

Mid-term examination on Introduction to the Internet

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I. Questions. Suppose two hosts A and B , separated by 1,000 km, and connected by a direct link of $R = 1$ Mbps. Propagation speed of the link is 2.5×10^8 m/sec.

1. Calculate the *bandwidth-delay product* $R \times d_{\text{prop}}$.
2. Consider sending a file of 400,000 bits from host A to host B . Suppose the file is sent continuously as one big message. What is the maximum number of bits that we will be in the link at any given time?
3. Provide an interpretation of the bandwidth-delay product.
4. What is the width (in meters) of a bit in the link?

II. Question. Referring to the previous question, suppose we can modify R . For what value of R is the width of a bit as long as the length of the link?

III. Question. Consider sending a large file of F bits from host A to host B . There are two links (and one switch) between them and the links are uncongested (that is, no queuing delays). Host A segments the file into segments of S bits each and adds 40 bits of header to each segment, forming packets of $L = 40 + S$ bits. Each link has a transmission rate of R bit/s. Assuming that F/S is an integer, find the value of S that minimises the delay of moving the file from host A to host B . Disregard propagation delay.