Lab Exercise 3: DNS & Socket Programming

Exercise 3: Digging into DNS

```
z5173593@vx7:~$ dig www.eecs.berkeley.edu A

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> www.eecs.berkeley.edu A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29908
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 4, ADDITIONAL: 8

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;www.eecs.berkeley.edu.         IN      A

;; ANSWER SECTION:
www.eecs.berkeley.edu.  27532   IN      CNAME   live-eecs.pantheonsite.io.
live-eecs.pantheonsite.io. 149  IN      CNAME   fe1.edge.pantheon.io.
fe1.edge.pantheon.io.   245     IN      A       23.185.0.1
```

Question1.

IP address of www.eecs.berkeley.edu is 23.185.0.1, type A

Question 2.

CNAME is live-execs.pantheonsite.io. & fe1.edge.pantheon.io.

The reason for having alias is:

1) If we wan t to change the IP address for that website, we only need to change the last record and keep 'www.eecs.berkeley.edu.' unchanged.

2) The original name is very long and hard to remember or type, is not friendly for user, also the original are not meaningful.

Question 3.

```
;; AUTHORITY SECTION:
edge.pantheon.io.       164     IN      NS      ns-1213.awsdns-23.org.
edge.pantheon.io.       164     IN      NS      ns-2013.awsdns-59.co.uk.
edge.pantheon.io.       164     IN      NS      ns-644.awsdns-16.net.
edge.pantheon.io.       164     IN      NS      ns-233.awsdns-29.com.

;; ADDITIONAL SECTION:
ns-233.awsdns-29.com.   13004   IN      A       205.251.192.233
ns-233.awsdns-29.com.   13004   IN      AAAA    2600:9000:5300:e900::1
ns-644.awsdns-16.net.   13305   IN      A       205.251.194.132
ns-644.awsdns-16.net.   12003   IN      AAAA    2600:9000:5302:8400::1
ns-1213.awsdns-23.org.  12223   IN      A       205.251.196.189
ns-1213.awsdns-23.org.  11549   IN      AAAA    2600:9000:5304:bd00::1
ns-2013.awsdns-59.co.uk. 5815   IN      A       205.251.199.221
```

Authority sections contains web servers related to the webs in ‘ANSWER SECTION’. Additional sections contain the actual IP address for the name servers.

Question 4.

```
;; Query time: 9 msec
;; SERVER: 129.94.242.45#53(129.94.242.45)
;; WHEN: Sun Jun 28 16:39:12 AEST 2020
;; MSG SIZE  rcvd: 425
```

The IP address of my machine is 129.94.242.45#53

Question 5.

```
;; ANSWER SECTION:
eecs.berkeley.edu.      77094   IN      NS      adns1.berkeley.edu.
eecs.berkeley.edu.      77094   IN      NS      ns.CS.berkeley.edu.
eecs.berkeley.edu.      77094   IN      NS      ns.eecs.berkeley.edu.
eecs.berkeley.edu.      77094   IN      NS      adns2.berkeley.edu.
eecs.berkeley.edu.      77094   IN      NS      adns3.berkeley.edu.

;; ADDITIONAL SECTION:
ns.CS.berkeley.edu.     77883   IN      A       169.229.60.61
ns.eecs.berkeley.edu.   7394    IN      A       169.229.60.153
adns1.berkeley.edu.     221     IN      A       128.32.136.3
adns2.berkeley.edu.     129     IN      A       128.32.136.14
adns3.berkeley.edu.     1494    IN      A       192.107.102.142
adns3.berkeley.edu.     33339   IN      AAAA    2607:f140:a000:d::abc
```

DNS name servers:

adns1.berkeley.edu.	169.229.60.61
ns.CS.berkeley.edu.	169.229.60.153
ns.eecs.berkeley.edu.	128.32.136.3
adns2.berkeley.edu.	128.32.136.14
adns3.berkeley.edu.	192.107.102.142

NS type DNS query.

Question 6.

```
;; ANSWER SECTION:
54.101.68.111.in-addr.arpa. 1354 IN     PTR     webserver.seecs.nust.edu.pk.
```

DNS name for this IP address is webserver.seec.nyst.edu.pk. , type is PTR.

Question 7.

```
z5173593@vx7:~$ dig yahoo.com MX

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> yahoo.com MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 58990
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 9

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;yahoo.com.                     IN      MX

;; ANSWER SECTION:
yahoo.com.              1101    IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.              1101    IN      MX      1 mta6.am0.yahoodns.net.
yahoo.com.              1101    IN      MX      1 mta7.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.              6927    IN      NS      ns1.yahoo.com.
yahoo.com.              6927    IN      NS      ns4.yahoo.com.
yahoo.com.              6927    IN      NS      ns5.yahoo.com.
yahoo.com.              6927    IN      NS      ns2.yahoo.com.
yahoo.com.              6927    IN      NS      ns3.yahoo.com.
```

The flags are: qr, rd, ra. Not ‘aa’, so there’s no authority answer. This is because the answer section are from local DNS server not the originally server.

```
z5173593@vx3:~$ dig @ns3.yahoo.com yahoo.com MX

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @ns3.yahoo.com yahoo.com MX
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41301
;; flags: qr aa rd; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 10
;; WARNING: recursion requested but not available
```

But if we add @ns3.yahoo.com, flag ‘aa’ appears, it means we got the authority answer.

Question 8.

```
z5173593@vx7:~$ dig @adns1.berkeley.edu yahoo.com MX

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @adns1.berkeley.edu yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: REFUSED, id: 4642
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 1
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;yahoo.com.                     IN      MX

;; Query time: 168 msec
;; SERVER: 128.32.136.3#53(128.32.136.3)
;; WHEN: Sun Jun 28 18:08:47 AEST 2020
;; MSG SIZE  rcvd: 38
```

'answer: 0', means there's no answer, the Berkeley server is built for Berkeley not Yahoo, so either because Berkeley not provide service for Yahoo or Yahoo didn't catch the recursion form Berkeley.

Question 9.

Use MX type of DNS query and add one of the address from authority answer in the command like:

```
;; AUTHORITY SECTION:
yahoo.com.              172800  IN      NS      ns3.yahoo.com.
yahoo.com.              172800  IN      NS      ns2.yahoo.com.
yahoo.com.              172800  IN      NS      ns1.yahoo.com.
yahoo.com.              172800  IN      NS      ns5.yahoo.com.
yahoo.com.              172800  IN      NS      ns4.yahoo.com.
```

dig @ns3.yahoo.com yahoo.com MX

Question 10.

```
z5173593@vx3:~$ hostname -f
vx3.orchestra.cse.unsw.EDU.AU
```

```
z5173593@vx3:~$ dig . NS

;; ADDITIONAL SECTION:
a.root-servers.net.     151344  IN      A       198.41.0.4
a.root-servers.net.     130969  IN      AAAA    2001:503:ba3e::2:30
b.root-servers.net.     1302    IN      A       199.9.14.201
b.root-servers.net.     147380  IN      AAAA    2001:500:200::b
c.root-servers.net.     1303    IN      A       192.33.4.12
c.root-servers.net.     86876   IN      AAAA    2001:500:2::c
d.root-servers.net.     1215    IN      A       199.7.91.13
d.root-servers.net.     86876   IN      AAAA    2001:500:2d::d
e.root-servers.net.     1215    IN      A       192.203.230.10
e.root-servers.net.     86876   IN      AAAA    2001:500:a8::e
f.root-servers.net.     598541  IN      A       192.5.5.241
f.root-servers.net.     96548   IN      AAAA    2001:500:2f::f
g.root-servers.net.     1215    IN      A       192.112.36.4
g.root-servers.net.     86875   IN      AAAA    2001:500:12::d0d
h.root-servers.net.     302550  IN      A       198.97.190.53
h.root-servers.net.     86876   IN      AAAA    2001:500:1::53
i.root-servers.net.     26348   IN      A       192.36.148.17
i.root-servers.net.     96548   IN      AAAA    2001:7fe::53
j.root-servers.net.     1215    IN      A       192.58.128.30
j.root-servers.net.     250777  IN      AAAA    2001:503:c27::2:30
k.root-servers.net.     302550  IN      A       193.0.14.129
k.root-servers.net.     184278  IN      AAAA    2001:7fd::1
l.root-servers.net.     1215    IN      A       199.7.83.42
l.root-servers.net.     148435  IN      AAAA    2001:500:9f::42
m.root-servers.net.     601675  IN      A       202.12.27.33
m.root-servers.net.     233970  IN      AAAA    2001:dc3::35
```

Choose root ‘m’ — 202.12.27.33

```
z5173593@vx3:~$ dig @202.12.27.33 vx3.orchestra.cse.unsw.edu.au

;; ADDITIONAL SECTION:
a.au.                   172800  IN      A       58.65.254.73
c.au.                   172800  IN      A       162.159.24.179
d.au.                   172800  IN      A       162.159.25.38
m.au.                   172800  IN      A       156.154.100.24
n.au.                   172800  IN      A       156.154.101.24
q.au.                   172800  IN      A       65.22.196.1
r.au.                   172800  IN      A       65.22.197.1
s.au.                   172800  IN      A       65.22.198.1
t.au.                   172800  IN      A       65.22.199.1
a.au.                   172800  IN      AAAA    2407:6e00:254:306::73
c.au.                   172800  IN      AAAA    2400:cb00:2049:1::a29f:18b3
d.au.                   172800  IN      AAAA    2400:cb00:2049:1::a29f:1926
m.au.                   172800  IN      AAAA    2001:502:2eda::24
n.au.                   172800  IN      AAAA    2001:502:ad09::24
q.au.                   172800  IN      AAAA    2a01:8840:be::1
r.au.                   172800  IN      AAAA    2a01:8840:bf::1
s.au.                   172800  IN      AAAA    2a01:8840:c0::1
t.au.                   172800  IN      AAAA    2a01:8840:c1::1
```

Choose the first .au — 58.65.254.73

```
z5173593@vx3:~$ dig @58.65.254.73 vx3.orchestra.cse.unsw.edu.au

;; ADDITIONAL SECTION:
q.au.                   86400   IN      A       65.22.196.1
r.au.                   86400   IN      A       65.22.197.1
s.au.                   86400   IN      A       65.22.198.1
t.au.                   86400   IN      A       65.22.199.1
q.au.                   86400   IN      AAAA    2a01:8840:be::1
r.au.                   86400   IN      AAAA    2a01:8840:bf::1
s.au.                   86400   IN      AAAA    2a01:8840:c0::1
t.au.                   86400   IN      AAAA    2a01:8840:c1::1
```

.edu.au

```
; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @58.65.254.73 vx3.orchestra.cse.unsw.edu.au
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 36084
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 9
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;vx3.orchestra.cse.unsw.edu.au. IN      A

;; AUTHORITY SECTION:
edu.au.                 86400   IN      NS      s.au.
edu.au.                 86400   IN      NS      q.au.
edu.au.                 86400   IN      NS      t.au.
edu.au.                 86400   IN      NS      r.au.

;; ADDITIONAL SECTION:
q.au.                   86400   IN      A       65.22.196.1
r.au.                   86400   IN      A       65.22.197.1
s.au.                   86400   IN      A       65.22.198.1
t.au.                   86400   IN      A       65.22.199.1
q.au.                   86400   IN      AAAA    2a01:8840:be::1
r.au.                   86400   IN      AAAA    2a01:8840:bf::1
s.au.                   86400   IN      AAAA    2a01:8840:c0::1
t.au.                   86400   IN      AAAA    2a01:8840:c1::1
```

unsw.edu.au

```
z5173593@vx3:~$ dig @65.22.196.1 vx3.orchestra.cse.unsw.edu.au

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @65.22.196.1 vx3.orchestra.cse.unsw.edu.au
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 52817
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 6
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;vx3.orchestra.cse.unsw.edu.au. IN      A

;; AUTHORITY SECTION:
unsw.edu.au.            900     IN      NS      ns1.unsw.edu.au.
unsw.edu.au.            900     IN      NS      ns2.unsw.edu.au.
unsw.edu.au.            900     IN      NS      ns3.unsw.edu.au.

;; ADDITIONAL SECTION:
ns1.unsw.edu.au.        900     IN      A       129.94.0.192
ns2.unsw.edu.au.        900     IN      A       129.94.0.193
ns3.unsw.edu.au.        900     IN      A       192.155.82.178
ns1.unsw.edu.au.        900     IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au.        900     IN      AAAA    2001:388:c:35::2
```

cse.unsw.edu.au

But the ‘ANSWER’ is still 0, so we keep digging.

```
z5173593@vx3:~$ dig @129.94.0.192 vx3.orchestra.cse.unsw.edu.au

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @129.94.0.192 vx3.orchestra.cse.unsw.edu.au
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 6412
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 2, ADDITIONAL: 5
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;vx3.orchestra.cse.unsw.edu.au. IN      A

;; AUTHORITY SECTION:
cse.unsw.edu.au.        10800   IN      NS      beethoven.orchestra.cse.unsw.edu.au.
cse.unsw.edu.au.        10800   IN      NS      maestro.orchestra.cse.unsw.edu.au.

;; ADDITIONAL SECTION:
beethoven.orchestra.cse.unsw.edu.au. 10800 IN A 129.94.172.11
beethoven.orchestra.cse.unsw.edu.au. 10800 IN A 129.94.208.3
beethoven.orchestra.cse.unsw.edu.au. 10800 IN A 129.94.242.2
maestro.orchestra.cse.unsw.edu.au. 10800 IN A   129.94.242.33

;; Query time: 4 msec
;; SERVER: 129.94.0.192#53(129.94.0.192)
;; WHEN: Mon Jun 29 00:40:06 AEST 2020
;; MSG SIZE  rcvd: 168
```

orchestra.cse.unsw.edu.au

```
z5173593@vx3:~$ dig @maestro.orchestra.cse.unsw.edu.au vx3.orchestra.cse.unsw.edu.au

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @maestro.orchestra.cse.unsw.edu.au vx3.orchestra.cse.unsw.edu.au
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41338
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;vx3.orchestra.cse.unsw.edu.au. IN      A

;; ANSWER SECTION:
vx3.orchestra.cse.unsw.edu.au. 3600 IN  A       129.94.242.116

;; AUTHORITY SECTION:
orchestra.cse.unsw.edu.au. 3600 IN      NS      beethoven.orchestra.cse.unsw.edu.au.
orchestra.cse.unsw.edu.au. 3600 IN      NS      maestro.orchestra.cse.unsw.edu.au.

;; ADDITIONAL SECTION:
maestro.orchestra.cse.unsw.edu.au. 3600 IN A    129.94.242.33
beethoven.orchestra.cse.unsw.edu.au. 3600 IN A  129.94.242.2

;; Query time: 0 msec
;; SERVER: 129.94.242.33#53(129.94.242.33)
;; WHEN: Mon Jun 29 00:42:19 AEST 2020
;; MSG SIZE  rcvd: 152
```

Now the ‘ANSWER’ is ‘1’, which get the IP address of orchestra.cse.unsw.edu.au

So total 5 DNS servers.

Question 11.

Yes, one physical machine can have several names and/or IP addresses associated with it. Multiple interfaces will have different IP addresses.