

# Assignment 2

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M.S Computer Science - CS825  
Assignment 2

- 1) Binary representation of addresses and netmasks:
- a) 132.177.5.192/29 :  
IP Address : 132.177.5.192  
10000100.10110001.00000101.11000000  
Netmask : 255.255.255.248 (29)  
11111111.11111111.11111111.11111000  
b) 10.0.0.48 - 10.0.0.55  
10.0.0.48  
00001010.00000000.00000000.00110000  
10.0.0.55  
00001010.00000000.00000000.00110111  
\*10.0.0.48/7  
c) /13  
Netmask : 255.248.0.0  
11111111.11111000.00000000.00000000  
d) Netmask 255.255.192.0  
11111111.11111111.11000000.00000000  
Prefix length : 18
- 2)  
(132.177.0.0/20, A)  
132.177.0.0 – 255.255.240.0  
(132.177.1.0/25, B)  
132.177.1.0 – 255.255.255.128  
(132.177.0.0/16, C)  
132.177.0.0 – 255.255.0.0  
(0.0.0.0/0, D)  
0.0.0.0 – 0.0.0.0  
a) 132.177.0.1  
It matches (132.177.0.0/20, A)=( 132.177.0.0 – 255.255.240.0) and (132.177.0.0/16, C)=( 132.177.0.0 – 255.255.0.0)  
So the entry with highest prefix bits (132.177.0.0/20, A) with Interface A will be selected.  
b) 132.177.1.122  
It matches (132.177.1.0/25, B)=( 132.177.1.0 – 255.255.255.128), so it will be routed to interface B.  
c) 132.177.1.133  
It matches (132.177.1.0/25, B)=( 132.177.1.0 – 255.255.255.128), so it will be routed to interface B.  
d) 132.177.8.4  
It matches (132.177.0.0/20, A) , so it will be routed to interface A  
e) 132.177.16.5  
It matches (132.177.0.0/20, A) , so it will be routed to interface A  
f) 132.178.0.1  
It matches (0.0.0.0/0, D), so it will be routed to interface D

3)

a) (i) netsh interface show interface

```
C:\Users\Ajesh>netsh interface show interface
Admin State   State        Type         Interface Name
-----
--
Enabled       Disconnected Dedicated    Ethernet
Enabled       Connected    Dedicated    Wi-Fi
```

(ii) netsh interface ip show interfaces

```
C:\Users\Ajesh>netsh interface ip show interfaces
```

Idx	Met	MTU	State	Name
14	5	1500	disconnected	Ethernet
5	45	1500	connected	Wi-Fi
1	75	4294967295	connected	Loopback Pseudo-Interface 1
10	25	1500	disconnected	Local Area Connection* 2

(iii) ipconfig | findstr "adapter"

```
C:\Users\Ajesh>ipconfig | findstr "adapter"
Ethernet adapter Ethernet:
Wireless LAN adapter Local Area Connection* 2:
Wireless LAN adapter Wi-Fi:
Tunnel adapter Local Area Connection* 3:
Tunnel adapter isatap.aw4.unh.edu:
```

In linux:

(i) ip link show

```
[avv1004@agate ~]$ ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP mode DEFAULT group default qlen 1000
    link/ether 18:66:da:a9:d1:ab brd ff:ff:ff:ff:ff:ff
3: eno2: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
    link/ether 18:66:da:a9:d1:ac brd ff:ff:ff:ff:ff:ff
4: enp4s0f0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
```

```
link/ether a0:36:9f:b7:b8:88 brd ff:ff:ff:ff:ff:ff
5: enp4s0f1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
```

```
link/ether a0:36:9f:b7:b8:8a brd ff:ff:ff:ff:ff:ff
6: eno1.610@eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 18:66:da:a9:d1:ab brd ff:ff:ff:ff:ff:ff
```

b)

(i) Windows (Command prompt) : ipconfig

```
C:\Users\Ajesh>ipconfig
```

Windows IP Configuration

Ethernet adapter Ethernet:

Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection\* 2:

Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . : aw4.unh.edu  
Link-local IPv6 Address . . . . : fe80::dd32:8f32:6f7e:6334%5  
IPv4 Address. . . . . : 10.21.99.91  
Subnet Mask . . . . . : 255.255.0.0  
Default Gateway . . . . . : 10.21.0.1

Tunnel adapter Local Area Connection\* 3:

Connection-specific DNS Suffix . :  
IPv6 Address. . . . . : 2001:0:5ef5:79fb:fa:6925:7b4e:11bd  
Link-local IPv6 Address . . . . : fe80::fa:6925:7b4e:11bd%3  
Default Gateway . . . . . :

Tunnel adapter isatap.aw4.unh.edu:

Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix . : aw4.unh.edu

(ii) Linux : ifconfig

```
[avv1004@agate ~]$ ifconfig
```

```

eno1:
flags=4163<UP,BROADCAST,RUNNING,MULTICAST
> mtu 1500
    inet 132.177.4.36 netmask 255.255.252.0 broadcast
132.177.7.255
    inet6 fe80::1a66:daff:fea9:d1ab prefixlen 64 scopeid
0x20<link>
    ether 18:66:da:a9:d1:ab txqueuelen 1000 (Ethernet)
    RX packets 1548157441 bytes 1008737862855
(939.4 GiB)
    RX errors 0 dropped 20 overruns 3375 frame 0
    TX packets 1393727226 bytes 986682928899 (918.9
GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0
    device memory 0x92600000-926ffff

```

```

eno2: flags=4099<UP,BROADCAST,MULTICAST> mtu
1500
    ether 18:66:da:a9:d1:ac txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0
    device memory 0x92500000-925ffff

```

```

eno1.610:
flags=4163<UP,BROADCAST,RUNNING,MULTICAST
> mtu 1500
    inet6 fe80::1a66:daff:fea9:d1ab prefixlen 64 scopeid
0x20<link>
    inet6 2606:4100:38c0:9::5 prefixlen 64 scopeid
0x0<global>
    ether 18:66:da:a9:d1:ab txqueuelen 1000 (Ethernet)
    RX packets 598974 bytes 7556941537 (7.0 GiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 571349 bytes 98105075 (93.5 MiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0

```

```

enp4s0f0: flags=4099<UP,BROADCAST,MULTICAST>
mtu 1500
    ether a0:36:9f:b7:b8:88 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0

```

```

enp4s0f1: flags=4099<UP,BROADCAST,MULTICAST>
mtu 1500
    ether a0:36:9f:b7:b8:8a txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)

```

```

    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 73695574 bytes 415079890252 (386.5
GiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 73695574 bytes 415079890252 (386.5
GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions
0

```

c) (i) Linux :  
sudo route -n  
(or)  
netstat -rn

(ii) Windows (Command prompt) :  
route print

d) (i) Linux :  
arp

(ii) Windows (Command prompt) :  
arp -a

4) (Step i) Retrieved one of the root name servers from  
<https://www.internic.net/domain/named.root>

(Step ii) Querying one of the root name servers to get list  
of TLD name servers for .edu TLD

```

[avv1004@agate ~]$ dig +norecurse a.root-servers.net. edu

; <<>> DiG 9.10.4-P8-RedHat-9.10.4-5.P8.fc25 <<>>
+norecurse a.root-servers.net.
edu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 38180
;; flags: qr ra; QUERY: 1, ANSWER: 1, AUTHORITY:
13, ADDITIONAL: 26

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;a.root-servers.net.      IN      A

```

:: ANSWER SECTION:

a.root-servers.net. 544656 IN A 198.41.0.4

:: AUTHORITY SECTION:

root-servers.net. 536718 IN NS j.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS d.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS h.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS c.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS i.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS m.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS f.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS l.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS g.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS b.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS a.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS E.ROOT-SERVERS.NET.  
root-servers.net. 536718 IN NS k.ROOT-SERVERS.NET.

:: ADDITIONAL SECTION:

b.root-servers.net. 544655 IN A 192.228.79.201  
c.root-servers.net. 544656 IN A 192.33.4.12  
d.root-servers.net. 544656 IN A 199.7.91.13  
e.root-servers.net. 544656 IN A 192.203.230.10  
f.root-servers.net. 544656 IN A 192.5.5.241  
g.root-servers.net. 544656 IN A 192.112.36.4  
h.root-servers.net. 544656 IN A 198.97.190.53  
i.root-servers.net. 544656 IN A 192.36.148.17  
j.root-servers.net. 544656 IN A 192.58.128.30  
k.root-servers.net. 544656 IN A 193.0.14.129  
l.root-servers.net. 544656 IN A 199.7.83.42  
m.root-servers.net. 544656 IN A 202.12.27.33  
a.root-servers.net. 450315 IN AAAA 2001:503:ba3e::2:30  
b.root-servers.net. 536718 IN AAAA 2001:500:200::b  
c.root-servers.net. 536718 IN AAAA 2001:500:2::c  
d.root-servers.net. 536718 IN AAAA 2001:500:2d::d  
e.root-servers.net. 536718 IN AAAA 2001:500:a8::e

f.root-servers.net. 450315 IN AAAA 2001:500:2f::f  
g.root-servers.net. 536718 IN AAAA 2001:500:12::d0d  
h.root-servers.net. 450315 IN AAAA 2001:500:1::53  
i.root-servers.net. 536718 IN AAAA 2001:7fe::53  
j.root-servers.net. 450315 IN AAAA 2001:503:c27::2:30  
k.root-servers.net. 450315 IN AAAA 2001:7fd::1  
l.root-servers.net. 536718 IN AAAA 2001:500:9f::42  
m.root-servers.net. 450315 IN AAAA 2001:dc3::35

:: Query time: 0 msec

:: SERVER: 132.177.4.32#53(132.177.4.32)

:: WHEN: Wed Oct 11 10:24:42 EDT 2017

:: MSG SIZE rcvd: 867

:: Got answer:

:: ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 25850

:: flags: qr ra; QUERY: 1, ANSWER: 0, AUTHORITY: 6, ADDITIONAL: 8

:: OPT PSEUDOSECTION:

; EDNS: version: 0, flags:: udp: 4096

:: QUESTION SECTION:

;edu. IN A

:: AUTHORITY SECTION:

edu. 104730 IN NS l.edu-servers.net.  
edu. 104730 IN NS g.edu-servers.net.  
edu. 104730 IN NS c.edu-servers.net.  
edu. 104730 IN NS a.edu-servers.net.  
edu. 104730 IN NS d.edu-servers.net.  
edu. 104730 IN NS f.edu-servers.net.

:: ADDITIONAL SECTION:

a.edu-servers.net. 26256 IN A 192.5.6.30  
f.edu-servers.net. 18330 IN A 192.35.51.30  
g.edu-servers.net. 18330 IN A 192.42.93.30  
c.edu-servers.net. 18330 IN A 192.26.92.30  
d.edu-servers.net. 18330 IN A 192.31.80.30  
l.edu-servers.net. 18330 IN A 192.41.162.30  
g.edu-servers.net. 18330 IN AAAA 2001:503:cc2c::2:36

:: Query time: 0 msec

:: SERVER: 132.177.4.32#53(132.177.4.32)

:: WHEN: Wed Oct 11 10:24:42 EDT 2017

:: MSG SIZE rcvd: 267

(Step iii) Querying one of the above .edu TLD servers to get a list of UNH name servers.

```
[avv1004@agate ~]$ dig +norecurse a.edu-servers.net.
unh.edu
```

```
; <<>> DiG 9.10.4-P8-RedHat-9.10.4-5.P8.fc25 <<>>
+norecurse a.edu-servers.net.
unh.edu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 26419
;; flags: qr ra; QUERY: 1, ANSWER: 1, AUTHORITY: 4,
ADDITIONAL: 9
```

```
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:: udp: 4096
;; QUESTION SECTION:
;a.edu-servers.net.      IN      A
```

```
;; ANSWER SECTION:
a.edu-servers.net.      26223  IN      A      192.5.6.30
```

```
;; AUTHORITY SECTION:
edu-servers.net.       18297  IN      NS      av1.nstld.com.
edu-servers.net.       18297  IN      NS      av3.nstld.com.
edu-servers.net.       18297  IN      NS      av4.nstld.com.
edu-servers.net.       18297  IN      NS      av2.nstld.com.
```

```
;; ADDITIONAL SECTION:
av1.nstld.com.         146344 IN      A      192.42.177.30
av3.nstld.com.         146344 IN      A      192.82.133.30
av2.nstld.com.         146344 IN      A      192.42.178.30
av4.nstld.com.         146344 IN      A      192.82.134.30
av1.nstld.com.         146344 IN      AAAA
2001:500:124::30
av3.nstld.com.         146344 IN      AAAA
2001:500:126::30
av2.nstld.com.         146344 IN      AAAA
2001:500:125::30
av4.nstld.com.         146344 IN      AAAA
2001:500:127::30
```

```
;; Query time: 0 msec
;; SERVER: 132.177.4.32#53(132.177.4.32)
;; WHEN: Wed Oct 11 10:25:15 EDT 2017
;; MSG SIZE rcvd: 319
```

```
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 50279
;; flags: qr ra; QUERY: 1, ANSWER: 1, AUTHORITY: 4,
ADDITIONAL: 8
```

```
;; OPT PSEUDOSECTION:
```

```
; EDNS: version: 0, flags:: udp: 4096
```

```
;; QUESTION SECTION:
```

```
;unh.edu.              IN      A
```

```
;; ANSWER SECTION:
```

```
unh.edu.               266    IN      A      132.177.132.99
```

```
;; AUTHORITY SECTION:
```

```
unh.edu.               18319  IN      NS      ns2.unh.edu.
unh.edu.               18319  IN      NS      unhsst.unh.edu.
unh.edu.               18319  IN      NS      nic.unh.edu.
unh.edu.               18319  IN      NS      ns.usnh.edu.
```

```
;; ADDITIONAL SECTION:
```

```
ns2.unh.edu.           18465  IN      A      132.177.102.30
unhsst.unh.edu.        18465  IN      A      132.177.128.56
ns.usnh.edu.           18465  IN      A      158.65.126.94
nic.unh.edu.           18465  IN      A      132.177.128.99
ns2.unh.edu.           23109  IN      AAAA
2606:4100:3fff:102::102:30
unhsst.unh.edu.        18860  IN      AAAA
2606:4100:1800:80::8038
nic.unh.edu.           66203  IN      AAAA
2606:4100:1800:80::8063
```

```
;; Query time: 0 msec
```

```
;; SERVER: 132.177.4.32#53(132.177.4.32)
```

```
;; WHEN: Wed Oct 11 10:25:15 EDT 2017
```

```
;; MSG SIZE rcvd: 279
```

(Step iv) Querying one of the above to get addresses of CS name servers:

```
[avv1004@agate ~]$ dig +norecurse ns2.unh.edu.
cs.unh.edu
```

```
; <<>> DiG 9.10.4-P8-RedHat-9.10.4-5.P8.fc25 <<>>
```

```
+norecurse ns2.unh.edu. cs.unh.edu
```

```
;; global options: +cmd
```

```
;; Got answer:
```

```
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 58726
```

```
;; flags: qr ra; QUERY: 1, ANSWER: 1, AUTHORITY: 4,
ADDITIONAL: 7
```

```
;; OPT PSEUDOSECTION:
```

```
; EDNS: version: 0, flags:: udp: 4096
```

```
;; QUESTION SECTION:
```

```
;ns2.unh.edu.          IN      A
```

```
;; ANSWER SECTION:
```

```
ns2.unh.edu.           18096  IN      A      132.177.102.30
```

```

;; AUTHORITY SECTION:
unh.edu.      17950 IN   NS   unhsst.unh.edu.
unh.edu.      17950 IN   NS   ns2.unh.edu.
unh.edu.      17950 IN   NS   ns.usnh.edu.
unh.edu.      17950 IN   NS   nic.unh.edu.

;; ADDITIONAL SECTION:
unhsst.unh.edu. 18096 IN   A    132.177.128.56
ns.usnh.edu.    18096 IN   A    158.65.126.94
nic.unh.edu.    18096 IN   A    132.177.128.99
ns2.unh.edu.    22740 IN   AAAA
2606:4100:3fff:102::102:30
unhsst.unh.edu. 18491 IN   AAAA
2606:4100:1800:80::8038
nic.unh.edu.    65834 IN   AAAA
2606:4100:1800:80::8063

;; Query time: 0 msec
;; SERVER: 132.177.4.32#53(132.177.4.32)
;; WHEN: Wed Oct 11 10:31:24 EDT 2017
;; MSG SIZE rcvd: 263

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 14407
;; flags: qr aa ra; QUERY: 1, ANSWER: 1, AUTHORITY:
2, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;cs.unh.edu.      IN      A

;; ANSWER SECTION:
cs.unh.edu.      86400 IN      A    132.177.4.32

;; AUTHORITY SECTION:
cs.unh.edu.      86400 IN      NS    cs.unh.edu.
cs.unh.edu.      86400 IN      NS    lava.cs.unh.edu.

;; ADDITIONAL SECTION:
lava.cs.unh.edu. 86400 IN      A    132.177.4.30
cs.unh.edu.      86400 IN      AAAA
2606:4100:38c0:9::3

;; Query time: 0 msec
;; SERVER: 132.177.4.32#53(132.177.4.32)
;; WHEN: Wed Oct 11 10:31:24 EDT 2017
;; MSG SIZE rcvd: 132

```

(Step v) As the last step, asking one of those for IP address:

```

[avv1004@agate ~]$ dig +norecurse cs.unh.edu
iol.unh.edu

; <<>> DiG 9.10.4-P8-RedHat-9.10.4-5.P8.fc25 <<>>
+norecurse cs.unh.edu iol.unh.edu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 15898
;; flags: qr aa ra; QUERY: 1, ANSWER: 1, AUTHORITY:
2, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;cs.unh.edu.      IN      A

;; ANSWER SECTION:
cs.unh.edu.      86400 IN      A    132.177.4.32

;; AUTHORITY SECTION:
cs.unh.edu.      86400 IN      NS    cs.unh.edu.
cs.unh.edu.      86400 IN      NS    lava.cs.unh.edu.

;; ADDITIONAL SECTION:
lava.cs.unh.edu. 86400 IN      A    132.177.4.30
cs.unh.edu.      86400 IN      AAAA
2606:4100:38c0:9::3

;; Query time: 0 msec
;; SERVER: 132.177.4.32#53(132.177.4.32)
;; WHEN: Wed Oct 11 10:32:09 EDT 2017
;; MSG SIZE rcvd: 132

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR,
id: 7558
;; flags: qr ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2,
ADDITIONAL: 4

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;iol.unh.edu.     IN      A

;; ANSWER SECTION:
iol.unh.edu.     191629 IN     A    132.177.123.95

;; AUTHORITY SECTION:
iol.unh.edu.     21042 IN     NS    dns.iol.unh.edu.
iol.unh.edu.     21042 IN     NS    dns-
slave.iol.unh.edu.

;; ADDITIONAL SECTION:
dns.iol.unh.edu. 198609 IN     A    132.177.123.46

```

dns-slave.iol.unh.edu. 193842 IN A  
132.177.123.83  
dns-slave.iol.unh.edu. 193842 IN AAAA  
2606:4100:3880:1234::4

:: Query time: 0 msec  
:: SERVER: 132.177.4.32#53(132.177.4.32)  
:: WHEN: Wed Oct 11 10:32:09 EDT 2017  
:: MSG SIZE rcvd: 158

5)  
IP Address : 175.45.176.81  
Country : KP or North Korea  
Hostname : Ryugyong-dong (AS131279), hostnames  
resolving to 175.45.176.81 : [www.mfa.gov.kp](http://www.mfa.gov.kp),  
[www.tourism DPRK.gov.kp](http://www.tourism DPRK.gov.kp)

6) Queried using -query as AAAA as it gives ipv6 address  
on agate which has ipv6 connectivity and received the ipv6  
address : 2607:f8b0:4006:805::200e  
(Commands provided below)

```
[avv1004@agate ~]$ nslookup -query=AAAA  
ipv6.google.com  
Server:      132.177.4.32  
Address:     132.177.4.32#53
```

Non-authoritative answer:  
ipv6.google.com canonical name = ipv6.l.google.com.  
ipv6.l.google.com has AAAA address  
2607:f8b0:4006:805::200e

Authoritative answers can be found from:  
google.com nameserver = ns4.google.com.  
google.com nameserver = ns3.google.com.  
google.com nameserver = ns2.google.com.  
google.com nameserver = ns1.google.com.  
ns2.google.com internet address = 216.239.34.10  
ns1.google.com internet address = 216.239.32.10  
ns3.google.com internet address = 216.239.36.10  
ns4.google.com internet address = 216.239.38.10

7) a)

(i) Full Query: www.redit.com

Response: protocol decode of Frame 2,  
114 bytes on wire and captured (912 bits),

IPV4, DST: 132.177.15.156,  
Transaction ID: 0x9367  
A www.redit.com CNAME redit.com A 201.175.1.137  
OPT

(ii) Full Query: www.redit.com

Response: protocol decode of Frame 4,  
114 bytes on wire and captured (912 bits),  
Transaction ID: 0x2bd0  
A www.redit.com CNAME redit.com A 201.175.1.137  
OPT

(iii) Full Query: nonexistent.redit.com

Response: protocol decode of Frame 6,  
146 bytes on wire and captured (1168 bits),  
Transaction ID: 0xf541  
No such name A nonexistent.redit.com SOA dns.redit.com  
OPT

Description:

Total number of queries is 3 and they are host address.  
Total number of responses is 3. They include 1 with 'No  
such name' message, number of packets = 1. 'No error',  
number of packets = 2.  
RR Types includes 2 number of response records for Host  
address, 2 number of response records for CNAME  
(Canonical name for an alias), 3 number of response  
records for OPT, 1 number of response record for SOA  
(State of a zone of Authority) where for the 3<sup>rd</sup> query it was  
unable to find IP address, so instead of returning IP  
address, it asks to check at dns.redit.com

Response time varied from 0.078864 sec for Frame 2,  
0.026048 for Frame 4, 0.088949 sec for Frame 6.

b) Name server in query 1: [redit.com](http://redit.com)  
Name server in query 2: [redit.com](http://redit.com)  
Name server in query 3: nonexistent.redit.com

c) One(1) Returned (resolved) ip address is 201.175.1.137  
Name : redit.com  
Country: Mexico  
Returned in query response 2 times.

d)

Time to live value for IP address in query 1 response  
(frame 2) = 599  
Time to live value for IP address in query 2 response  
(frame 4) = 227

Time to live value for IP address in query 3 response (frame 6) = NA

e)

```
dig redit.com
dig redit.com
dig nonexistent.redit.com
```

```
or,
ipconfig/flushdns
ipconfig/displaydns
nslookup redit.com
or
tcpdump
```

f)

Latencies of queries:

Response time for query 1 (0.078864) is higher in the beginning and it reduced for query 2 (0.026048).

It later increased for query 3 (0.088949) and it is the highest.

Response time was high for the first time when a new query was given and it reduced when the same query is given for the 2<sup>nd</sup> time. It increased highly when a non-existent address was given.

8)

a) Experiment description:

Code implemented in python, Server.py executed from personal system with LAN ip address chooses the specified port, host\_server and starts to listen for a connection from client, while Client.py executed in [agate.cs.unh.edu](https://www.agate.cs.unh.edu) gets a connection established to the listening server. As soon as the connection is established, Server makes note of current time and sends the .txt file which is 1MB in size and makes note of time at that instance as soon as the file is sent. Difference between the times is noted down as upload throughput.

Client.py starts to make note of current time and as soon as it receives the .txt file from server, it opens a while loop and receive the data. After saving the file with complete information at client destination, it ends time to calculate download throughput.

Table 1.1 Observed round-trip latency and upload, download throughput (all measurements are in seconds given for 1kb of data for analysis, actual file size is 1mb)

Execute count	Round-trip latency (seconds)	Upload throughput (seconds)	Download throughput (seconds)
1	0.062000	0.0150001	0.04700016
2	0.059001	0.0183191	0.05819012
3	0.063421	0.0314617	0.03276545
4	0.048944	0.0672457	0.04243254
5	0.324523	0.0415459	0.03212457

From the experiment and analysis, it has been noted from sequence of runs that upload time taken by the server is less than the download time taken by the client. The upload time taken by the server when placed in different machine is high than time received while executing Server and Client in the same host. Round trip latency, time taken by server to send a packet and time taken by Client to receive the same packet is higher than individual upload or download throughput taken individually. Generally throughput and latency can be improved by having single instances of transfer while maximizing usage of packet data that is sent and received.

b) Snippet of the code developed for this experiment and analysis is given below:

Server.py

```
Server.py [3]
1  #importing socket
2  import socket
3  import ssl
4  import time
5  import sys
6
7  #chosen port
8  port = 7001
9  s = socket.socket()
10 #host_server = socket.gethostname()
11 host_server = "10.21.93.30"
12 #host = "132.177.238.65"
13 s.bind((host_server, port))
14 s.listen(4)
15
16 print 'Waiting for client....'
17 while True:
18     conn, addr = s.accept()
19     print 'Got connection from', addr
20     data = conn.recv(1024)
21     print('Server received', repr(data))
22     filename='ajesh.txt'
23     a1=time.time()
24     f = open(filename,'rb')
25     l = f.read(1024)
26     while (l):
27         conn.send(l)
28         l = f.read(1024)
29     f.close()
30     a2=time.time()
31     print('Sent')
32     print('Upload time:', a2-a1)
33     conn.close()
34     s.close()
```



## Client.py

```
Client.py
1  import socket
2  import time
3
4  s = socket.socket()
5  host = socket.gethostname()
6  host = "10.21.93.30"
7  port = 7001
8
9  s.connect((host, port))
10 s.send("Hello server!")
11
12 a3 = time.time()
13 with open('received_file', 'wb') as f:
14     while True:
15         data = s.recv(1024)
16         if not data:
17             break
18         f.write(data)
19 f.close()
20 a4 = time.time()
21 print('Download time:', a4-a3)
22 s.close()
```