CS331 Project 1 Problems – Ben Webb

1) **R16:** Transmission Delay, Propagation Delay, Processing Delay, and Queueing Delay. Transmission Delay is variable depending on the length of the packet and the transmission rate. Propagation Delay is also variable depending on the distance between the two ends (source and destination) as well as the propagation speed. Processing Delay is variable depending on the tasks that the network layer is performing (deep package inspection adds processing time). Queueing Delay is variable depending on how busy the network is and how long a job waits before being executed.
R22: A layer can encapsulate, decapsulate, control for errors, control for speed, and run deep package inspection. Multiple Layers can perform all these tasks including: Application, Transport, Network and Link layers.
2) **P25:** a. $d_{prop} = \frac{d}{c} = \frac{20{,}000km}{2.5\times10^5 m/sec} * \frac{1000m}{1km} = 0.08\ seconds$

   b. $R \times d_{prop} = 2 \times 10^6\ \frac{bit}{second} \times 0.08\ seconds = 160{,}000\ bits.$

   c. The bandwidth-delay product is the relationship between the rate that bits can enter a link with the rate that bits reach the end point. It represents the maximum number of bits in the link at any given time.

   d. Width = $\frac{20{,}000\ km}{160{,}000\ bits} \times \frac{1000\ m}{1\ km} = \frac{C\ meters}{1\ bit} = 125\ meters$. This is longer than a football field.

   e. General formula for width of a bit is $\frac{m}{R\times s}$

   P28: a. $Latency = d_{tr} + d_{prop} = \frac{800{,}000\ bits}{2\times10^6 \frac{bit}{second}} + 0.08seconds = 0.48\ seconds.$

   b. $Latency = 20\left(d_{tr} + d_{prop}\right) = 20\left(\frac{40{,}000\ bits}{2\times10^6 \frac{bit}{second}} + 0.08seconds\right) = 2\ seconds.$

   c. For part a. the propagation time, which is the time it takes the package to arrive to the receiver is included. The time to transmit is the same. The result for b could also be found with the same d_{tr} from a but with 20 * d_{prop} instead of only one.
3) a. The range is 132.177.12.192 ~ 132.177.12.207.
   b. The prefixes is 10.20.30.0/23.
   c. The netmask is 255.255.248.0.
   d. The prefix length is 19.
4) A has mask of 255.255.255.0, B has mask 255.255.252.0, C has mask 255.255.0.0, D has mask 0.0.0.0
   132.176.20.1 – D.
   132.177.20.2 – B, C, D.
   132.177.21.3 – A, B, C, D.
   132.177.21.4 – A, B, C, D.
   132.177.37.5 – C, D.
5) a. IP: 137.146.135.252 Hostname: Bens-mac-mini.local Subnet ID: 137.146.135.0 Prefix: 24 Subnet Mask: 255.255.255.0

IP: 137.146.125.27 Hostname: bens-iPhone Subnet ID: 137.146.124.0 Prefix: 21 Subnet Mask: 255.255.248.0

b.

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Routing tables

Internet:
Destination        Gateway            Flags        Refs      Use   Netif Expire
default            v18.mc.r.ntwk.colb UGSc           92        0     en0
127                localhost          UCS             0        0     lo0
localhost          localhost          UH              1    10213     lo0
137.146.120/21     link#6             UCS             2        0     en0      !
137.146.120.1/32   link#6             UCS             1        0     en0      !
v18.mc.r.ntwk.colb 88:a2:5e:5a:d8:e0  UHLWIir         34        0     en0   1167
137.146.120.85/32  link#6             UCS             1        0     en0      !
137.146.120.85     3c:15:c2:eb:64:74  UHLWI           0       28     lo0
137.146.123.202    a0:51:b:c0:f6:ca   UHLWI           0       90     en0    965
137.146.127.77     90:e1:7b:b1:95:6   UHLWI           0        1     en0    811
169.254            link#6             UCS             1        0     en0      !
224.0.0/4          link#6             UmCS            2        0     en0      !
224.0.0.251        1:0:5e:0:0:fb      UHmLWI          0        0     en0
239.255.255.250    1:0:5e:7f:ff:fa    UHmLWI          0       52     en0
255.255.255.255/32 link#6             UCS             0        0     en0      !

Internet6:
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with a default gateway of 137.146.135.1 and 137.146.120.1

c.

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bash-3.2# arp -a
v18.mc.r.ntwk.colby.edu (137.146.120.1) at 88:a2:5e:5a:d8:e0 on en0 ifscope [ethernet]
? (137.146.120.85) at 3c:15:c2:eb:64:74 on en0 ifscope permanent [ethernet]
? (137.146.123.202) at a0:51:b:c0:f6:ca on en0 ifscope [ethernet]
? (137.146.127.77) at 90:e1:7b:b1:95:6 on en0 ifscope [ethernet]
? (224.0.0.251) at 1:0:5e:0:0:fb on en0 ifscope permanent [ethernet]
? (239.255.255.250) at 1:0:5e:7f:ff:fa on en0 ifscope permanent [ethernet]
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6) a. A trace captures a packet of information broadcast to the network. This trace is capturing at UDP which is in the transportation layer. It captures the source IP, destination IP, communication protocol, as well as the data itself. The trace specifically is catching the activity of a ping where the number of hops was restricted to 1, thereby resulting in a TTL response.

b. ping -m 1 lgal15s46-in-f4.1e100.net

c. The hostname of the target was lgal15s46-in-f4.1e100.net

d. The hostname of the sender was some Apple device on the Colby network.

e. Wireshark uses MAC addresses to determine the manufacturer. The tool can be accessed here: https://www.wireshark.org/tools/oui-lookup.html