Chris Grimes
Computer Communication Networks 35201
Homework 1

1) The performance of a client-server system is strongly influenced by two major network characteristics: the bandwidth of the network (that is, how many bits/sec it can transport) and the latency (that is, how many seconds it takes for the first bit to get from the client to the server). Give an example of a network that exhibits high bandwidth but also high latency. Then give an example of one that has both low bandwidth and low latency. Problem 3, page 86 of the text.

An example of a network that has high bandwidth and high latency would be any satellite network that is based in space. A network such as this can transfer a lot of data but the transfer itself can take up to several minutes or more, depending on the distance the data needs to travel.

An example of a network that has low bandwidth and low latency would be the Bluetooth connection between my headphones and my phone. A network such as this can transmit small amounts of data very quickly, where the latency between my phone sending the music data and the headphones playing said music is virtually non-existent.

2) Besides bandwidth and latency, what other parameter is needed to give a good characterization of the quality of service offered by a network used for (i) digitized voice traffic? (ii) video traffic? (iii) financial transaction traffic? Problem 4, page 86 of the text.

Reliability is another parameter, in addition to bandwidth and latency, that is needed to establish whether or not a given network has a good quality of service. Without reliability it doesn't really matter how much data a given network can push through the system or how long a given transfer of data takes to finish. If a given network isn't available for use when its user needs it, it might as well not exist. Users will not be willing to use a network be it for digitized voice traffic, video traffic or financial transaction traffic if there is no assurance that said network can complete the transfer of data upon request.

3) What are two reasons for using layered protocols? What is one possible disadvantage of using layered protocols? Problem 10, page 86 of the text.

Two reasons for the implementation of layered protocols are to reduce complexity by offering services to higher layers while hiding the details of how said services are implemented and facilitate the ability change a specific protocol without changing any other protocols

One possible disadvantage of using layered protocols is decreased throughput. In order to ensure that the network is defended from threats, mechanisms are implemented in several layers to help reduce the likelihood that you are being spied on, but implementing these security mechanisms in several layers can decrease throughput.

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4) A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers? Problem 16, page 87 of the text

If there are n number of layers in a given protocol hierarchy and at each layer a h-byte header is added then there are n*h space wasted at each layer for headers. Since each message generates M bytes, M should be added to the total number of header bytes resulting in the equation n*h/(M+(n*h)). Where n*h/(M+(n*h)) is the fraction of network bandwidth filled with headers.

5) An image is 1024 x 768 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? Over a 1-Mbps cable modem? Over a 10-Mbps Ethernet? Over 100-Mbps Ethernet? Problem 23, page 87 of the text.

1024*768= 786,432 total pixels in the given image

786,432*3= 2,359,296 total bytes in the given image

2,359,296*8= 18,874,368 total bits in the given image

A) How long does it take to transmit it over a 56-kbps modem channel?

18,874,368/ 56,000= 337.0422857 seconds

B) Over a 1-Mbps cable modem?

18,874,368/ 1,000,000= 18.874368 seconds

C) Over a 10-Mbps Ethernet?

18,874,368/ 10,000,000= 1.8874368 seconds

D) Over 100-Mbps Ethernet?

18,874,368/ 100,000,000= .18874368 seconds