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CSEE 4119
HW #1

1. rate = R bps
distance = m meters
propagation delay = m/s
packet size = L bits

a. $d_{prop} = \frac{m}{s}$
b. $d_{trans} = \frac{L}{R}$
c. $d_{end\text{-}to\text{-}end} = d_{prop} + d_{trans} = \frac{m}{s} + \frac{L}{R}$
d. $t = 0$
@ $t = d_{trans}$
At $d_{trans}$, the last bit should just be leaving Host A.
e. $d_{prop} < d_{trans}$
$t = d_{trans}$
The first bit should already be at host B.
f. $s = 2.5 \times 10^4$ m/s
$L = 100$ bits
$R = 28$ Kbits
$d_{prop} = d_{trans}$
$\frac{d}{2.5 \cdot 10^4 \text{ m/s}} = \frac{100 \text{ bits}}{28000 \text{ b/s}} = 0.00357 s$
$d = 89.286$ m

2. # RTT
index.html w/ 5 jpeg
a. Non-persistent connections require 2 RTT per object.
In this case, non-persistent connections require 12 RTT
b. With parallel connections, the index.html file requires 2 RTT, 2 for 4 jpeg and 2 for final jpeg. Total # of RTT = 6
c. Persistent connections require 1 RTT per object plus 1 for startup
In this case, the connection require 7 RTT
d. 1 setup + 1 index.html + 1 jpegs = 3 RTT's

3. There will be 1000 server-side sockets and 1001 port #.
There are 1000 sockets 's for each TCP connection and 1 additional server-side port # ready for a new connection.

4. when $d_{queue} = 0$

a. $130u = \frac{m}{2 \times 10^8} + \frac{8(1024)}{10^9} \Rightarrow m = 24.4\text{km}$

b. $d_{end\ to\ end_{avg}} = 142us$

$d_{endtoend} - (d_{prop} + d_{trans}) = d_{queue} = 142us - 130us = 12us$

time without queing delay to transmit: $\frac{8(1024)}{10^9} = 8.19us$

$\Rightarrow \frac{12}{8.19} = 1.47$ packets are queued on average.