CSE 160: HW 1-6

20: a) 10Mbps ethernet with a delay of 10 μs

delay · bandwidth = $(10 \cdot 10^{-6}) \cdot 10$ Mbps

$1 \cdot 10^{-4}$ Mb = 0.0001Mb

b) transmission time = $\frac{\text{size}}{\text{bandwidth}} \Rightarrow \frac{5 \times 10^3 \text{ bits}}{10 \cdot 10^6 \text{ bps}} = .05 \cdot 10^{-3}$

$\frac{.5 \cdot 10^{-3} \cdot 10^3}{10^3} = .05 \cdot 10^{3} \cdot 10^{-6}$

$50 \cdot 10^{-6}$ 50μs

$(2 \cdot 50) + (2 \cdot 10) = (120 \cdot 10^{-6}) \cdot (10 \cdot 10^6)$ bps $= (1.2 \cdot 10^3)$

$= \frac{1.2\text{KB}}{8}$

= .15KB

c) delay × bandwidth = $(1.5 \cdot 10^6 \text{ bits/sec}) \cdot 50 \cdot 10^{-3}$ sec

$= 1.5 \cdot 50 \cdot 10^6 \cdot 10^{-3}$

$= 75 \cdot 10^3$ bits $\Rightarrow \frac{75000}{8} =$ 9,375KB

d) 35,900km high

The one way propagation delay: delay = $\frac{\text{distance}}{\text{speed}} = \frac{2 \cdot 35{,}900 \cdot 10^3 \text{ m}}{3 \cdot 10^8 \text{ m/s}}$

$= 0.24$s

Delay bandwidth = 0.24s · 1.5mbps

$= (24 \cdot 10^{-2})$ s $\cdot (1.5 \cdot 10^6)$ bps

$= (36 \cdot 10^4)$ bits

$= 360000/8 =$ 4500 bytes