

Week 4 Lab Report - COMP3331

Exercise 2

The following is the output when I dig www.cecs.anu.edu.au.

```
wk4 21:49:06 $ dig www.cecs.anu.edu.au
; <<>> DiG 9.7.3 <<>> www.cecs.anu.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 8701
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 4, ADDITIONAL: 5

;; QUESTION SECTION:
;www.cecs.anu.edu.au.          IN      A

;; ANSWER SECTION:
www.cecs.anu.edu.au.  1997    IN      CNAME  rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au. 1997    IN      A      150.203.161.98

;; AUTHORITY SECTION:
cecs.anu.edu.au.  76      IN      NS      ns3.cecs.anu.edu.au.
cecs.anu.edu.au.  76      IN      NS      ns2.cecs.anu.edu.au.
cecs.anu.edu.au.  76      IN      NS      ns4.cecs.anu.edu.au.
cecs.anu.edu.au.  76      IN      NS      ns1.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns1.cecs.anu.edu.au. 1995    IN      A      150.203.161.4
ns2.cecs.anu.edu.au. 1995    IN      A      150.203.161.36
ns3.cecs.anu.edu.au. 426     IN      A      150.203.161.50
ns4.cecs.anu.edu.au. 426     IN      A      150.203.161.38
ns4.cecs.anu.edu.au. 426     IN      AAAA   2001:388:1034:2905::26

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Fri Aug 18 21:49:52 2017
;; MSG SIZE rcvd: 238
```

Q1:

- The IP address is **150.203.161.98**. The type of DNS query is A.

Q2:

- The canonical name(CNAME) is **rproxy.cecs.anu.edu.au**. Its IP address is also **150.203.161.98**. Alias host-names, when present, are typically more mnemonic than canonical hostnames.

Q3:

- The authority section contains records of other authoritative servers. These authoritative servers provide accessible DNS records that map the names of those

hosts to IP address. In addition, the additional section contains records of IP addresses of all the authoritative DNS servers. These IP addresses contain both IPv4 addresses and IPv6 addresses.

Q4:

- The local DNS server of CSE is **129.94.242.2**. If I use the command **dig +trace www.cecs.anu.edu.au**, as I know the root server is given by our local DNS server, from our output presenting below, I can see that list of root servers are received from **129.94.242.2**.

```
; <<>> DiG 9.7.3 <<>> +trace www.cecs.anu.edu.au
;; global options: +cmd
.                213003      IN      NS      e.root-servers.net.
.                213003      IN      NS      g.root-servers.net.
.                213003      IN      NS      f.root-servers.net.
.                213003      IN      NS      c.root-servers.net.
.                213003      IN      NS      m.root-servers.net.
.                213003      IN      NS      h.root-servers.net.
.                213003      IN      NS      j.root-servers.net.
.                213003      IN      NS      i.root-servers.net.
.                213003      IN      NS      b.root-servers.net.
.                213003      IN      NS      d.root-servers.net.
.                213003      IN      NS      l.root-servers.net.
.                213003      IN      NS      k.root-servers.net.
.                213003      IN      NS      a.root-servers.net.
;; Received 508 bytes from 129.94.242.2#53(129.94.242.2) in 0 ms
```

Q5:

The output when I dig -t NS cecs.anu.edu.au.

```
~ 22:35:13 $ dig -t NS cecs.anu.edu.au

; <<>> DiG 9.7.3 <<>> -t NS cecs.anu.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 36757
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 8

;; QUESTION SECTION:
;cecs.anu.edu.au.      IN      NS

;; ANSWER SECTION:
cecs.anu.edu.au.  1532    IN      NS      ns4.cecs.anu.edu.au.
cecs.anu.edu.au.  1532    IN      NS      ns1.cecs.anu.edu.au.
cecs.anu.edu.au.  1532    IN      NS      ns3.cecs.anu.edu.au.
cecs.anu.edu.au.  1532    IN      NS      ns2.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns1.cecs.anu.edu.au.  2863    IN      A        150.203.161.4
ns1.cecs.anu.edu.au.  1532    IN      AAAA     2001:388:1034:2905::4
```

```

ns2.cecs.anu.edu.au.    2864  IN      A       150.203.161.36
ns2.cecs.anu.edu.au.    1532  IN      AAAA    2001:388:1034:2905::24
ns3.cecs.anu.edu.au.    1295  IN      A       150.203.161.50
ns3.cecs.anu.edu.au.    860   IN      AAAA    2001:388:1034:2905::32
ns4.cecs.anu.edu.au.    1296  IN      A       150.203.161.38
ns4.cecs.anu.edu.au.    1297  IN      AAAA    2001:388:1034:2905::26

```

```

;; Query time: 2 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Fri Aug 18 22:35:37 2017
;; MSG SIZE rcvd: 281

```

- From the output above, here is the summary:

DNS nameserver	IPv4	IPv6
ns1.cecs.anu.edu.au	150.203.161.4	2001:388:1034:2905::4
ns2.cecs.anu.edu.au	150.203.161.36	2001:388:1034:2905::24
ns3.cecs.anu.edu.au	150.203.161.50	2001:388:1034:2905::32
ns4.cecs.anu.edu.au	150.203.161.38	2001:388:1034:2905::26

- The type of query sent to obtain that information is NS.

Q6:

```

~ 22:45:37 $ dig -x 149.171.158.109
; <<>> DiG 9.7.3 <<>> -x 149.171.158.109
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 26797
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 3, ADDITIONAL: 6
;; QUESTION SECTION:
;109.158.171.149.in-addr.arpa.      IN      PTR
;; ANSWER SECTION:
109.158.171.149.in-addr.arpa. 3414 IN      PTR    www.engineering.unsw.edu.au.
109.158.171.149.in-addr.arpa. 3414 IN      PTR    engplws008.ad.unsw.edu.au.
;; AUTHORITY SECTION:
158.171.149.in-addr.arpa. 10614 IN      NS      ns3.unsw.edu.au.
158.171.149.in-addr.arpa. 10614 IN      NS      ns2.unsw.edu.au.
158.171.149.in-addr.arpa. 10614 IN      NS      ns1.unsw.edu.au.
;; ADDITIONAL SECTION:
ns1.unsw.edu.au. 3503 IN      A       129.94.0.192
ns1.unsw.edu.au. 8728 IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au. 3503 IN      A       129.94.0.193
ns2.unsw.edu.au. 8728 IN      AAAA    2001:388:c:35::2

```

```

ns3.unsw.edu.au. 3503 IN A 192.155.82.178
ns3.unsw.edu.au. 8728 IN AAAA 2600:3c01::f03c:91ff:fe73:5f10
;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Fri Aug 18 22:45:49 2017
;; MSG SIZE rcvd: 301

```

- There are two domain names associated with **149.171.158.109**. One is **www.engineering.unsw.edu.au** and the other is **engplws008.ad.unsw.edu.au**. And the type of query is PTR.

Q7:

```

wk4 23:00:15 $ dig MX yahoo.com @129.94.242.33
; <<>> DiG 9.7.3 <<>> MX yahoo.com @129.94.242.33
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 24018
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8
;; QUESTION SECTION:
;yahoo.com. IN MX
;; ANSWER SECTION:
yahoo.com. 1324 IN MX 1 mta7.am0.yahoodns.net.
yahoo.com. 1324 IN MX 1 mta5.am0.yahoodns.net.
yahoo.com. 1324 IN MX 1 mta6.am0.yahoodns.net.
;; AUTHORITY SECTION:
yahoo.com. 36031 IN NS ns5.yahoo.com.
yahoo.com. 36031 IN NS ns3.yahoo.com.
yahoo.com. 36031 IN NS ns1.yahoo.com.
yahoo.com. 36031 IN NS ns4.yahoo.com.
yahoo.com. 36031 IN NS ns2.yahoo.com.
;; ADDITIONAL SECTION:
ns1.yahoo.com. 388120 IN A 68.180.131.16
ns1.yahoo.com. 43054 IN AAAA 2001:4998:130::1001
ns2.yahoo.com. 296975 IN A 68.142.255.16
ns2.yahoo.com. 64194 IN AAAA 2001:4998:140::1002
ns3.yahoo.com. 4916 IN A 203.84.221.53
ns3.yahoo.com. 35219 IN AAAA 2406:8600:b8:fe03::1003
ns4.yahoo.com. 296975 IN A 98.138.11.157
ns5.yahoo.com. 217006 IN A 119.160.247.124
;; Query time: 0 msec
;; SERVER: 129.94.242.33#53(129.94.242.33)
;; WHEN: Fri Aug 18 23:00:45 2017
;; MSG SIZE rcvd: 360

```

- I found I have not received any authoritative answer because “aa” which means getting authoritative answer does not include in the flags. As my CSE machine asked that specified CSE DNS server, the message was sent from that DNS server. However, I

could get this “aa” flag only if the message was sent directly from one of the authoritative servers for yahoo.com.

Q8:

```
wk4 23:22:08 $ dig MX yahoo.com @ns2.cecs.anu.edu.au
; <<>> DiG 9.7.3 <<>> MX yahoo.com @ns2.cecs.anu.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 47321
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
yahoo.com\@ns2.cecs.anu.edu.au.      IN      MX

;; AUTHORITY SECTION:
cecs.anu.edu.au. 3600 IN      SOA      ns1.cecs.anu.edu.au.
hostmaster.cecs.anu.edu.au. 1502939351 10800 3600 604800 86400

;; Query time: 23 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Fri Aug 18 23:22:15 2017
;; MSG SIZE rcvd: 98
```

- Hence, from the output above, it did not return any answer.

Q9:

```
wk4 23:42:04 $ dig MX yahoo.com @ns1.yahoo.com

; <<>> DiG 9.7.3 <<>> MX yahoo.com @ns1.yahoo.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 51356
;; flags: qr aa rd; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
yahoo.com.      IN      MX

;; ANSWER SECTION:
yahoo.com.      1800 IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.      1800 IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.      1800 IN      MX      1 mta6.am0.yahoodns.net.

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

```

yahoo.com.      172800    IN      NS      ns4.yahoo.com.
yahoo.com.      172800    IN      NS      ns1.yahoo.com.
yahoo.com.      172800    IN      NS      ns3.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.  1209600   IN      A       68.180.131.16
ns2.yahoo.com.  1209600   IN      A       68.142.255.16
ns3.yahoo.com.  1209600   IN      A       203.84.221.53
ns4.yahoo.com.  1209600   IN      A       98.138.11.157
ns5.yahoo.com.  1209600   IN      A       119.160.247.124
ns1.yahoo.com.  86400     IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.  86400     IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.  86400     IN      AAAA    2406:8600:b8:fe03::1003

;; Query time: 146 msec
;; SERVER: 68.180.131.16#53(68.180.131.16)
;; WHEN: Fri Aug 18 23:43:52 2017
;; MSG SIZE rcvd: 360

```

- By checking the flag, there is an “aa” flag in the output. So I can conclude that the answer is authoritative. So the answers for mail servers for Yahoo!Mail are **mta5.am0.yahoodns.net**, **mta6.am0.yahoodns.net** and **mta7.am0.yahoodns.net**. The query type is MX.

Q10:

Ask my local DNS server for root server:

```

~ 23:52:29 $ dig ns .
; <<>> DiG 9.7.3 <<>> ns .
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 46945
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 13

;; QUESTION SECTION:
;.                IN      NS
;; ANSWER SECTION:
.                 207330   IN      NS      b.root-servers.net.
.                 207330   IN      NS      a.root-servers.net.
.                 207330   IN      NS      f.root-servers.net.
.                 207330   IN      NS      c.root-servers.net.
.                 207330   IN      NS      k.root-servers.net.
.                 207330   IN      NS      l.root-servers.net.
.                 207330   IN      NS      m.root-servers.net.
.                 207330   IN      NS      i.root-servers.net.
.                 207330   IN      NS      h.root-servers.net.
.                 207330   IN      NS      j.root-servers.net.
.                 207330   IN      NS      d.root-servers.net.
.                 207330   IN      NS      g.root-servers.net.

```

```

.                207330      IN      NS      e.root-servers.net.

;; ADDITIONAL SECTION:
a.root-servers.net. 293849      IN      A      198.41.0.4
a.root-servers.net. 293849      IN      AAAA   2001:503:ba3e::2:30
b.root-servers.net. 40809 IN      A      192.228.79.201
b.root-servers.net. 311472      IN      AAAA   2001:500:200::b
c.root-servers.net. 87269 IN      A      192.33.4.12
c.root-servers.net. 485105      IN      AAAA   2001:500:2::c
d.root-servers.net. 270662      IN      A      199.7.91.13
d.root-servers.net. 3003 IN      AAAA   2001:500:2d::d
e.root-servers.net. 50393 IN      A      192.203.230.10
e.root-servers.net. 155350      IN      AAAA   2001:500:a8::e
f.root-servers.net. 314465      IN      A      192.5.5.241
f.root-servers.net. 53434 IN      AAAA   2001:500:2f::f
g.root-servers.net. 148974      IN      A      192.112.36.4
;; Query time: 1 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Fri Aug 18 23:54:44 2017
;; MSG SIZE rcvd: 508

```

Ask root for au DNS server

```

~ 23:54:44 $ dig NS au @b.root-servers.net
; <<>> DiG 9.7.3 <<>> NS au @b.root-servers.net
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41740
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 8, ADDITIONAL: 15
;; WARNING: recursion requested but not available
;; QUESTION SECTION:
;au.                IN      NS
;; AUTHORITY SECTION:
au.                172800      IN      NS      y.au.
au.                172800      IN      NS      v.au.
au.                172800      IN      NS      b.au.
au.                172800      IN      NS      u.au.
au.                172800      IN      NS      x.au.
au.                172800      IN      NS      a.au.
au.                172800      IN      NS      w.au.
au.                172800      IN      NS      z.au.
;; ADDITIONAL SECTION:
a.au.              172800      IN      A      58.65.254.73
b.au.              172800      IN      A      58.65.253.73
u.au.              172800      IN      A      211.29.133.32
v.au.              172800      IN      A      202.12.31.141
w.au.              172800      IN      A      37.209.192.5
x.au.              172800      IN      A      37.209.194.5

```

```

y.au.          172800      IN      A       37.209.196.5
z.au.          172800      IN      A       37.209.198.5
a.au.          172800      IN      AAAA    2407:6e00:254:306::73
b.au.          172800      IN      AAAA    2407:6e00:253:306::73
v.au.          172800      IN      AAAA    2001:dcd:4001:1:0:1836:0:141
w.au.          172800      IN      AAAA    2001:dcd:1::5
x.au.          172800      IN      AAAA    2001:dcd:2::5
y.au.          172800      IN      AAAA    2001:dcd:3::5
z.au.          172800      IN      AAAA    2001:dcd:4::5
;; Query time: 173 msec
;; SERVER: 192.228.79.201#53(192.228.79.201)
;; WHEN: Fri Aug 18 23:55:41 2017
;; MSG SIZE rcvd: 472

```

Ask au for edu.au DNS server

```

~ 23:58:14 $ dig NS edu.au @y.au
; <<>> DiG 9.7.3 <<>> NS edu.au @y.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 64952
;; flags: qr aa rd; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 0
;; WARNING: recursion requested but not available
;; QUESTION SECTION:
;edu.au.                IN      NS
;; ANSWER SECTION:
edu.au.                 86400   IN      NS      w.au.
edu.au.                 86400   IN      NS      x.au.
edu.au.                 86400   IN      NS      y.au.
edu.au.                 86400   IN      NS      z.au.
;; Query time: 15 msec
;; SERVER: 37.209.196.5#53(37.209.196.5)
;; WHEN: Sat Aug 19 00:00:37 2017
;; MSG SIZE rcvd: 88

```

Ask edu.au for unsw.edu.au DNS server

```

~ 23:55:41 $ dig NS unsw.edu.au @y.au
; <<>> DiG 9.7.3 <<>> NS unsw.edu.au @y.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1022
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 5
;; WARNING: recursion requested but not available
;; QUESTION SECTION:
;unsw.edu.au.           IN      NS
;; AUTHORITY SECTION:
unsw.edu.au.           14400   IN      NS      ns3.unsw.edu.au.

```



```

unsw.edu.au.      14400 IN      NS      ns2.unsw.edu.au.
unsw.edu.au.      14400 IN      NS      ns1.unsw.edu.au.
;; ADDITIONAL SECTION:
ns1.unsw.edu.au.  14400 IN      A       129.94.0.192
ns2.unsw.edu.au.  14400 IN      A       129.94.0.193
ns3.unsw.edu.au.  14400 IN      A       192.155.82.178
ns1.unsw.edu.au.  14400 IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au.  14400 IN      AAAA    2001:388:c:35::2
;; Query time: 15 msec
;; SERVER: 37.209.196.5#53(37.209.196.5)
;; WHEN: Fri Aug 18 23:56:10 2017
;; MSG SIZE rcvd: 187

```

Ask unsw.edu.au for cse.unsw.edu.au

```

~ 23:56:10 $ dig NS cse.unsw.edu.au @ns3.unsw.edu.au
; <<>> DiG 9.7.3 <<>> NS cse.unsw.edu.au @ns3.unsw.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 58502
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 2, ADDITIONAL: 4
;; WARNING: recursion requested but not available
;; QUESTION SECTION:
;cse.unsw.edu.au.      IN      NS
;; 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 129.94.242.2
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
maestro.orchestra.cse.unsw.edu.au. 10800 IN A 129.94.242.33
;; Query time: 157 msec
;; SERVER: 192.155.82.178#53(192.155.82.178)
;; WHEN: Fri Aug 18 23:56:45 2017
;; MSG SIZE rcvd: 153

```

Ask maestro.orchestra.cse.unsw.edu.au for weill.cse.unsw.edu.au

```

~ 23:56:45 $ dig A weill.cse.unsw.edu.au @maestro.orchestra.cse.unsw.edu.au
; <<>> DiG 9.7.3 <<>> A weill.cse.unsw.edu.au
@maestro.orchestra.cse.unsw.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50884
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 2
;; QUESTION SECTION:
;weill.cse.unsw.edu.au.      IN      A

```

```
;; ANSWER SECTION:
weill.cse.unsw.edu.au. 3600 IN A 129.94.242.49
;; AUTHORITY SECTION:
cse.unsw.edu.au. 3600 IN NS beethoven.orchestra.cse.unsw.edu.au.
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: Fri Aug 18 23:57:52 2017
;; MSG SIZE rcvd: 143
```

- There are 6 DNS servers that I have to query to get the authoritative answer. There are my local DNS server, root DNS server, au DNS server, edu.au DNS server, unsw.edu.au DNS server and cse.unsw.edu.au DNS server.

Q11:

- Yes, a computer may have several network interfaces and each network interface may have several IP addresses. Also, one IP address can have two different names. For example, in question 6, there are two names under the same IP address, which are www.engineering.unsw.edu.au and engplws008.ad.unsw.edu.au.