

Computer Networks
A Systems Approach, 3rd Edition
Third Edition

Chapter 1 problems

16. (a) Propagation delay on the link is $(55 \times 10^9) / (3 \times 10^8) = 184$ seconds. Thus the RTT is **368 seconds**.
- (b) The delay \times bandwidth product for the link is $= 184 \times 128 \times 10^3 = \mathbf{2.81 MB}$
- (c) After a picture is taken it must be transmitted on the link and be completely propagated before Mission Control can interpret it. Transmit delay for 5MB of data is $41,943,040 \text{ bits} / 128 \times 10^3 = 328$ seconds. Thus, the total time required is transmit delay + propagation delay $= 328 + 184 = \mathbf{512 \text{ seconds}}$
6. We will count the transfer as completed when the last data bit arrives at its destination.
- (a) $1.5 \text{ MB} = 12,582,912 \text{ bits}$. Two initial RTTs (160 ms) + $12,582,912 / 10,000,000 \text{ bps}$ (transmit) + RTT/2 (propagation) $\approx \mathbf{1.458 \text{ seconds}}$
- (b) Number of packets required $= 1.5 \text{ MB} / 1 \text{ KB} = 1536$. To the above we add the time for **1535 RTTs** (the number of RTTs between when packet 1 arrives and packet 1536 arrives), for a total of $1.458 + 122.8 = \mathbf{124.258 \text{ seconds}}$

