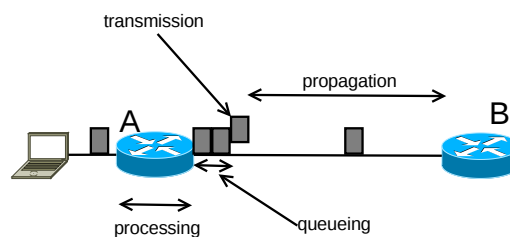


Computer Networks and Distributed Systems Exercise Sheet 3

Exercise 3.1

Two hosts A and B are connected via a single connection with capacity R bps. Assume, that the distance between the hosts is s meters and the velocity of propagation for the connection is v meter/second. Host A sends a packet consisting of L bits to host B.

- Express the *propagation delay* d_{prop} as a function of s and v .
- Express the *transmission time* d_{trans} of the packet as a function of L and R .
- Find a term for the end-to-end delay neglecting the delay caused by queues or processing by hosts.
- Assume, that host A starts the transmission at time $t = 0$.
At what location is the last bit of the packet a time $t = d_{trans}$?
- Assume, that d_{prop} is greater than d_{trans} .
At what location is the first bit of the packet at time $t = d_{trans}$?
- Assume, that d_{prop} is less than d_{trans} .
At what location is the first bit of the packet at time $t = d_{trans}$?
- Assume, that $v = 2,8 * 10^8 \frac{m}{s}$, $L = 100$ bits and $R = 28$ kbps.
Compute the distance s , such that $d_{prop} = d_{trans}$.



Exercise 3.2 Perform a traceroute at two different hours of the day (between 06:00 and 10:00; between 18:00 and 22:00) to the following destinations: www.heise.de (Europe), www.whitehouse.gov (America), www.un.org.cn (Asia).

- Find the number of routers in the path to each destination at each of the two hours. Explain how the traceroute works.
- Compare the values for source and destination being on the same continent and on different continents. How can you identify the transition to another continent?

Hint for Linux users: Use the option `-I` for the `traceroute` command.