Weihan Chu(wcm350)

1-p3:

a. Circuit-switched network is more appropriate for this application. Because in circuit-switched network, when the network establishes the circuit, is also reserves a constant transmission rate in the network's links for the duration of the connection. Since a given transmission rate has been reserved for this connection, the sender can transfer the data to the receiver at the guaranteed constant rate. In this problem, the transmission rate is constant, so it's suitable to reserve this. What's more, considering that the running time is relatively long, it is worth setting up this circuit-switched network.

b. This network doesn't need congestion control. In this problem, the traffic may comes from that all applications need many links to transfer the data. But even in this situation, the sum of the application data rates is still less than the capacities of each link. So network doesn't need congestion control.

1-p4:

a. 16 connections. Because in order to maximum the connections, we need to reserve the connection with near switches. Such as, A->B has four connections, B->C has four connections, C->D has four connections, D->A has four connections.

b. 8 connections can be in progress. Because four connections come from A->B->C， four connections come from A->D->C.

c. Yes, we can make connections like this: A->C , B->D, C->A, D->B. In this situation, from A->C, there are two connections are A->B->C, and there are two other connections are C->D->A. From B->D, there are two connections are B>C->D, and there are two other connections are D->A->B.

1-p6:

a. propagation delay=m/s seconds
b. transmission delay=L/R seconds
c. end to end delay= propagation delay+transmission delay=(m/s+L/R) seconds
d. Host A
e. still in the link. The position is t×s .
f. Host B
g. m/s=l/R then m=Ls/R=120×2.5/56×10^8 =5.357×10^8 =535.7km

1.p7:

To generate all the bits in the packet:

56×8/(64×10^3)sec=7msec

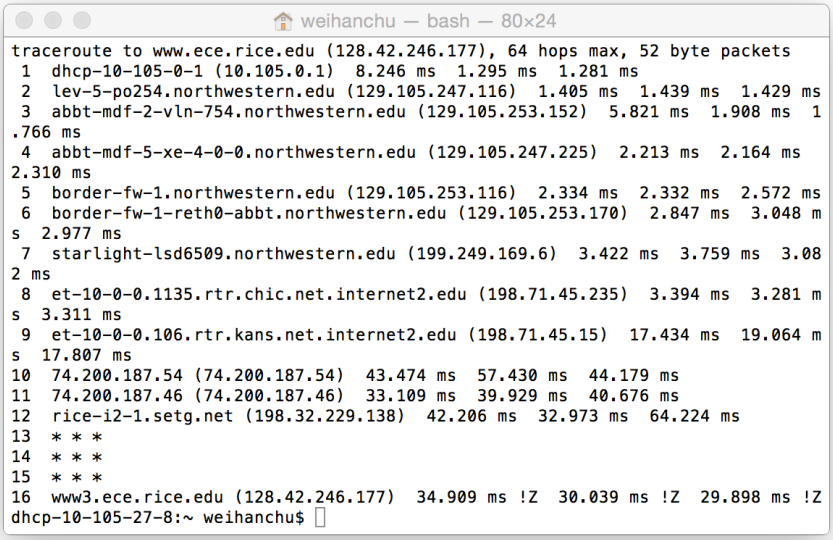
The transmission rate:

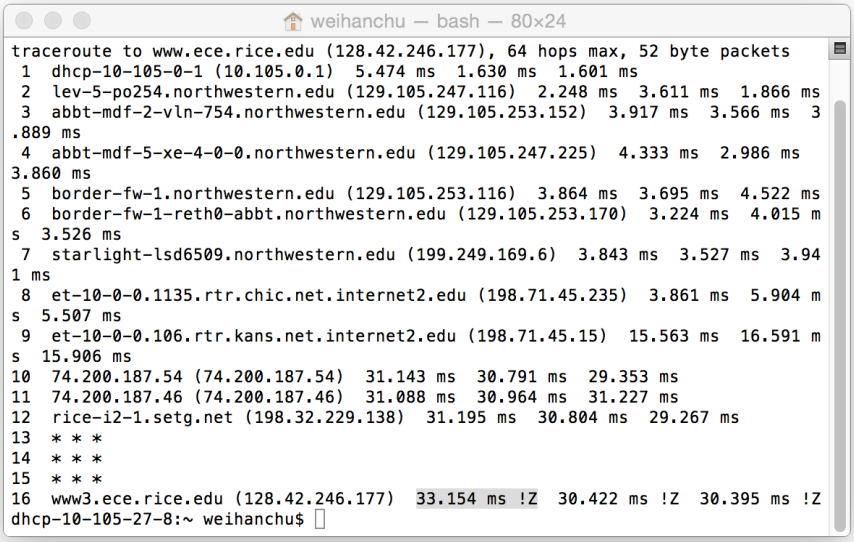
56×8/(2×10^6)=224usec

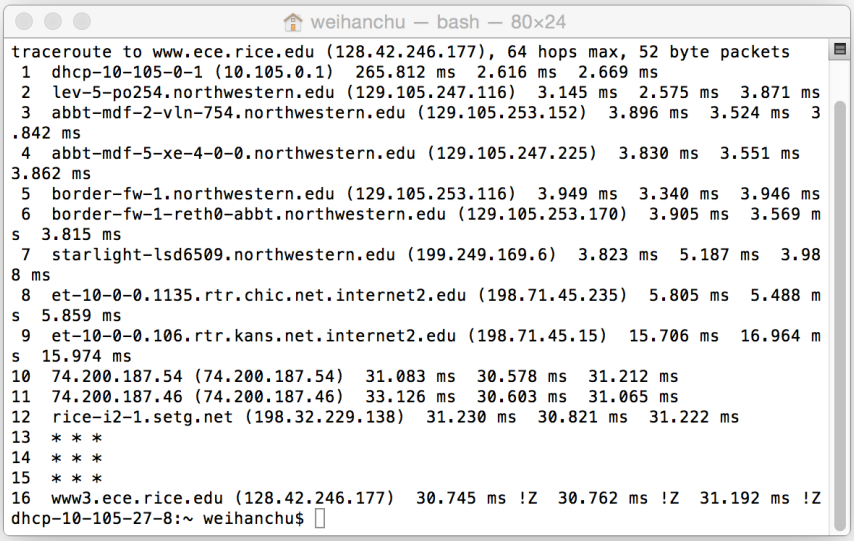
the propagation delay is: 10 msec

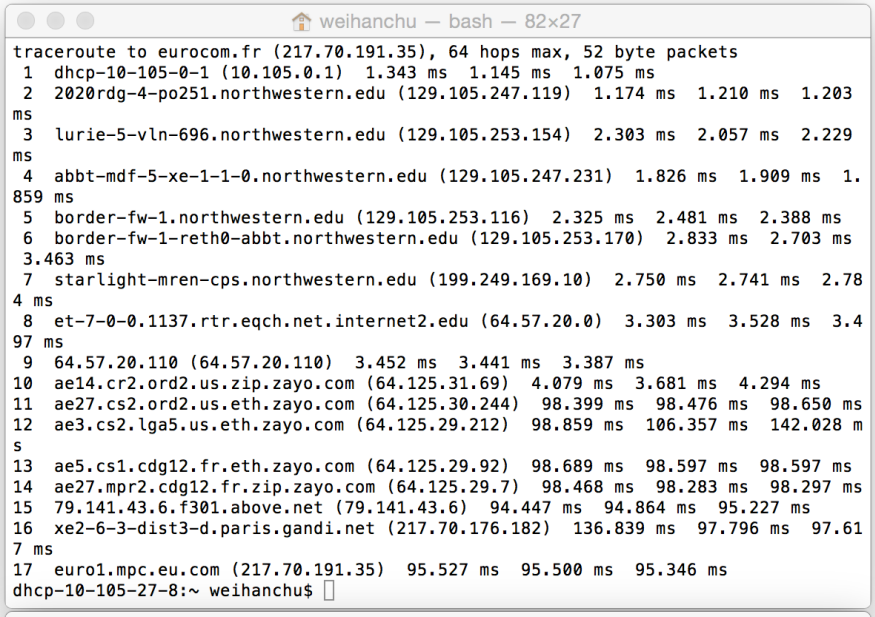
So the total delay=7msec+224usec+10msec=17.224msec

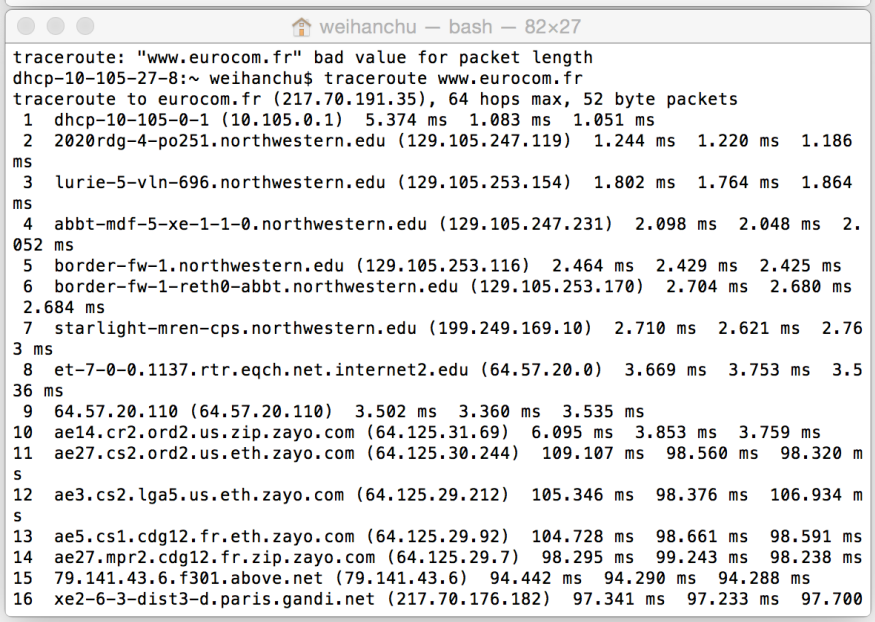
1.p18

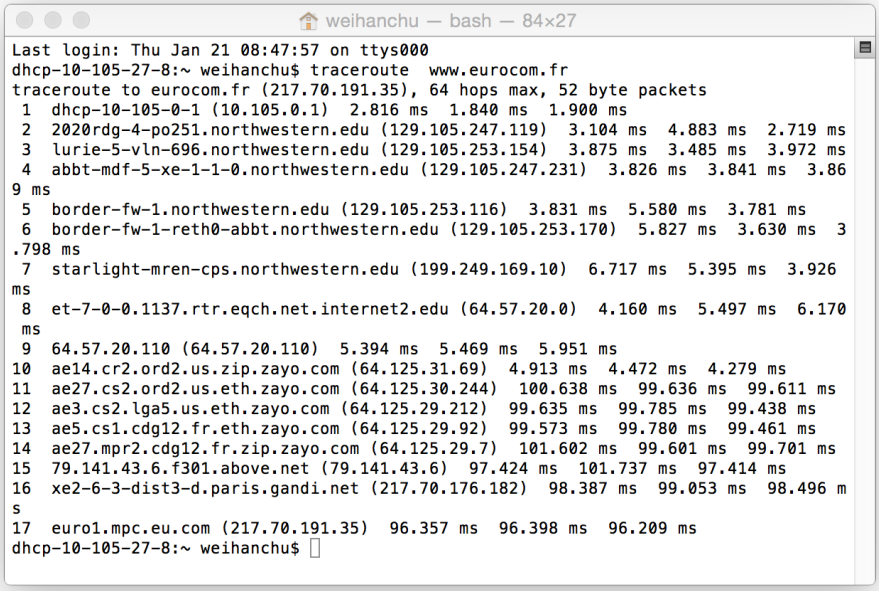

weihanchu — bash — 80×24
traceroute to www.ece.rice.edu (128.42.246.177), 64 hops max, 52 byte packets
 1 dhcp-10-105-0-1 (10.105.0.1) 8.246 ms 1.295 ms 1.281 ms
 2 lev-5-po254.northwestern.edu (129.105.247.116) 1.405 ms 1.439 ms 1.429 ms
 3 abbt-mdf-2-vln-754.northwestern.edu (129.105.253.152) 5.821 ms 1.908 ms 1
.766 ms
 4 abbt-mdf-5-xe-4-0-0.northwestern.edu (129.105.247.225) 2.213 ms 2.164 ms
2.310 ms
 5 border-fw-1.northwestern.edu (129.105.253.116) 2.334 ms 2.332 ms 2.572 ms
 6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 2.847 ms 3.048 m
s 2.977 ms
 7 starlight-lsd6509.northwestern.edu (199.249.169.6) 3.422 ms 3.759 ms 3.08
2 ms
 8 et-10-0-0.1135.rtr.chic.net.internet2.edu (198.71.45.235) 3.394 ms 3.281 m
s 3.311 ms
 9 et-10-0-0.106.rtr.kans.net.internet2.edu (198.71.45.15) 17.434 ms 19.064 m
s 17.807 ms
10 74.200.187.54 (74.200.187.54) 43.474 ms 57.430 ms 44.179 ms
11 74.200.187.46 (74.200.187.46) 33.109 ms 39.929 ms 40.676 ms
12 rice-i2-1.setg.net (198.32.229.138) 42.206 ms 32.973 ms 64.224 ms
13 * * *
14 * * *
15 * * *
16 www3.ece.rice.edu (128.42.246.177) 34.909 ms !Z 30.039 ms !Z 29.898 ms !Z
dhcp-10-105-27-8:~ weihanchu$


weihanchu — bash — 80×24
traceroute to www.ece.rice.edu (128.42.246.177), 64 hops max, 52 byte packets
 1 dhcp-10-105-0-1 (10.105.0.1) 5.474 ms 1.630 ms 1.601 ms
 2 lev-5-po254.northwestern.edu (129.105.247.116) 2.248 ms 3.611 ms 1.866 ms
 3 abbt-mdf-2-vln-754.northwestern.edu (129.105.253.152) 3.917 ms 3.566 ms 3
.889 ms
 4 abbt-mdf-5-xe-4-0-0.northwestern.edu (129.105.247.225) 4.333 ms 2.986 ms
3.860 ms
 5 border-fw-1.northwestern.edu (129.105.253.116) 3.864 ms 3.695 ms 4.522 ms
 6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 3.224 ms 4.015 m
s 3.526 ms
 7 starlight-lsd6509.northwestern.edu (199.249.169.6) 3.843 ms 3.527 ms 3.94
1 ms
 8 et-10-0-0.1135.rtr.chic.net.internet2.edu (198.71.45.235) 3.861 ms 5.904 m
s 5.507 ms
 9 et-10-0-0.106.rtr.kans.net.internet2.edu (198.71.45.15) 15.563 ms 16.591 m
s 15.906 ms
10 74.200.187.54 (74.200.187.54) 31.143 ms 30.791 ms 29.353 ms
11 74.200.187.46 (74.200.187.46) 31.088 ms 30.964 ms 31.227 ms
12 rice-i2-1.setg.net (198.32.229.138) 31.195 ms 30.804 ms 29.267 ms
13 * * *
14 * * *
15 * * *
16 www3.ece.rice.edu (128.42.246.177) 33.154 ms !Z 30.422 ms !Z 30.395 ms !Z
dhcp-10-105-27-8:~ weihanchu$


weihanchu — bash — 80×24
traceroute to www.ece.rice.edu (128.42.246.177), 64 hops max, 52 byte packets
 1 dhcp-10-105-0-1 (10.105.0.1) 265.812 ms 2.616 ms 2.669 ms
 2 lev-5-po254.northwestern.edu (129.105.247.116) 3.145 ms 2.575 ms 3.871 ms
 3 abbt-mdf-2-vln-754.northwestern.edu (129.105.253.152) 3.896 ms 3.524 ms 3
.842 ms
 4 abbt-mdf-5-xe-4-0-0.northwestern.edu (129.105.247.225) 3.830 ms 3.551 ms
3.862 ms
 5 border-fw-1.northwestern.edu (129.105.253.116) 3.949 ms 3.340 ms 3.946 ms
 6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 3.905 ms 3.569 m
s 3.815 ms
 7 starlight-lsd6509.northwestern.edu (199.249.169.6) 3.823 ms 5.187 ms 3.98
8 ms
 8 et-10-0-0.1135.rtr.chic.net.internet2.edu (198.71.45.235) 5.805 ms 5.488 m
s 5.859 ms
 9 et-10-0-0.106.rtr.kans.net.internet2.edu (198.71.45.15) 15.706 ms 16.964 m
s 15.974 ms
10 74.200.187.54 (74.200.187.54) 31.083 ms 30.578 ms 31.212 ms
11 74.200.187.46 (74.200.187.46) 33.126 ms 30.603 ms 31.065 ms
12 rice-i2-1.setg.net (198.32.229.138) 31.230 ms 30.821 ms 31.222 ms
13 * * *
14 * * *
15 * * *
16 www3.ece.rice.edu (128.42.246.177) 30.745 ms !Z 30.762 ms !Z 31.192 ms !Z
dhcp-10-105-27-8:~ weihanchu$


weihanchu — bash — 82×27
traceroute to eurocom.fr (217.70.191.35), 64 hops max, 52 byte packets
1 dhcp-10-105-0-1 (10.105.0.1) 1.343 ms 1.145 ms 1.075 ms
2 2020rdg-4-po251.northwestern.edu (129.105.247.119) 1.174 ms 1.210 ms 1.203 ms
3 lurie-5-vln-696.northwestern.edu (129.105.253.154) 2.303 ms 2.057 ms 2.229 ms
4 abbt-mdf-5-xe-1-1-0.northwestern.edu (129.105.247.231) 1.826 ms 1.909 ms 1.859 ms
5 border-fw-1.northwestern.edu (129.105.253.116) 2.325 ms 2.481 ms 2.388 ms
6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 2.833 ms 2.703 ms 3.463 ms
7 starlight-mren-cps.northwestern.edu (199.249.169.10) 2.750 ms 2.741 ms 2.784 ms
8 et-7-0-0.1137.rtr.eqch.net.internet2.edu (64.57.20.0) 3.303 ms 3.528 ms 3.497 ms
9 64.57.20.110 (64.57.20.110) 3.452 ms 3.441 ms 3.387 ms
10 ae14.cr2.ord2.us.zip.zayo.com (64.125.31.69) 4.079 ms 3.681 ms 4.294 ms
11 ae27.cs2.ord2.us.eth.zayo.com (64.125.30.244) 98.399 ms 98.476 ms 98.650 ms
12 ae3.cs2.lga5.us.eth.zayo.com (64.125.29.212) 98.859 ms 106.357 ms 142.028 ms
13 ae5.cs1.cdg12.fr.eth.zayo.com (64.125.29.92) 98.689 ms 98.597 ms 98.597 ms
14 ae27.mpr2.cdg12.fr.zip.zayo.com (64.125.29.7) 98.468 ms 98.283 ms 98.297 ms
15 79.141.43.6.f301.above.net (79.141.43.6) 94.447 ms 94.864 ms 95.227 ms
16 xe2-6-3-dist3-d.paris.gandi.net (217.70.176.182) 136.839 ms 97.796 ms 97.617 ms
17 euro1.mpc.eu.com (217.70.191.35) 95.527 ms 95.500 ms 95.346 ms
dhcp-10-105-27-8:~ weihanchu$


weihanchu — bash — 82×27
traceroute: "www.eurocom.fr" bad value for packet length
dhcp-10-105-27-8:~ weihanchu$ traceroute www.eurocom.fr
traceroute to eurocom.fr (217.70.191.35), 64 hops max, 52 byte packets
1 dhcp-10-105-0-1 (10.105.0.1) 5.374 ms 1.083 ms 1.051 ms
2 2020rdg-4-po251.northwestern.edu (129.105.247.119) 1.244 ms 1.220 ms 1.186 ms
3 lurie-5-vln-696.northwestern.edu (129.105.253.154) 1.802 ms 1.764 ms 1.864 ms
4 abbt-mdf-5-xe-1-1-0.northwestern.edu (129.105.247.231) 2.098 ms 2.048 ms 2.052 ms
5 border-fw-1.northwestern.edu (129.105.253.116) 2.464 ms 2.429 ms 2.425 ms
6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 2.704 ms 2.680 ms 2.684 ms
7 starlight-mren-cps.northwestern.edu (199.249.169.10) 2.710 ms 2.621 ms 2.763 ms
8 et-7-0-0.1137.rtr.eqch.net.internet2.edu (64.57.20.0) 3.669 ms 3.753 ms 3.536 ms
9 64.57.20.110 (64.57.20.110) 3.502 ms 3.360 ms 3.535 ms
10 ae14.cr2.ord2.us.zip.zayo.com (64.125.31.69) 6.095 ms 3.853 ms 3.759 ms
11 ae27.cs2.ord2.us.eth.zayo.com (64.125.30.244) 109.107 ms 98.560 ms 98.320 ms
12 ae3.cs2.lga5.us.eth.zayo.com (64.125.29.212) 105.346 ms 98.376 ms 106.934 ms
13 ae5.cs1.cdg12.fr.eth.zayo.com (64.125.29.92) 104.728 ms 98.661 ms 98.591 ms
14 ae27.mpr2.cdg12.fr.zip.zayo.com (64.125.29.7) 98.295 ms 99.243 ms 98.238 ms
15 79.141.43.6.f301.above.net (79.141.43.6) 94.442 ms 94.290 ms 94.288 ms
16 xe2-6-3-dist3-d.paris.gandi.net (217.70.176.182) 97.341 ms 97.233 ms 97.700


weihanchu — bash — 84×27
Last login: Thu Jan 21 08:47:57 on ttys000
dhcp-10-105-27-8:~ weihanchu$ traceroute www.eurocom.fr
traceroute to eurocom.fr (217.70.191.35), 64 hops max, 52 byte packets
1 dhcp-10-105-0-1 (10.105.0.1) 2.816 ms 1.840 ms 1.900 ms
2 2020rdg-4-po251.northwestern.edu (129.105.247.119) 3.104 ms 4.883 ms 2.719 ms
3 lurie-5-vln-696.northwestern.edu (129.105.253.154) 3.875 ms 3.485 ms 3.972 ms
4 abbt-mdf-5-xe-1-1-0.northwestern.edu (129.105.247.231) 3.826 ms 3.841 ms 3.869 ms
5 border-fw-1.northwestern.edu (129.105.253.116) 3.831 ms 5.580 ms 3.781 ms
6 border-fw-1-reth0-abbt.northwestern.edu (129.105.253.170) 5.827 ms 3.630 ms 3.798 ms
7 starlight-mren-cps.northwestern.edu (199.249.169.10) 6.717 ms 5.395 ms 3.926 ms
8 et-7-0-0.1137.rtr.eqch.net.internet2.edu (64.57.20.0) 4.160 ms 5.497 ms 6.170 ms
9 64.57.20.110 (64.57.20.110) 5.394 ms 5.469 ms 5.951 ms
10 ae14.cr2.ord2.us.zip.zayo.com (64.125.31.69) 4.913 ms 4.472 ms 4.279 ms
11 ae27.cs2.ord2.us.eth.zayo.com (64.125.30.244) 100.638 ms 99.636 ms 99.611 ms
12 ae3.cs2.lga5.us.eth.zayo.com (64.125.29.212) 99.635 ms 99.785 ms 99.438 ms
13 ae5.cs1.cdg12.fr.eth.zayo.com (64.125.29.92) 99.573 ms 99.780 ms 99.461 ms
14 ae27.mpr2.cdg12.fr.zip.zayo.com (64.125.29.7) 101.602 ms 99.601 ms 99.701 ms
15 79.141.43.6.f301.above.net (79.141.43.6) 97.424 ms 101.737 ms 97.414 ms
16 xe2-6-3-dist3-d.paris.gandi.net (217.70.176.182) 98.387 ms 99.053 ms 98.496 ms
17 euro1.mpc.eu.com (217.70.191.35) 96.357 ms 96.398 ms 96.209 ms
dhcp-10-105-27-8:~ weihanchu$

a.The average of the round-trip delay is 31.615ms , 31.327ms, 31.702ms.
The standard deviation of the the round-trip delay is 2.853ms, 1.585ms, 1.275ms

b. 12, in this example, the path doesn't change in different times.

c. In this example, there are six ISP networks. And the largest delays do occur at the peering interfaces between adjacent ISPs

d.The average of the round-trip delay is 95.458ms, 97.425ms, 96.32133ms
The standard deviation of the the round-trip delay is 0.010ms, 0.244ms, 0.100ms
The number of routers in the path 17 ,the path doesn't change in different times
In this example, there are five ISP networks. And the largest delays do occur at the peering interfaces between adjacent ISPs

2-p1:
a. False,the client will send four request

b.True, because multiple Web pages residing on the same server can be sent from the server to the same client over a single persistent TCP

c. False, because in non-persistent connections, each TCP connection is closed after server sends the object.Each TCP connection transports one request message and one response message.

d.False, This date indicates the time and date when HTTP response was created and sent by the server. Note that this is not the time when the object was created or last modified. it is the time when the server retrieves the object from its file system.

e.False, for example,404 NOT FOUND

2-P4:
a. http://gai a.cs.umass.edu /cs453/index.html

b. HTTP/1.1

c. persistent connection. because Connection:keep-alive

d. We don't know from this problem

e.Mozilla/5.0, because the server can actually send different versions of the same object to different types of user agents

2.p7:
first, to get the IP address:
$RTT_1 + RTT_2 + \ldots + RTT_n$

second, to get the object:$2RTT_o$

So, the total time is:

$2RTT_o + RTT_1 + RTT_2 + \ldots + RTT_n$

2.p8:

a.$RTT_1 + \ldots + RTT_n + 2RTT_o + 8 \times 2RTT_o$

$= 18RTT_o + RTT_1 + \ldots + RTT_n$

b.$RTT_1 + \ldots + RTT_n + 2RTT_o + 2 \times 2RTT_o$

$= 6RTT_o + RTT_1 + \ldots + RTT_n$

c.$RTT_1 + \ldots + RTT_n + 2RTT_o + RTT_o$

$== 3RTT_o + RTT_1 + \ldots + RTT_n$.

2.p9:

a.

Δ= (850,000 bits)/(15,000,000 bits/sec) = 0.0567 sec

then from $\Delta/(1 - \Delta B)$

we can get the average access delay=0.0567/（1-0.0567×16）=0.6sec

because the internet side of access response is 3 sec

so the total response time=0.6 sec+3sec=3.6 sec

b.

the traffic intensity is reduced 60%, now it is $\Delta B \times 0.4 = 0.36288$

so the total average response time in the miss situation=3cec+0.0567/(1-0.36288)=3.089sec

when the cache doesn't miss. the response time is 0

so the total average response time=3.089×0.4+0=1.2356sec

no the response time is 1.2356sec

2-p18, (a) to (e):

a. whois database can locate the registrar, whois server, DNS server for a given input of domain name, IP address or network name.

b. NS1.REGISTER.COM from http://whois.aliyun.com

c. DNS.BAIDU.COM from www.register.com

c. (1)www.baidu.com,

web server:

Name: baidu.com

Address: 180.149.132.47

Name: baidu.com

Address: 220.181.57.217

```
Name:    baidu.com
Address: 111.13.101.208
Name:    baidu.com
Address: 123.125.114.144

name server:
baidu.com    nameserver = ns2.baidu.com.
baidu.com    nameserver = ns7.baidu.com.
baidu.com    nameserver = dns.baidu.com.
baidu.com    nameserver = ns3.baidu.com.
baidu.com    nameserver = ns4.baidu.com.

mail server:
baidu.com    mail exchanger = 20 jpmx.baidu.com.
baidu.com    mail exchanger = 20 mx50.baidu.com.
baidu.com    mail exchanger = 10 mx.n.shifen.com.
baidu.com    mail exchanger = 20 mx1.baidu.com.
```

(2)www.hello.com

```
web server:
Name:    hello.com
Address: 104.197.3.133
name server:
hello.com    nameserver = ns6.dnsmadeeasy.com.
hello.com    nameserver = ns5.dnsmadeeasy.com.
hello.com    nameserver = ns7.dnsmadeeasy.com.
mail server:
hello.com    mail exchanger = 5 alt2.aspmx.l.google.com.
hello.com    mail exchanger = 1 aspmx.l.google.com.
hello.com    mail exchanger = 5 alt1.aspmx.l.google.com.
hello.com    mail exchanger = 10 aspmx2.googlemail.com.
hello.com    mail exchanger = 10 aspmx3.googlemail.com.
```

(3)local :www.northwestern.edu

```
web server:
Name:    northwestern.edu
Address: 129.105.136.53
name server:
northwestern.edu nameserver = cicada.northwestern.edu.
northwestern.edu nameserver = accuvax.northwestern.edu.
northwestern.edu nameserver = dns1.buffalo.edu.
mail server:
northwestern.edu mail exchanger = 10 evcspsym2.ads.northwestern.edu.
northwestern.edu mail exchanger = 10 evcspsym1.ads.northwestern.edu.
northwestern.edu mail exchanger = 10 chcspsym3.ads.northwestern.edu.
northwestern.edu mail exchanger = 10 chcspsym2.ads.northwestern.edu.
northwestern.edu mail exchanger = 10 chcspsym1.ads.northwestern.edu.
northwestern.edu mail exchanger = 10 evcspsym3.ads.northwestern.edu.
```

d. the www.qq.com has multiple IP address:

```
> set type=a
> qq.com
Server:         129.105.49.1
Address:        129.105.49.1#53

Non-authoritative answer:
Name:   qq.com
Address: 163.177.65.160
Name:   qq.com
Address: 125.39.240.113
>
```

as for my university:

```
> www.northwestern.edu
Server:         129.105.49.1
Address:        129.105.49.1#53

www.northwestern.edu    canonical name = nuinfo.wideip.northwestern.edu.
Name:   nuinfo.wideip.northwestern.edu
Address: 129.105.136.53
```

e. My university's IP range is 129.105.0.0 - 129.105.255.255