

Homework #1 Solutions – 5 Points Each

1.

Imagine that you have trained your St. Bernard, Bernie, to carry a box of three 8 mm tapes instead of a flask of brandy. (When your disk fills up, you consider that an emergency.) These tapes each contain 7 gigabytes. The dog can travel to your side, wherever you may be, at 18 km/hour. For what range of distances does Bernie have a higher data rate than a transmission line whose data rate (excluding overhead) is 150 Mbps?

15.

Negotiation has to do with getting both sides to agree on some parameters or values to be used during the communication. Maximum packet size is one example, but there are many others.

18. (a) Data link layer. (b) Network layer.

20. With n layers and h bytes added per layer, the total number of header bytes per message is hn , so the space wasted on headers is hn . The total message size is $M + nh$, so the fraction of bandwidth wasted on headers is $hn/(M + hn)$.

24.

Doubling every 18 months means a factor of four gain in 3 years. In 9 years, the gain is then 4^3 or 64, leading to 6.4 billion hosts. Many possible explanations.

28.

The image is $1024 \cdot 768 \cdot 3$ bytes or 2,359,296 bytes. This is 18,874,368 bits. At 56,000 bits/sec, it takes about 337.042 sec. At 1,000,000 bits/sec, it takes about 18.874 sec. At 10,000,000 bits/sec, it takes about 1.887 sec. At 100,000,000 bits/sec, it takes about 0.189 sec.