CS & IT ENGINEERING

COMPUTER NETWORKS

Flow control

Lecture No-1

By- Ankit Doyla Sir

Delay in computer Network

1. If the generator has more than one term and coefficient of x° is 1, all single bit error can be detected.
2. If a generator cannot divide $x^t + 1$ (t between 0 and n – 1) then all isolated Double error can be detected
3. A generator that contains a Factor of x + 1 and detect all odd numbered errors.

Bandwidth:

- Bandwidth represent the rate at which no. of bits placed on the link in one sec.

Velocity:

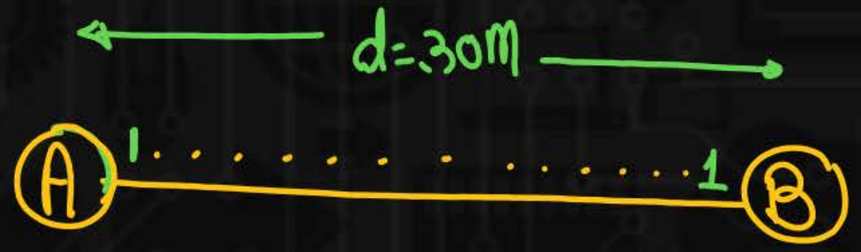
- Represent the rate, distance covered in one sec.

100 bits
Transfer
From A to B

B = 1bps = 1bits/sec
u = 10m/sec

Total time = 100sec + 3sec

Total time = 103 sec



data = 100 bits

B = 1 bits/sec

v = 10 m/sec

Delay in Computer Network

1. Transmission delay (T_d)
2. Propagative delay (P_d)
3. Queuing delay (Q_d)
4. Processing delay (P_{sd})

Transmission delay

: Amount of time taken to transfer a Packet on to the outgoing Link is called as Transmission delay.

(1)

Packet size = 1000 bits

Bandwidth = 2bPS = 2 bits/sec

$$\text{Transmission delay} = \frac{1000 \text{ bits}}{2 \text{ bits/sec}}$$

Transmission delay = 500 sec

(2)

Packet size = 100 bits

Bandwidth = 10bPS = 10 bits/sec

$$\text{Transmission delay} = \frac{100 \text{ bits}}{10 \text{ bits/sec}}$$

Transmission delay = 10 sec

Transmission delay = $\frac{\text{Packet size or Length of Pkt}}{\text{Bandwidth}}$

$$T_d = \frac{L}{B}$$

① $L = 8000$ bits , $B = 8000$ bits/sec

$$T_d = \frac{L}{B} = \frac{8000 \text{ bits}}{8000 \text{ bits/sec}}$$

$$\boxed{T_d = 1 \text{ sec}}$$

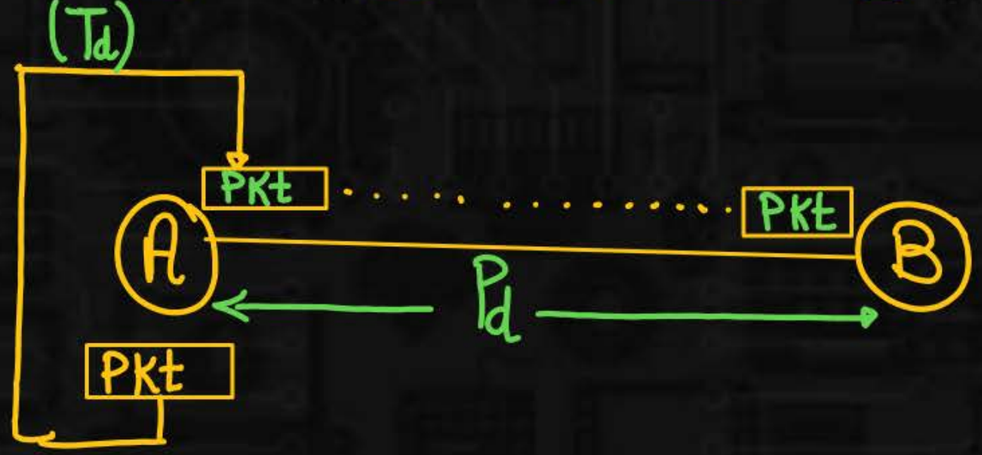
	Data	Bandwidth
K	$1024 (2^{10})$	10^3
M	$1024 * 1024 (2^{20})$	10^6
G	$1024 * 1024 * 1024 (2^{30})$	10^9

② $L = 8K$ bits , $B = 8$ KBPS $= 8K$ bits/sec

$$T_d = \frac{L}{B} = \frac{8 * 1024 \text{ bits}}{8 \times 10^3 \text{ bits/sec}} = \frac{8192 \text{ bits}}{8000 \text{ bits/sec}} = 1.024 \text{ sec}$$

Propagation delay

Amount of time taken to reach a packet from one point to another point is called as Propagation delay.



$u = 10\,m/sec$

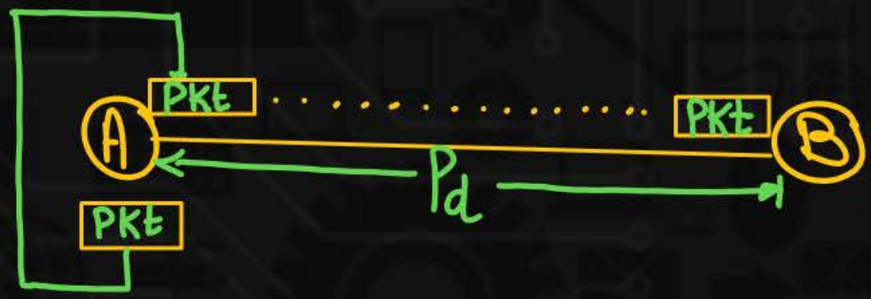
$$\text{Propagation delay} = \frac{50\,m}{10\,m/sec}$$

$$\text{Propagation delay} = 5\,sec$$

Propagation delay = $\frac{\text{distance}}{\text{Velocity}}$

$P_d = \frac{d}{v}$

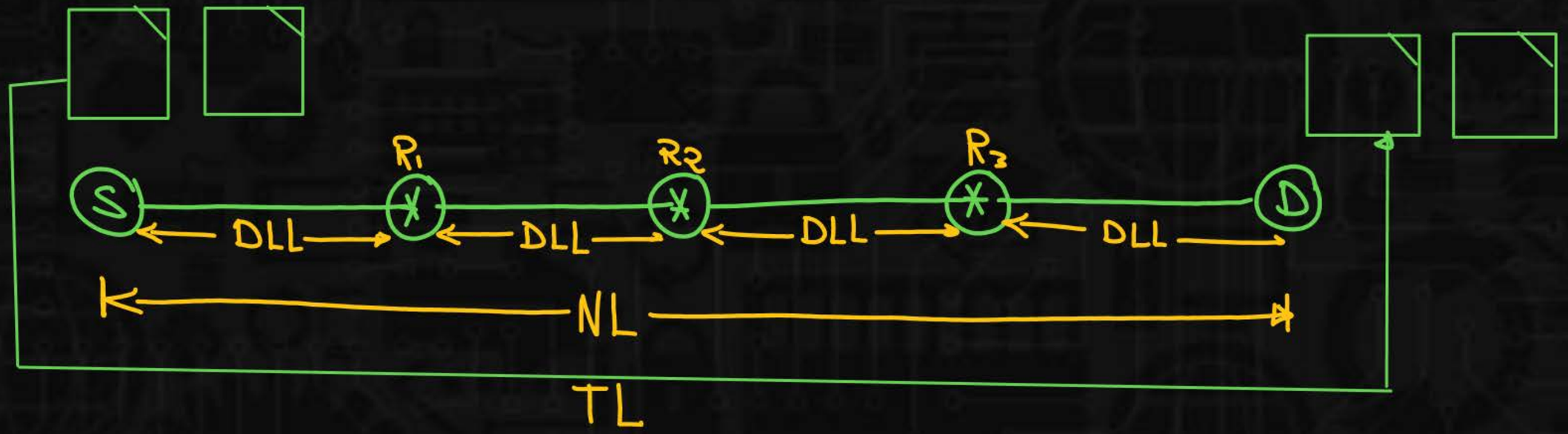
(T_d)



Total time taken to send a Packet From A to B = $T_d + P_d$

Queuing delay (Qd)

The amount of time packet will wait in the queue at a router before being taken up for processing is called as Queuing delay.



DLL → Node to Node
or
Hop to Hop

NL → source Host to destination Host

TL → Process to process
or
end to end

DLL → MAC Add or Physical Add → 48 bit

NL → IP Add or Logical Add → 32 bit

TL → Port No. or service → 16 bit
Point
Address

OSI Layer

⇓

7 Layer's

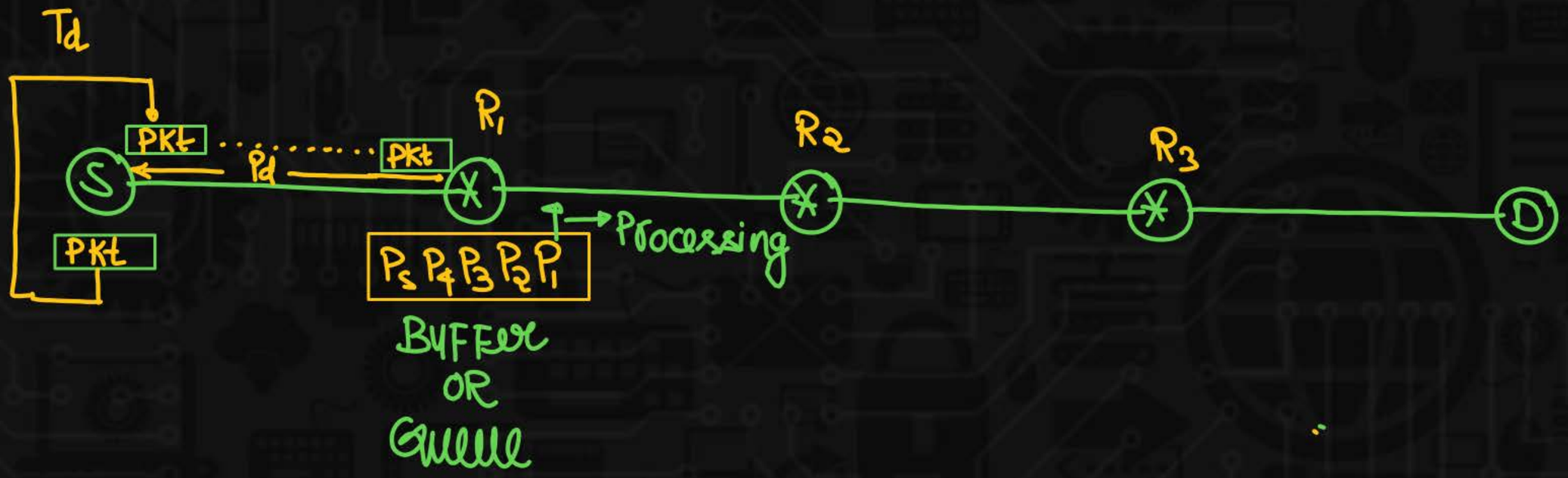
Application Layer
Presentation Layer
Session Layer
Transport Layer (TL)
Network Layer (NL)
Data Link Layer (DL)
Physical Layer (PL)

TCP/IP

⇓

5 Layers

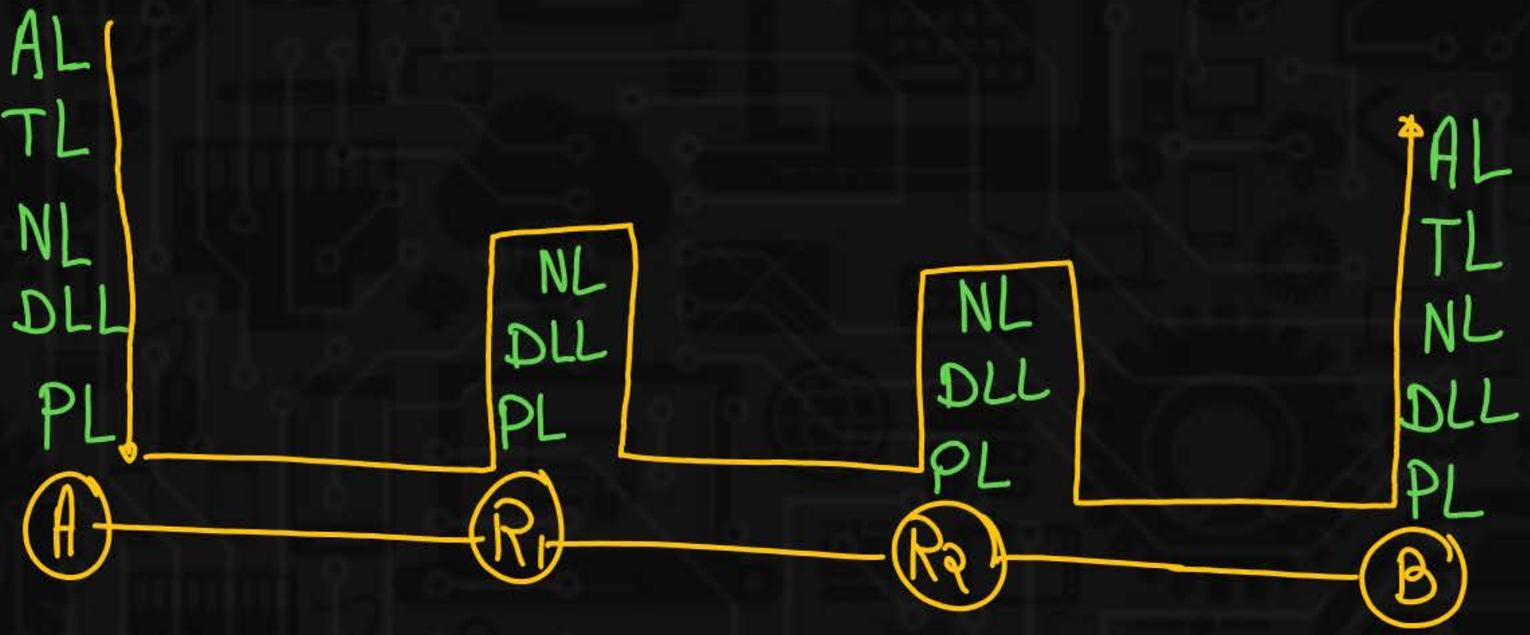
Application Layer
Transport Layer
Network Layer
Data Link layer
Physical Layer


Td
PKt
PKt
PKt
Pd
S
R1
R2
R3
D
Processing
P5 P4 P3 P2 P1
BUFFER
OR
QUEUE


Raju
Munni
Geeta
Reena
Rani

Processing delay

Processing delay is the time required for a router or a destination host to receive packet from its input port, remove the header, perform an error detection procedure, and deliver the packet to the out Port (in case of Router) or deliver the Packet to upper Layer Protocal (in case of Destination Host)


AL
TL
NL
DLL
PL
NL
DLL
PL
NL
DLL
PL
AL
TL
NL
DLL
PL
A
R1
R2
B

Problem Solving
on
Delay in Computer Network

Q.1 If the packet size is 1 KB and channel capacity is 10^9 bits/sec, what is the transmission time ?

A. 6 μs

B. 10 μs

C. 8 μs ✓

D. Cannot be calculated

Packet size (L) = 1KB = 1024 Byte = 1024 * 8 bits
= 8192 bits

Bandwidth (B) = 10^9 bits/sec

$$T_d = \frac{L}{B} = \frac{8192 \text{ bits}}{10^9 \text{ bits/sec}}$$

$$= \frac{8192}{10^3 * 10^6 \text{ sec}}$$

$$= 8.192 * 10^{-6} \text{ sec}$$

$\simeq 8$ μsec

Q.2

Consider two hosts X and Y, connected by a single direct link of rate 10^6 bits/sec. The distance between the two hosts is 10,000 km and the propagation speed along the link is 2×10^8 m/sec. Host X send a file of 50,000 bytes as one large message to host Y continuously. Let the transmission and propagation delay be p millisecond and q milliseconds, respectively. Then the value of p and q are.

Gate-2017 (2M)

$B = 10^6$ bits/sec , $d = 10{,}000$ km

$v = 2*10^8$ m/sec $= 2*10^5$ km/sec , Packet size (L) $= 50{,}000$ Byte $= 8*50{,}000$ bits $= 4{,}00000$ bits

$T_d(P) = \frac{L}{B} = \frac{4{,}00000 \text{ bits}}{10^6 \text{ bits/sec}}$

$= 400*10^{-3}$ sec

$= 400$ msec

(A) p = 50 and q = 100

(B) p = 50 and q = 400

(C) p = 100 and q = 50

(D) ✓ p = 400 and q = 50

$$P_d(2) = \frac{d}{v}$$

So

$$= \frac{10{,}000\ \text{km}}{2 \times 10^5\ \text{km/sec}}$$

$$= 50 \times 10^{-3}\ \text{sec}$$

$$\boxed{2 = 50\ \text{m/sec}}$$

Q.3

Consider two computers, X and Y connected via a single Bandwidth 512 Gbps. Suppose that both hosts are separated by distance M meters, and the propagation delay along the link is 2×10^9 meter/sec. Computer X has to send a packet of size 1 Kbyte to computer Y. What will be the distance M such that the delay in propagation is equal to the delay in transmission ?

$B = 512 * 10^9$ bits/sec , distance = 'M' mtr

$v = 2 * 10^9$ M/sec , $L = 1\,KB = 1024\,Byte = 8 * 1024$ bits

A 35 meter

B 34 meter

C 33 meter

D ✓ 32 meter

$$P_d = T_d$$

$$\frac{d}{v} = \frac{L}{B}$$

$$\frac{M}{2*10^9 \text{ M/sec}} = \frac{8*1024 \text{ bits}}{512*10^9 \text{ bits/sec}}$$

$$M = \frac{8*1024*2*10^9}{512*10^9} \text{ Mtr}$$

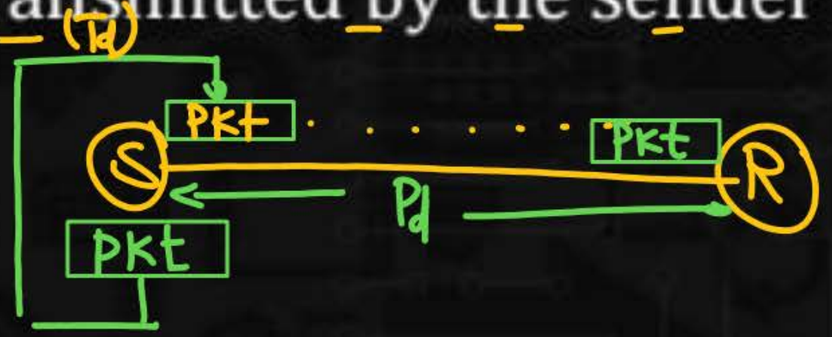
$$M = 32 \text{ Mtr}$$

Q.4

Consider a 100 Mbps link between an earth station(sender) and a satellite (receiver) at an altitude of 2100 km. The signal propagates at a speed of 3×10^8 m/s. The time taken

(in milliseconds, rounded off to two decimal places) for the receiver to completely receive a packet of 1000 bytes transmitted by the sender is 7.08.

GATE 2022 (2M)



Total time From sender to Receiver
$= T_d + P_d$
$= .08 + 7 = 7.08$ msec

$d = 2100$ KM, $v = 3 * 10^8$ m/sec
$= 3 * 10^5$ km/sec

Packet size = 1000 Byte = 8000 bits

$B = 100$ Mbps $= 100 * 10^6$ bits/sec
$= 10^8$ bits/sec

$$T_d = \frac{L}{B}$$

$$= \frac{8000 \text{ bits}}{10^8 \text{ bits/sec}}$$

$$= 8 * 10^{-5} \text{ sec}$$

$$= .08 * 10^{-3} \text{ sec}$$

$$= .08 \text{ msec}$$

$$P_d = \frac{d}{v} = \frac{2700 \text{ km}}{8 * 10^5 \text{ km/sec}}$$

$$= 7 * 10^{-3} \text{ sec} = 7 \text{ msec}$$

Q.5

Which of the following delay is faced by the packet in travelling from one end system to another?

A. Propagation delay

B. Queuing delay

C. Transmission delay

D. All of the mentioned


THANK YOU
GW
SOLDIERS !