

KFUPM - COMPUTER ENGINEERING DEPARTMENT**COE-540 – Computer Networks - Quiz 01 – Due Mon Sept 19th, 2011****Student Name:****Student Number:**

- 1) (100 points) A file of size K bits is to be sent from Node 1 to Node N traversing the intermediate $N-1$ point-to-point links as shown in Figure below. Assume the link transmission rate is R bits/sec and ignore the link propagation time and node processing delay.
- If the file is NOT segmented but rather sent as a whole on each of the links, write an expression for the total transmission time, T_{total1} .
 - If the file is segmented into packets of size P bits where an overhead of H bits is added to each packet, write an expression for the total transmission time, T_{total2} .
 - Show that the total transmission time in (b) is typically lower than that in (a) for reasonable values of N , R , K , and P . Plot T_{total1} and T_{total2} (in seconds) on the same graph for $K = 100$ kbit, $R = 64$ kb/s, $N = 10$, $H = 100$ bytes, and variable P . Let P vary from 1 bit to 10^6 bits and limit the y-axis to values ranging from 0 to 50 seconds. Use the proper legends to identify the individual curves.
 - To exploit the gain of pipelining, one may be tempted to segment the file into a large number of packets. However this would mean a significant fraction of network resources will be used to transmitting the overhead information only; Furthermore, the amount of transmit time for the overhead information also increases. Therefore, there is an optimal packet size that must be used for the given network. Find the optimal packet size for minimum overall transfer time for the file.
 - Using the numbers in (c) calculate T_{total2} for the optimal packet size. Plot this point on the graph produced for part (c).

Hint: For part (e), write a formula of the overall file transfer time (the one found in part (b)) and differentiate it with respect to P . Assume $K/P \gg 1$.

