CSE 30264 Computer Networks
Homework 1
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P1. d = 4 km = 4000 m
$c = 2 * 10^8$ m/s
propagationDelay = distance/speed = d/c
transmissionDelay = packetSize/bandwidth

d/c = size/bandwidth
bandwidth = c * size/d

100 bytes: bandwidth = $(2 * 10^8$ m/s) * (100 bytes * (8 bits / byte)) / 4000m
= 40,000,000 bits/s
= 40 Mbps

512 bytes: bandwidth = $(2 * 10^8$ m/s) * (512 bytes * (8 bits / byte)) / 4000m
= 204,800,000 bits/s
= 204.8 Mbps

P2. I logged onto student02.cse.nd.edu. Ethernet was connected to the 192.168.1.0 network.

P3. Adrian Gerbaud, agerbau2

P4. bw = 1 Gbps = $1 * 10^9$ bits/s
d = $385{,}000 * 10^3$ (one-way) -> d = $7.7 * 10^8$ m
$c = 3 * 10^8$ m/s

(a) minimum RTT = propagation = d/c
RTT = $(7.7 * 10^8$ m) /$(3 * 10^8$ m/s)
= **2.567 s**

(b) DBP = delay * bandwidth = RTT * bw
= (2.567 s) * $(1 * 10^9$ bits/s)
= $2.567 * 10^9$ bits = **2.567 Gb**

(c) This is the maximum amount of total data that can be in transmit in the connection at a given time.

(d) latency = prop + transmit ~~+ queue~~
= d/c + size/bw
= (2.567 s) + (25MB * (2^{20} bytes/MB) * (8 bits/byte)) /$(1 * 10^9$ bits/s)
= 2.567 s + .210s
= 2.777s

P5. (a) A file server would most require limited loss from the network, because the data being sent is likely text or binary files that require identical transfer for the files to remain usable and intact. Latency would also be an important factor because users expect files to be almost instantaneously accessible to them.

(b) A print server would also require limited loss form the network for text files, but this would be less important for images being printed as changes to graphic data is difficult for humans to detect.

(c) The performance of digital libraries would benefit from minimal loss as well as from a large average bandwidth. Since digital libraries contain large files for books or media files that have to be transmitted, the latency will be dictated by the transmission delay.

(d) The performance of monitoring of weather instruments would be maximized by a large bandwidth to transmit the large amount of data reported by the instruments.

(e) Performance in voice transmission would benefit most from minimizing latency so there can be a fluid conversation. Less important for a voice application are bandwidth, since audio recordings are small, and lost packets, since humans are capable of filling in these kinds of small losses.

(f) Bandwidth would be most important to the performance of a video monitoring application. Because there is a large amount of data every second captured by video cameras, the transmission of this data with sufficient bandwidth would be important.

(g) Bandwidth and minimizing jitter would be important to the performance of TV broadcasts. The same information from (f) applies to this application in terms of bandwidth. Reduction of jitter is important for television broadcasting so frames aren't lost when the data is displayed to the receiver.