Final examination of Introduction to Networking

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1. **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.
   (a) Calculate the *bandwidth-delay product* $R \times d_{\text{prop}}$.
   (b) 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?
   (c) Provide an interpretation of the bandwith-delay product.
   (d) What is the width (in meters) of a bit in the link?
2. **Question.** Referring to question 1, suppose we can modify R. For what value of R is the width of a bit as long as the length of the link?
3. **Question.** What are the advantages of message segmentation in packet-switched networks? What are the disadvantages?
4. **Question.** Is HFC bandwidth dedicated or shared among users? Are collisions possible in a downstream HFC channel?
5. **Question.** List five tasks that a protocol layer can perform. Is it possible that one (or more) of these tasks could be performed by two (or more) layers?
6. **Questions.** True or false?
   (a) Suppose a user requests a Web page that consists of some text and two images. For this page the client will send one request and receive three response messages.
   (b) Two distinct Web pages can be sent over the same persistent connection.
   (c) With non-persistent connections between browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.
   (d) The `Date:` header in the HTTP response message indicates when the object in the response was last modified.