

Propagation Delay = distance / speed of light

$$RTT = \text{Propagation Delay} \times 2$$

$$\text{Propagation Delay} = \frac{55 \text{ Gm}}{3 \times 10^8 \text{ m/s}}$$

$$= \frac{55\,000\,000\,000}{3\,000\,000\,000}$$

$$= 183.333 \text{ sec}$$

a. $RTT = 183.333 \times 2$

$$= 366.666$$

$$= 367 \text{ sec}$$

b. Delay \times Bandwidth

$$= 183.33 \times 128 \times 10^3 \text{ bps}$$

$$= 23,466.24 \times 10^3 \text{ bits}$$

$$= 23\,466\,240 \text{ bits}$$

$$= 23.46624 \text{ megabits}$$

$$= 2.93328 \text{ megabytes}$$

$$= \text{Approximately } 3 \text{ megabytes}$$

c. Transmit = size / bandwidth

$$= 5 \text{ MB} / 128 \times 10^3 \text{ bps}$$

$$= 5 \times 8 \times 10^6 \text{ bits} / 128 \times 10^3 \text{ bps}$$

$$= 40 \times 10^6 \text{ bits} / 128 \times 10^3 \text{ bps}$$

$$= 40,000,000 / 128,000$$

$$= 312.5 \text{ sec}$$