**CSC 335 Data Communications and Network I**

**Homework 6**

1. (1 point) What is the function of ARP? Explain how it helps in sending an IP datagram from a source to a destination, both on the same local network.

The address resolution protocol finds the hardware address of a host from its IP address which is maintained as a cache of IP-to-Ethernet address translation pairs on your computer. If both devices are on the same local network, ARP will find the IP address in its IP/MAC address table and get the MAC address to send the datagram to the destination.

1. (1 point) What is the function of NAT? How does NAT distinguish between multiple local hosts?

NAT stands for Network Address Translation, and it is a method of mapping multiple local private addresses to a public address before transferring the information. It is often used for businesses and home routers. It distinguishes between multiple hosts by utilizing reusable IP addresses within the private network.

1. (1 point) Differentiate between flow control and automatic repeat request.

Flow control is designed to control *how much* data is transferred at a time so as to not overload the receiver, whereas automatic repeat request is for error control. If the sender doesn’t receive acknowledgement before it times out since the last datagram was sent, it will automatically send it again under the assumption the previous datagram was lost in transmission.

1. (2 points) A TCP segment consisting of 1500 bits of data and 160 bits of header is sent to the IP layer, which appends another 160 bits of header. This is then transmitted through two networks each of which uses a 24 bit packet header/CRC. The destination network has a maximum frame size of 800 bits. How many bits including headers are delivered to the network layer at the destination? Note that the maximum size refers to the entire frame at the link layer. To solve this problem, first determine what is the size of the payload in the link layer frame. This will be the size of the IP datagram. From there, you have to calculate how many IP datagrams are needed to send all of the TCP data.

1844 bits of data are delivered to the network layer at the destination, which is far too much for the destination network to handle. To overcome this issue, you have to break down the 1500 bits of data into 3 pieces that are 400 bits in size and 1 piece that is 300 bits in size (4 pieces is the minimum, but you could do 5 even pieces of 300 bits). This way, when the 344 bits of headers are added onto the datagrams, they are still under 800 bits at the arrival of the destination network.

1. (1 point) (a) Why is it necessary to define ports at the receiving end for network services? (b) Visit the Internet Assigned Numbers Authority web site http://www.iana.org  and determine the top level domain code for Antartica, Macao, and South Africa, (c) Determine the port numbers for chat and https (ie., http over tsl/ssl)
2. It is necessary to define ports at the server end so that the client knows on which port the server is running the application desired. This way, client doesn’t first have to ask the server what port to connect to, by-passing a whole transmission step.
3. Antarctica - .aq, Macao - .mo, South Africa - .za
4. https port – 443, chat port (Internet Relay Chat) - 194
5. (1 point) Describe the three-way handshake in TCP. If flow control and error correction is performed at the transport layer by TCP, explain why some communications systems also perform these functions at the link layer.

The three way handshake is: 1) the client requesting a connection, 2) the server acknowledging and accepting the request, and 3) the client acknowledging the server’s acknowledgement and acceptance of the request. Flow control and error correction are performed at both the transport and link layers because they are accessed at different stages in the sending/receiving process. The transport layer does error correction and manages flow control from the end hosts, where the link layer does error correction and flow control across the network machines (routers and switches). It also makes the job of link layer devices easier because they don’t have to unpack the transport layer header and analyze its contents.