CSc 450/550: Computer Networks (Summer 2006)

Assignment 1

To be handed in at the lecture on May 25, 2006

1. In a few sentences, please list and compare the layered structure of ISO's OSI architecture and Internet's TCP/IP protocol stack. Please also explain how the functions of layers "missing" in TCP/IP protocol stack are achieved otherwise over the Internet.

2. In a few sentences, please define and compare the following terms: link bandwidth (in Hertz), baud rate (in sample-per-second), symbol rate (in symbol-per-second), and data rate (in bit-per-second). Please also explain the relationship between them.

3. In traditional telephone systems, local loop (i.e., between a telephone set and its nearest telephone switch) link bandwidth is about 3KHz, and the signal-to-noise ratio imposed by the system between two remote telephone sets is about 30dB. Using Shannon's Limit, please calculate the maximal data rate (in bit-per-second) analog modems can achieve between two remote telephone jacks.

4. In a few sentences, please explain how 56Kbps technology can achieve a data rate higher than the one calculated above.

5. In a few sentences, please explain and compare circuit switching and packet switching technologies.

6. For a simplified HTML document with URL `http://a.b.com/index.html`

```
<html>
<a href=‘‘image/fig1-big.jpg’’><img src=‘‘image/fig1-small.jpg’’></a>
<img src=‘‘http://x.y.com/image/fig2.gif’’>
<img src=‘‘http://a.b.com/image/fig3.gif’’>
</html>
```

   For a web browser that loads images (JPEG and GIF files) automatically, how many TCP connections will be opened by the browser to display this Web page properly, if:

   (a) non-persistent HTTP connections are used, or

   (b) persistent HTTP connections with non-pipelining are used, or

   (c) persistent HTTP connections with pipelining are used.

   How about a web browser that does not load images?