1.2 msec

$TT = 0.9 + 1.2$
$=$ 2.1 msec
↳ time taken to send data S to R.

Ex:
packet $= 10$
Data per packet $= \frac{1000}{10} = 100B$

$\frac{2}{10000}$

Packet size $= 100 + 100 = 200B$

pipeling applyed -
I packet $= 3 * T_t = 3 * \frac{200}{10^6} = 0.6$ msec

9 " $= 9 * T_t = 9 * 0.2 = 1.8$ msec

$TT = (0.6 + 1.8)$ msec
$=$ 2.4 msec

$\frac{150}{1000000}$
1.5

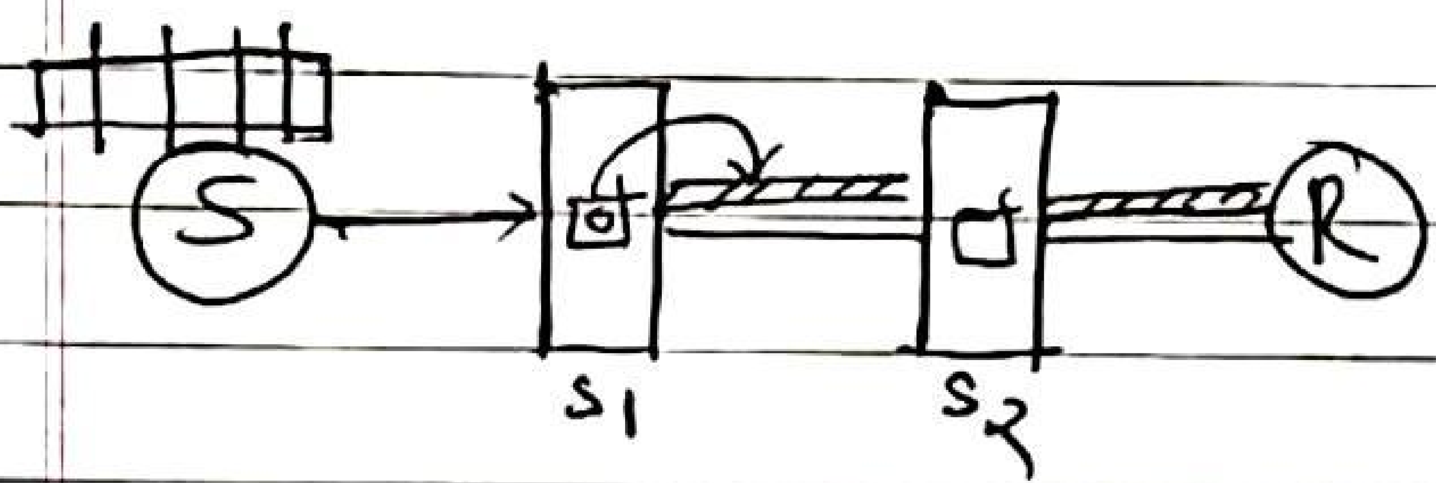
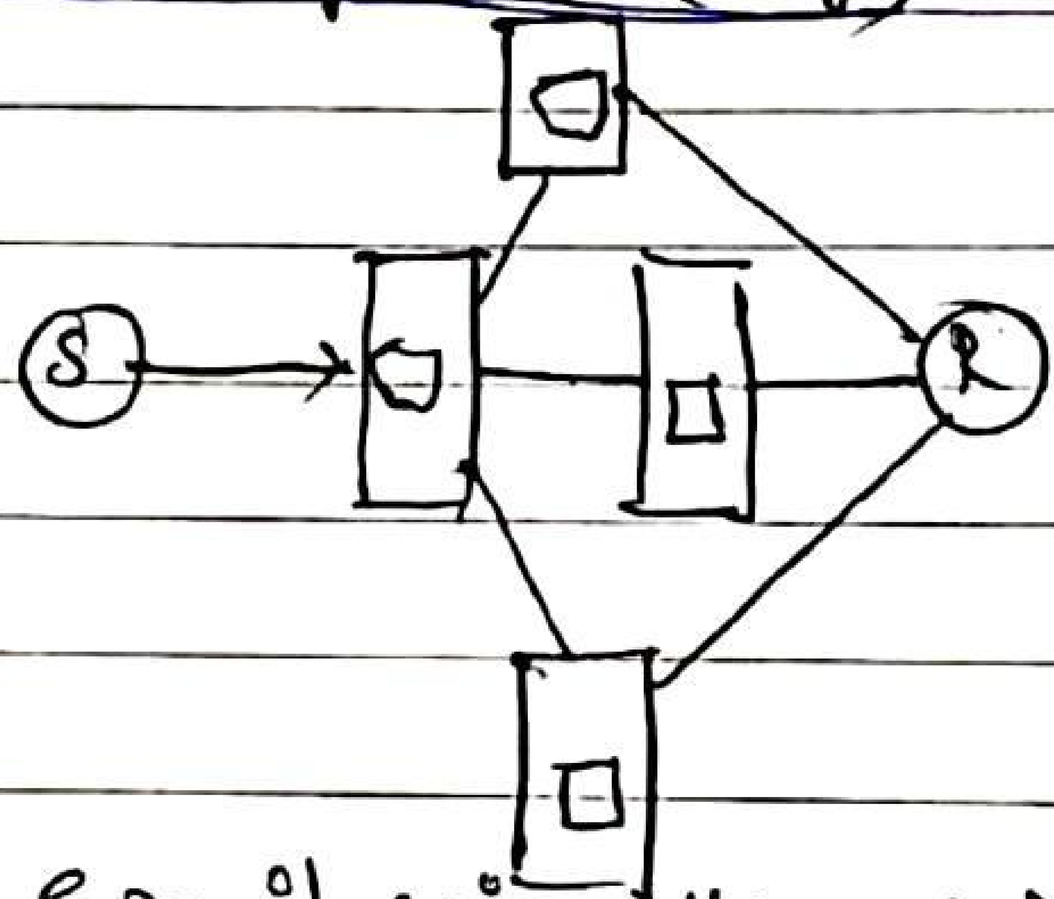
Ex: packet $= 20$, Data per packet $= 50B$
ps $= 150B$
Pipleling applyed -
I packet $= 3 * T_t = 3 * \frac{150}{10^6} = 0.15$ msec $\times 3$
$= 0.45$ msec

19 " $= 19 * T_t = 19 * 0.15 = 2.85$ msec

$$TT = (0.45 + 2.85)\ msec$$
$$= 3.30\ msec$$

D=1000 Data divide into no. of packets

	* no. of packet	Pipelelining	Total time (TT)
$\frac{1000}{1}$	1	NO	3.3 msec
$\frac{1000}{5}$	✓ 5	Yes	2.1 "
$\frac{1000}{10}$	10	Yes	2.4 "
$\frac{1000}{20}$	20	Yes	3.30 "

	Virtual circuit (VC)	Datagram (Dg)
		
	→ Phone call going through VC.	→ e-mail going through Dg.
header:	→ 1^{st} packets, Global header req. Other ", local header req.	→ Headers req for all the packets.
connection:	→ Buffer, CPU, BW, Reserved so it is connection oriented.	→ NO reservation, so it is connection less.
	→ Same path → Inorder follow	→ may follow diff paths, out of order is possible.
	→ highly Reliable.	→ Not reliable.
	→ very costly.	→ not very costly.
	Ex: ATM network.	Ex: IP Network.