



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT401 COMPUTER NETWORKS
II YEAR /IV SEMESTER

Unit 1- INTRODUCTION AND PHYSICAL LAYER
Topic 3 and 4:Network types - Performance



Computer Networks Types



Local Area Networks (LANs)

Network of computers located in a single location, like a home, school, or office building

Can share connection with other LANs and with the internet

Wide Area Networks (WANs)

Long distances

Provide connectivity over large areas

Metropolitan Area Networks (MANs)

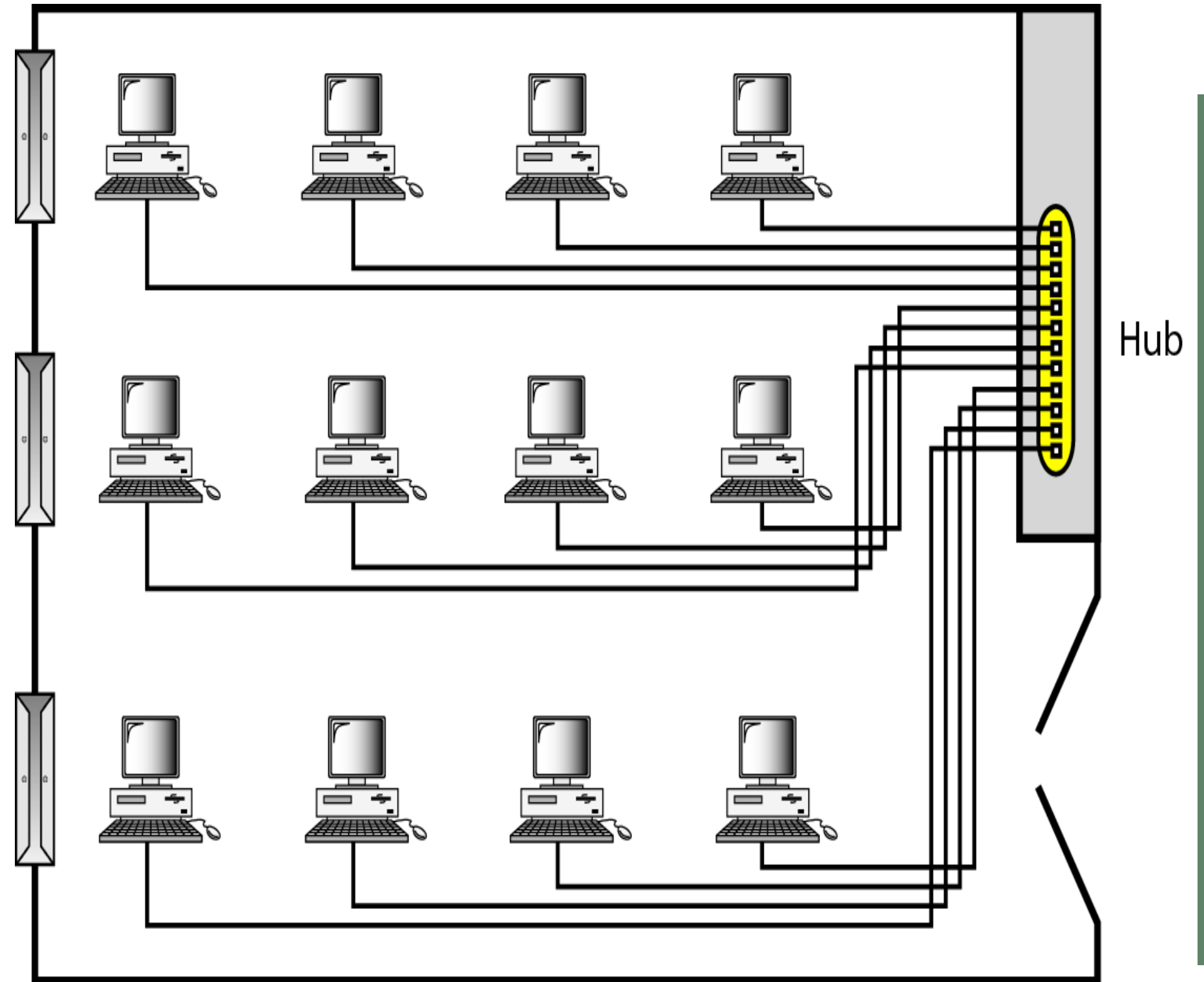
Provide connectivity over areas such as a city, a campus

Network Types - LAN

- ✓ LAN's will be either wired or wireless. Twisted pair, coax or fiber optic cable will be utilized in wired LAN's.
- ✓ Every LAN uses a protocol –a set of rules that governs, however, packets are designed and transmitted.
- ✓ LANs are capable of terribly high transmission rates (100s Mb/s to G b/s).
- ✓ Nodes in a LAN are joined at the side of an exact topology.

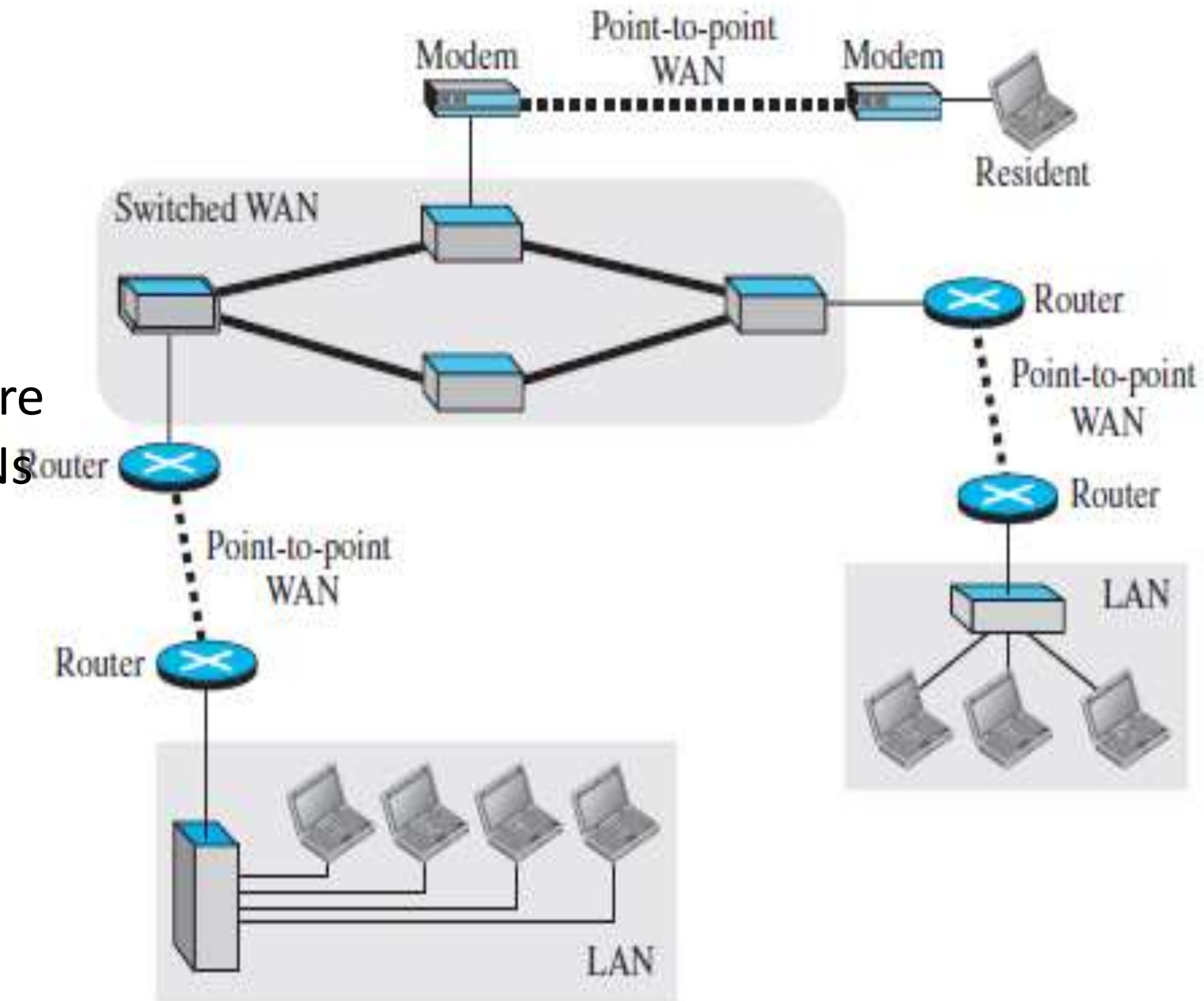
The topologies included are

1. Bus
2. Ring
3. Star



Computer Networks Types - WAN

- ✓ Network over a large area like a city, a country, or multiple countries
 - ✓ Connects multiple LANs together
- ✓ Generally utilizes different and much more expensive networking equipment than LANs
- ✓ The internet is the most popular WAN



A heterogeneous network made of four WANs and three LANs



Computer Networks- Performance



In networking, we use the following terms related to Performance

- ✓ Bandwidth in hertz, refers to the range of frequencies in a composite signal or the range of frequencies that a channel can pass.
- ✓ Bandwidth in bits per second, refers to the speed of bit transmission in a channel or link. Often referred to as Capacity.
- ✓ The **throughput is a measure of how fast we can actually send data through a network.**

Imagine a highway designed to transmit 1000 cars per minute from one point to another. However, if there is congestion on the road, this figure may be reduced to 100 cars per minute. The bandwidth is 1000 cars per minute; the throughput is 100 cars per minute.



Performance



✓ Propagation speed - speed at which a bit travels through the medium from source to destination.

✓ Transmission speed - the speed at which all the bits in a message arrive at the destination.
(difference in arrival time of first and last bit)

✓ Propagation Delay = Distance/Propagation speed

✓ Transmission Delay = Message size/bandwidth bps

✓ Latency = Propagation delay + Transmission delay + Queueing time + Processing time

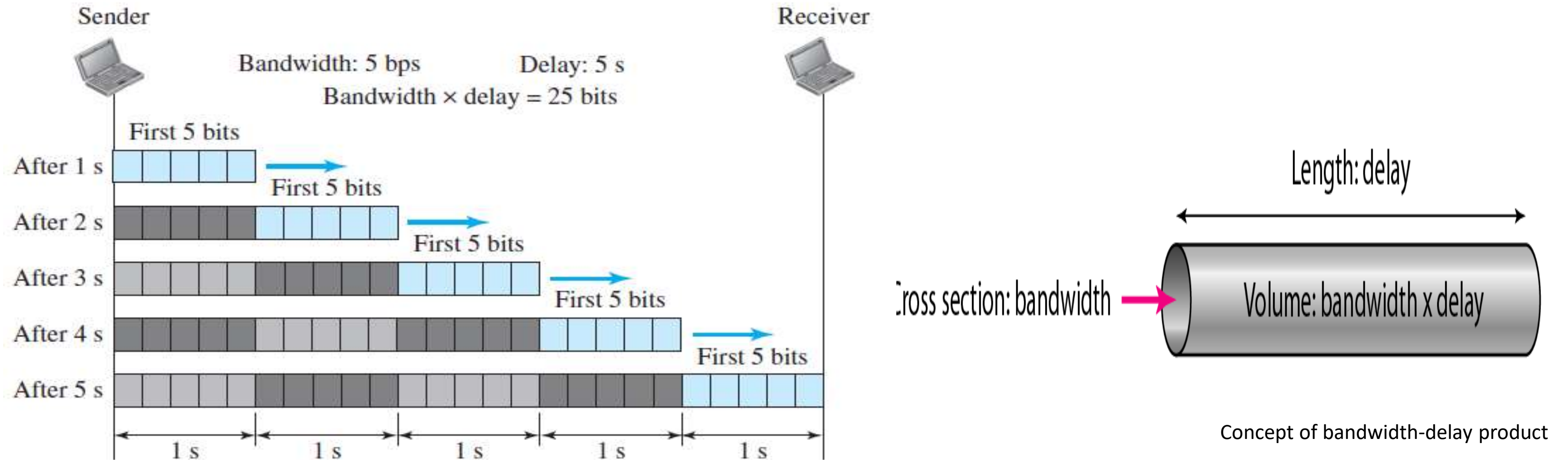
What are the propagation time and the transmission time for a 5-Mbyte message (an image) if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at 2.4×10^8 m/s.

$$\text{Propagation time} = \frac{12,000 \times 1000}{2.4 \times 10^8} = 50 \text{ ms}$$

$$\text{Transmission time} = \frac{5,000,000 \times 8}{10^6} = 40 \text{ s}$$

Performance

The bandwidth-delay product defines the number of bits that can fill the link.



Now assume we have a bandwidth of 5 bps. Figure 3.33 shows that there can be maximum $5 \times 5 = 25$ bits on the line. The reason is that, at each second, there are 5 bits on the line; the duration of each bit is 0.20 s.



Assessment



- a).What is BW?
- b) What is throughput?
- c) What is latency?
- d) What is propagation delay?





Reference



TEXT BOOKS

Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

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2. Andrew Tanenbaum, Computer Networks, Fifth Edition, Pearson (5th Edition) Education, 2013.
3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
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