Wenxi Chen
wchen466

Assignment 1

CS 4438
September 29, 2021

Question 1

1. Symbolic Name: www.csd.uwo.ca. IP Address: 129.100.22.17
2. 129.100.22.17 is a B Class IP Address. (Binary: 10000001.01100100.00010110.00010001)
3. The prefix for this class is the first two bits: 000001 01100100.
4. Up to $2^{(32-16)} = 2^{16} = 65536$ Hosts can belong to this network.

Question 2

1. First 20 Addresses:
   (a) **129.100.61.49**, 5 packets transmitted, 5 received, 0% packet loss, time 4018ms
   (b) 129.100.217.87, 6 packets transmitted, 0 received, 100% packet loss, time 5138ms
   (c) 129.100.64.86, 4 packets transmitted, 0 received, 100% packet loss, time 3093ms
   (d) 129.100.4.210, 4 packets transmitted, 0 received, 100% packet loss, time 3059ms
   (e) 129.100.179.47, 3 packets transmitted, 0 received, 100% packet loss, time 2058ms
   (f) 129.100.228.49, 4 packets transmitted, 0 received, 100% packet loss, time 3088ms
   (g) 129.100.13.111, 5 packets transmitted, 0 received, 100% packet loss, time 4100ms
   (h) **129.100.205.203**, 4 packets transmitted, 4 received, 0% packet loss, time 3084ms
   (i) 129.100.10.20, 5 packets transmitted, 0 received, 100% packet loss, time 4114ms
   (j) 129.100.26.88, 2 packets transmitted, 0 received, 100% packet loss, time 1058ms
   (k) 129.100.218.142, 3 packets transmitted, 0 received, 100% packet loss, time 2039ms
   (l) 129.100.7.108, 2 packets transmitted, 0 received, 100% packet loss, time 1004ms
   (m) **129.100.71.1**, 4 packets transmitted, 4 received, 0% packet loss, time 3097ms
   (n) 129.100.250.152, 4 packets transmitted, 0 received, 100% packet loss, time 3105ms
   (o) 129.100.163.194, 3 packets transmitted, 0 received, 100% packet loss, time 2059ms
   (p) 129.100.58.117, 4 packets transmitted, 0 received, 100% packet loss, time 3092ms
   (q) 129.100.211.181, 4 packets transmitted, 0 received, 100% packet loss, time 3068ms
   (r) 129.100.200.229, 4 packets transmitted, 0 received, 100% packet loss, time 3057ms
   (s) 129.100.174.55, 3 packets transmitted, 0 received, 100% packet loss, time 2046ms
   (t) 129.100.147.9, 5 packets transmitted, 0 received, 100% packet loss, time 4105ms
2. Fraction of address that correspond to actual machines: $\frac{3}{20}$
3. Estimated size: $65534 * \frac{3}{20} \approx 9830$

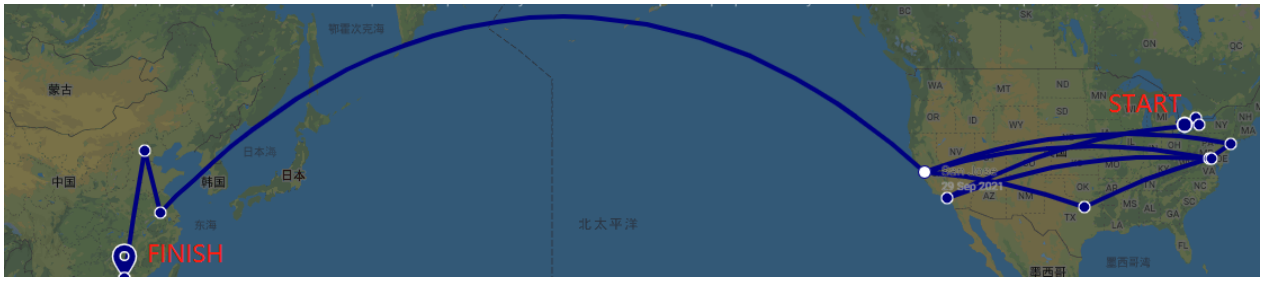
Assignment 1

Question 3

1. My IP address in CIDR notation: **172.31.101.242/23**
2. Network number: 10101100.00011111.0110010
   Computer number: 1.11110010
3. Up to $2^9 = 512$ computers can belong to the subnetwork.
4. Ethernet adapter MAC address: fa:16:3e:5b:68:60

Question 4

I traced bilibili.com located in China and it took 30 hops. As shown below:



Assignment 1

IP Address	Geographical Location	Latitude	Longitude
172.31.100.1	Private	NA	NA
129.100.20.1	London, ON, Canada	43.01088	-81.27746
172.29.102.5	Private	NA	NA
172.29.102.186	Private	NA	NA
172.29.102.18	Private	NA	NA
199.71.2.185	London, ON, Canada	43.00941	-81.26176
172.16.2.101	Private	NA	NA
172.16.0.10	Private	NA	NA
142.46.4.217	Toronto, ON, Canada	43.65366	-79.38282
142.47.203.62	Toronto, ON, Canada	43.65366	-79.38282
142.47.202.4	Toronto, ON, Canada	43.65366	-79.38282
142.47.202.89	Toronto, ON, Canada	43.65366	-79.38282
142.47.202.153	Toronto, ON, Canada	43.65366	-79.38282
142.47.202.244	Toronto, ON, Canada	43.65366	-79.38282
38.122.36.105	Buffalo, NY, USA	42.83708	-78.74842
154.54.29.201	Los Angeles, CA, USA	34.04564	-118.24164
154.54.7.129	Washington, DC, USA	38.9069	-77.0284
154.54.42.165	San Jose, CA, USA	37.33053	-121.83823
154.54.5.89	Dallas, TX, USA	32.80543	-96.81423
154.54.42.97	San Jose, CA, USA	37.33053	-121.83823
154.54.44.141	Herndon, VA, USA	38.98372	-77.38276
154.54.43.14	New York, NY, USA	40.75891	-73.97902
38.104.138.106	San Jose, CA, USA	37.33053	-121.83823
202.97.27.241	Nanjing, Jiangsu, China	32.04583	118.78417
202.97.12.2	Beijing, Beijing, China	39.91176	116.37923
202.97.89.217	Xicheng, Beijing, China	39.91518	116.37431
113.96.5.134	Guangzhou, Guangdong, China	23.12472	113.23861
121.14.14.58	Chancheng, Guangdong, China	23.0095	113.1224
113.96.6.93	Guangzhou, Guangdong, China	23.12472	113.23861
125.94.53.106	Guangzhou, Guangdong, China	23.12472	113.23861

Assignment 1

```
[wchen466@compute ~]$ traceroute bilibili.com
traceroute to bilibili.com (110.43.34.66), 30 hops max, 60 byte packets
 1  _gateway (172.31.100.1)  0.861 ms  0.785 ms  0.747 ms
 2  vlan20-publ.edge-serv.netmgmt.uwo.pri (129.100.20.1)  1.380 ms  1.317 ms  1.
422 ms
 3  edge-serv.core-uwo.netmgmt.uwo.pri (172.29.102.5)  1.647 ms  1.580 ms  1.492
 ms
 4  172.29.102.186 (172.29.102.186)  1.679 ms  1.640 ms  1.605 ms
 5  uwo-core-ssb.netmgmt.uwo.pri (172.29.102.18)  2.167 ms  2.123 ms  2.086 ms
 6  199.71.2.185 (199.71.2.185)  2.199 ms  1.678 ms  1.626 ms
 7  172.16.2.101 (172.16.2.101)  2.526 ms  2.889 ms  2.833 ms
 8  172.16.0.10 (172.16.0.10)  2.802 ms  3.250 ms  2.897 ms
 9  142.46.4.217 (142.46.4.217)  5.279 ms  5.469 ms  5.534 ms
10  x-0-3-0-7.c01.tfs.hydroonetelecom.com (142.47.203.62)  14.689 ms  14.794 ms
 14.732 ms
11  x-0-0-0-0.c01.rch.hydroonetelecom.com (142.47.202.4)  13.019 ms  12.983 ms x
-0-3-0-0.c01.mdp.hydroonetelecom.com (142.47.202.45)  16.174 ms
12  x-0-4-0-0.c01.sfd.hydroonetelecom.com (142.47.202.89)  15.957 ms x-0-0-0-0.c
01.sfd.hydroonetelecom.com (142.47.202.19)  14.507 ms x-0-4-0-0.c01.sfd.hydroone
telecom.com (142.47.202.89)  15.761 ms
13  x-0-0-0-0.p01.alb.hydroonetelecom.com (142.47.202.153)  12.938 ms  14.193 ms
  14.565 ms
14  x-0-0-0-0.p01.bms.hydroonetelecom.com (142.47.202.244)  14.418 ms  15.823 ms
  15.793 ms
15  te0-7-0-6.rcr21.buf02.atlas.cogentco.com (38.122.36.105)  11.801 ms  12.050
ms  10.343 ms
16  be3156.ccr21.cle04.atlas.cogentco.com (154.54.29.201)  15.455 ms be3157.ccr2
2.cle04.atlas.cogentco.com (154.54.47.125)  15.111 ms  16.528 ms
17  be2718.ccr42.ord01.atlas.cogentco.com (154.54.7.129)  22.003 ms  23.389 ms
22.476 ms
18  be2831.ccr21.mci01.atlas.cogentco.com (154.54.42.165)  35.193 ms  35.547 ms
be2832.ccr22.mci01.atlas.cogentco.com (154.54.44.169)  35.555 ms
19  be3035.ccr21.den01.atlas.cogentco.com (154.54.5.89)  46.169 ms  45.884 ms be
3036.ccr22.den01.atlas.cogentco.com (154.54.31.89)  47.145 ms
20  be3038.ccr32.slc01.atlas.cogentco.com (154.54.42.97)  55.693 ms be3037.ccr21
.slc01.atlas.cogentco.com (154.54.41.145)  55.806 ms  56.150 ms
21  be3110.ccr22.sfo01.atlas.cogentco.com (154.54.44.141)  72.222 ms be3109.ccr2
1.sfo01.atlas.cogentco.com (154.54.44.137)  70.453 ms be3110.ccr22.sfo01.atlas.c
ogentco.com (154.54.44.141)  72.025 ms
22  be3670.ccr41.sjc03.atlas.cogentco.com (154.54.43.14)  71.199 ms  71.409 ms
71.291 ms
23  38.104.138.106 (38.104.138.106)  66.940 ms  63.953 ms  64.347 ms
24  202.97.27.241 (202.97.27.241)  217.154 ms  217.285 ms  218.453 ms
25  202.97.12.2 (202.97.12.2)  218.802 ms 202.97.12.10 (202.97.12.10)  225.040 m
s 202.97.91.146 (202.97.91.146)  217.391 ms
26  202.97.89.217 (202.97.89.217)  225.278 ms 202.97.89.201 (202.97.89.201)  222
.015 ms 202.97.94.141 (202.97.94.141)  215.080 ms
27  113.96.5.134 (113.96.5.134)  226.393 ms 113.96.4.46 (113.96.4.46)  228.339 m
s 113.96.5.74 (113.96.5.74)  221.498 ms
28  121.14.14.58 (121.14.14.58)  226.622 ms  226.573 ms  224.017 ms
29  113.96.6.93 (113.96.6.93)  227.509 ms 125.94.53.122 (125.94.53.122)  222.004
 ms  221.855 ms
30  * * 125.94.53.106 (125.94.53.106)  221.346 ms
```

Assignment 1

Question 5

1. First 34 bytes of the package in HEX:
   4c 72 b9 f9 3d 6f d8 24 bd 91 5d 00 08 00 45 00
   00 c4 2a ba 40 00 3f 06 e8 f9 81 64 10 42 81 64
2. MAC Destination: 4c:72:b9:f9:3d:6f
   MAC Source: d8:24:bd:91:5d:00
3. Datagram information
   (a) Protocol version number: 4
   (b) Header length: 20 Bytes
   (c) Total length of datagram: 196
   (d) Time to live: 63
   (e) Source IP address: 129.100.16.66
   Destination IP address: 129.100.20.118

Question 6

1. $P_r(nocollision) = 1 - P_r(collision)$
   $= 1 - \frac{1}{3}$
   $= \frac{2}{3}$
2. $P_r(exactlythreecollisions) = P_r(firstcollision) * P_r(secondcollision) * P_r(thirdcollision) * (1 - P_r(fourthdcollision))$
   $= \frac{1}{3} * \frac{1}{9} * \frac{1}{27} * \frac{80}{81}$
   $= \frac{80}{59049} \approx 0.00135$

Question 7

Message received by B:

$$\begin{matrix} 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ \mathbf{1} & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{matrix}$$

Parity for each row:

$$\begin{matrix} 0 \\ 0 \\ 0 \\ 0 \end{matrix}$$

Parity for each column:

$$\begin{matrix} 0 & 1 & 1 & 0 \end{matrix}$$

The third row and first column's parity disagree with each other. Therefore the number "1" was altered. The correct message m is:

$$\begin{matrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{matrix}$$

$m = 101110000$

Question 8

Destination	**Next Hop**
129.1	deliver direct
194.8.11	deliver direct
196.3.7	196.3.7.18
192.10.4	192.10.4.16
164.80	192.10.4.16
132.32	192.10.4.16

Question 9

Network 1 packet(s):
[**header**: MAC addr. of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of A, IP addr. of R_1; **data length**: 180 bytes}
Total length: $20 + 20 + 180 = 220$ *bytes*

Network 2 packet(s):
[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_1, IP addr. of R_2; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*

[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_1, IP addr. of R_2; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*

[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_1, IP addr. of R_2; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*

Network 3 packet(s):
[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_2, IP addr. of B; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*

[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_2, IP addr. of B; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*

[**header**: MAC addr of A , MAC addr. of B; **data**: D]
D = {**header**: IP addr. of R_2, IP addr. of B; **data length**: 60 bytes}
Total length: $20 + 20 + 60 = 100$ *bytes*