

A has 5 bits to transmit to B
4.5km link
500kb/s data rate

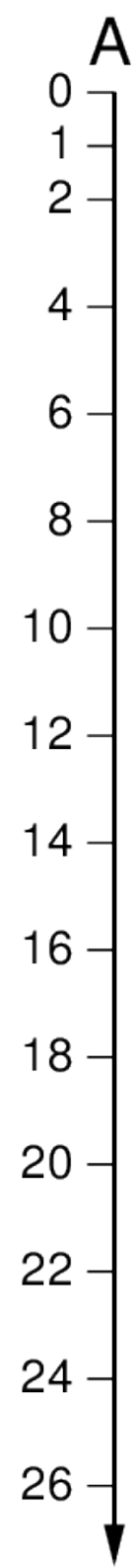
What is the total delay of delivering the information?

Two components of delay:

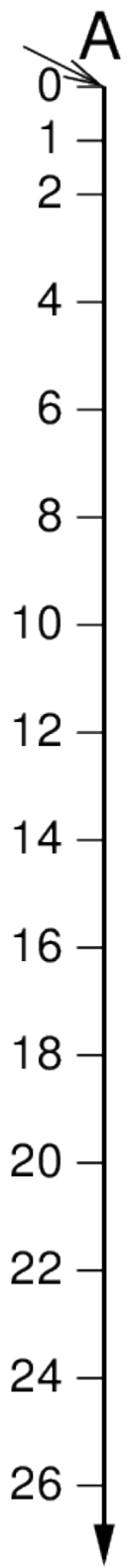
1. Transmission delay
2. Propagation delay

(Assume processing and queuing delays are very small, i.e. 0)

What is the transmission delay?



Start transmitting 1st bit



How long to transmit 1 bit?

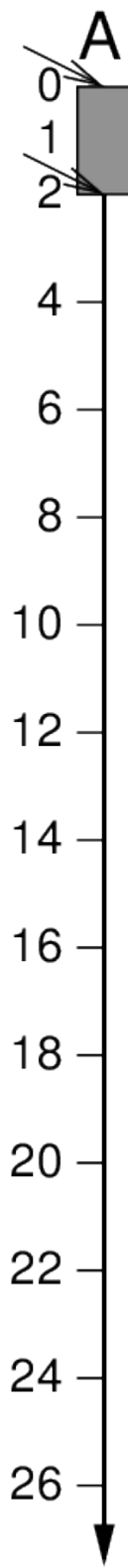
How long to transmit 1 bit?

Data rate is 500kb/s

Transmission time of 1 bit is 2 μ s

Start transmitting 1st bit

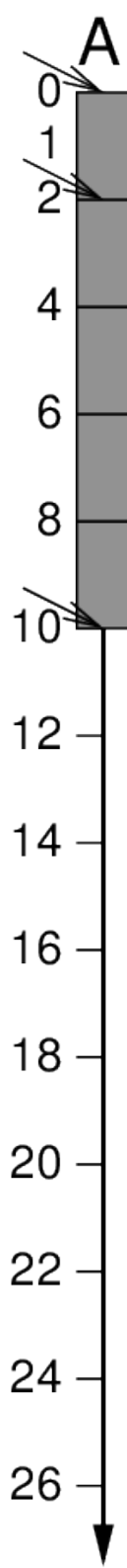
Finish transmitting 1st bit



Start transmitting 1st bit

Finish transmitting 1st bit

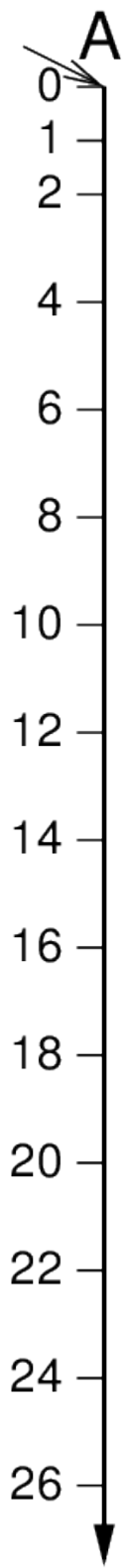
Finish transmitting 5th bit



Transmission delay is 10us

What is the propagation delay?

Start transmitting 1st bit

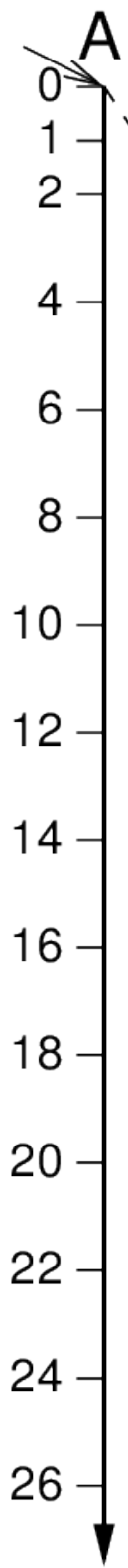


How long for signal to propagate from A to B?

How long for signal to propagate from A to B?

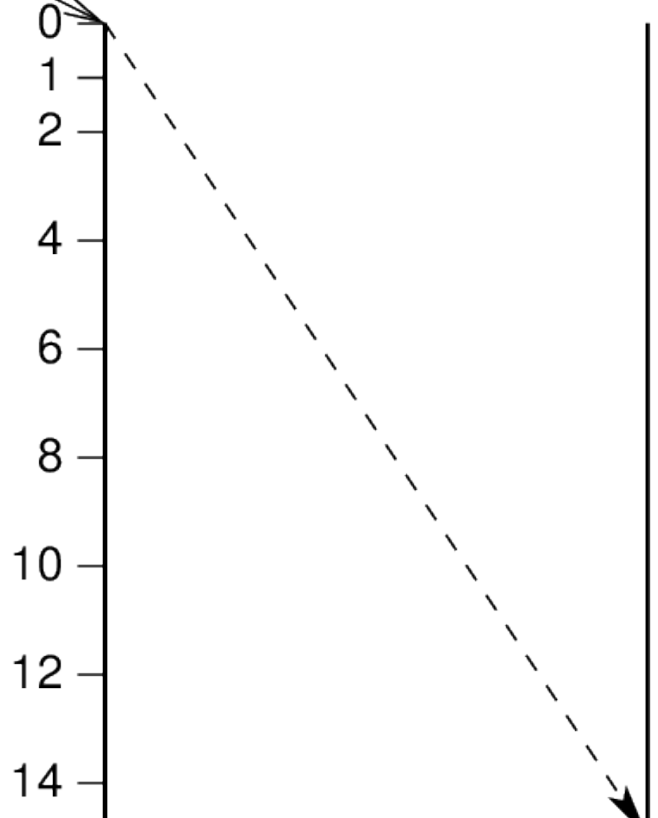
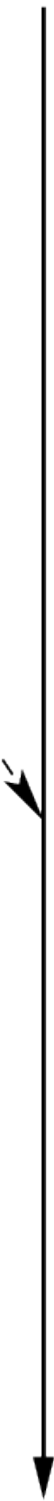
4.5km at 3×10^8 m/s is 15us

Start transmitting 1st bit



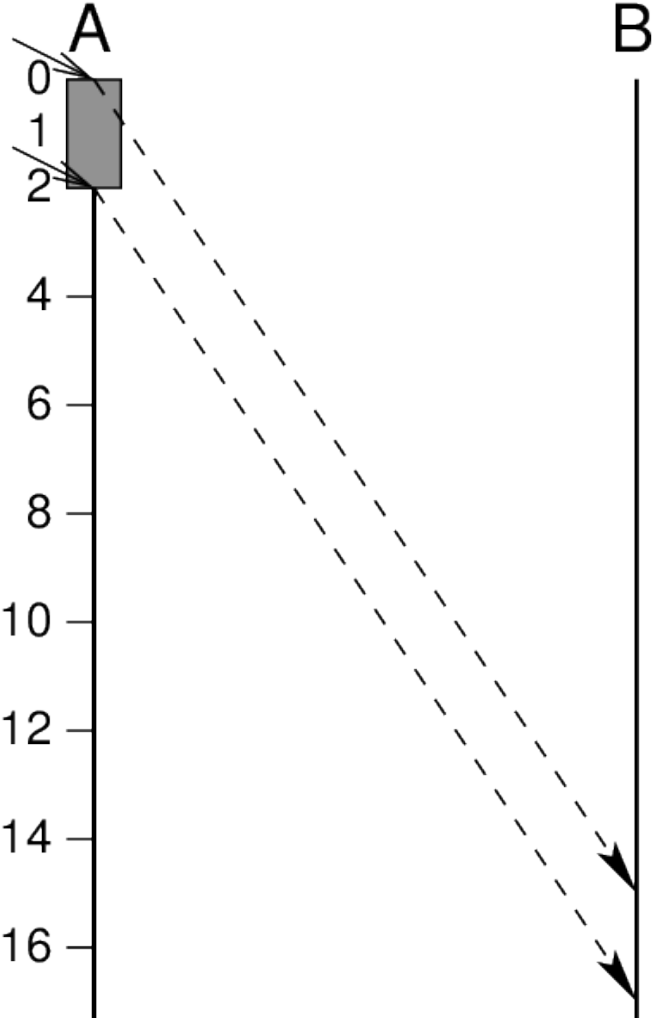
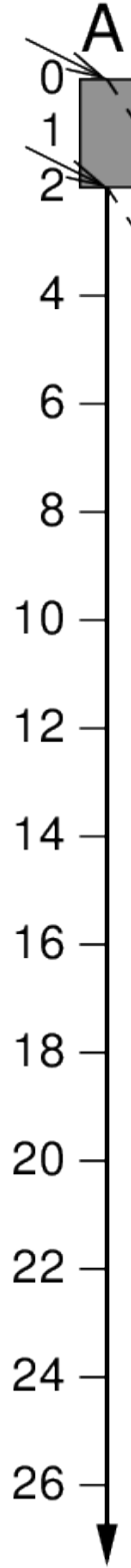
A

B



Start of signal representing
1st bit is received

Start transmitting 1st bit
Finish transmitting 1st bit

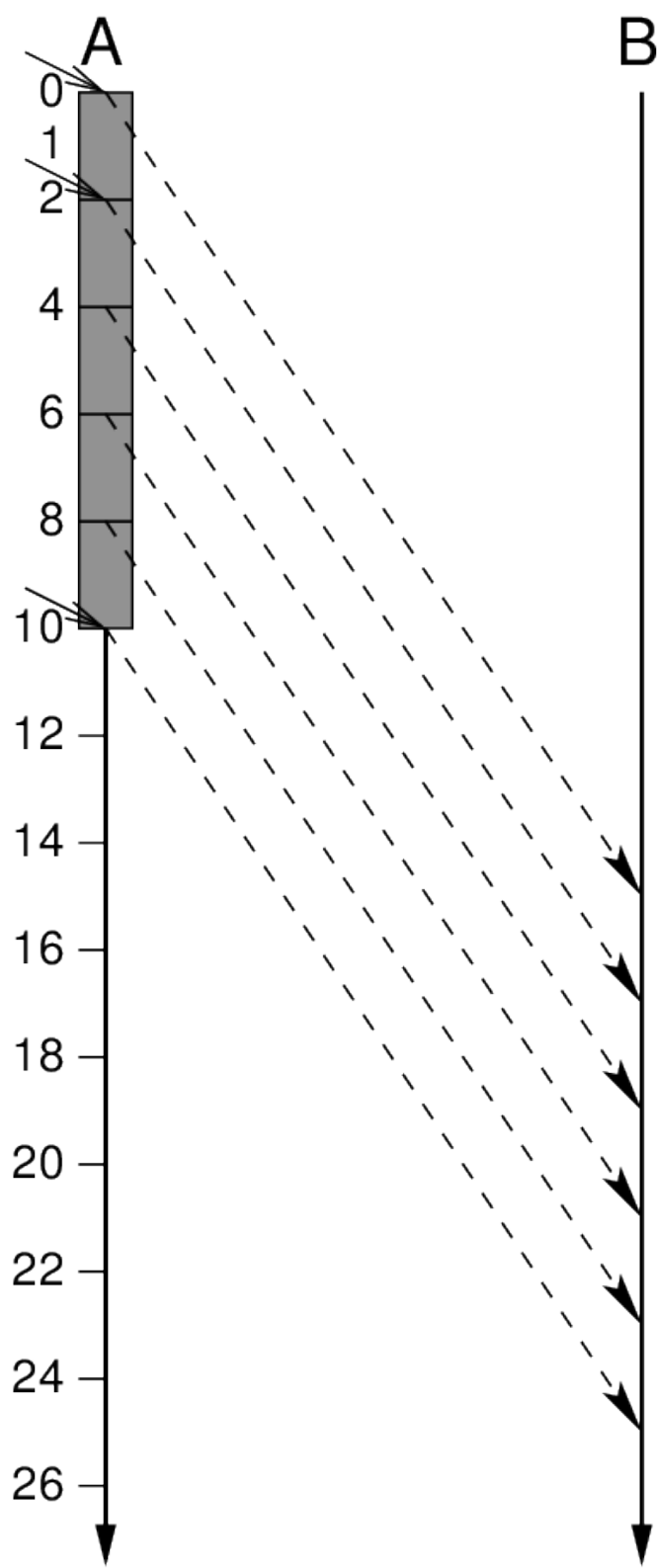


Start of signal representing
1st bit is received
End of signal representing
1st bit is received

Start transmitting 1st bit

Finish transmitting 1st bit

Finish transmitting 5th bit



Start of signal representing
1st bit is received
End of signal representing
1st bit is received

End of signal representing
5th bit is received

B receives all 5 bits at time 25us

Total delay is 25us

(10 us transmission delay +
15 us propagation delay)