

Exercise 3:

Q1.

IP: 150.203.161.98

Class IN, Type A query is made according to dig output.

Q2.

The canonical name is rproxy.cecs.anu.edu.au with IP 150.203.161.98.

Aliases are used as internet hosts can be identified in different ways. They are useful for humans to identify the location of the host within internet. Plus, some aliases' length varies and can be hard to processed by routers, hence IP address is used instead.

```
weill % 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: 58721
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 3, ADDITIONAL: 6
;;
;; QUESTION SECTION:
;www.cecs.anu.edu.au.      IN      A
;;
;; ANSWER SECTION:
www.cecs.anu.edu.au.    2654    IN      CNAME   rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au.  958     IN      A       150.203.161.98
;;
;; AUTHORITY SECTION:
cecs.anu.edu.au.        854     IN      NS      ns4.cecs.anu.edu.au.
cecs.anu.edu.au.        854     IN      NS      ns2.cecs.anu.edu.au.
cecs.anu.edu.au.        854     IN      NS      ns3.cecs.anu.edu.au.
;;
;; ADDITIONAL SECTION:
ns2.cecs.anu.edu.au.   2330    IN      A       150.203.161.36
ns2.cecs.anu.edu.au.   1565    IN      AAAA   2001:388:1034:2905::24
ns3.cecs.anu.edu.au.   2133    IN      A       150.203.161.50
ns3.cecs.anu.edu.au.   854     IN      AAAA   2001:388:1034:2905::32
ns4.cecs.anu.edu.au.   3573    IN      A       150.203.161.38
ns4.cecs.anu.edu.au.   242     IN      AAAA   2001:388:1034:2905::26
;;
;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Wed Aug 15 16:23:59 2018
;; MSG SIZE rcvd: 260
```

Q3.

The rest of the response:

- i) Question Section: shows query being made to find host IP (or the A record for www.cecs.anu.edu.au)
- ii) Authority section: Dig receives query answers through some authoritative name servers list under this section.
- iii). Additional section: extra info provided that maybe wanted but not requested by dig command.

Q4.

(In the 1st picture)

IP of local name server : “;; SERVER: 129.94.242.2#53(129.94.242.2)”

Q5.

DNS name servers: (In the 1st picture)

- ns3.cecs.anu.edu.au. (IP: 150.203.161.50)
- ns2.cecs.anu.edu.au. (IP: 150.203.161.36)
- ns4.cecs.anu.edu.au. (IP: 150.203.161.38)

Type NS query is made.

Q6.

DNS name associated to this IP:

engplws008.ad.unsw.edu.au.

engplws008.eng.unsw.edu.au.

www.engineering.unsw.edu.au.

DNS query: PTR

Q7.

```
wagner % dig @129.94.242.33 yahoo.com MX

; <>> DiG 9.7.3 <>> @129.94.242.33 yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 9280
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8

;; QUESTION SECTION:
;yahoo.com.           IN      MX

;; ANSWER SECTION:
yahoo.com.          1794    IN      MX      1 mta6.am0.yahoodns.net.
yahoo.com.          1794    IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.          1794    IN      MX      1 mta5.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.          144045   IN      NS      ns4.yahoo.com.
yahoo.com.          144045   IN      NS      ns2.yahoo.com.
yahoo.com.          144045   IN      NS      ns1.yahoo.com.
yahoo.com.          144045   IN      NS      ns5.yahoo.com.
yahoo.com.          144045   IN      NS      ns3.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.      146076   IN      A       68.180.131.16
ns1.yahoo.com.      41545    IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.      128958   IN      A       68.142.255.16
ns2.yahoo.com.      32012    IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.      319942   IN      A       203.84.221.53
ns3.yahoo.com.      86355    IN      AAAA    2406:8600:b8:fe03::1003
ns4.yahoo.com.      135762   IN      A       98.138.11.157
ns5.yahoo.com.      121833   IN      A       119.160.253.83

;; Query time: 0 msec
;; SERVER: 129.94.242.33#53(129.94.242.33)
;; WHEN: Wed Aug 15 23:12:13 2018
;; MSG SIZE  rcvd: 360
```

Judging by the flags with aa, the mail server did not give an authoritative answer. This is mostly due to its authority within EPFL domain.

Q8.

```
weber %
weber % dig @ns3.cecs.anu.edu.au. yahoo.com MX
; <>> DiG 9.7.3 <>> @ns3.cecs.anu.edu.au. yahoo.com MX
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: REFUSED, id: 51848
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 0
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;yahoo.com.           IN      MX

;; Query time: 7 msec
;; SERVER: 150.203.161.50#53(150.203.161.50)
;; WHEN: Wed Aug 15 23:30:14 2018
;; MSG SIZE rcvd: 27
```

No reply is received from the mail server.

```
weber %
weber %
weber %
weber %
weber %
weber % dig yahoo.com MX
;
; <>> DiG 9.7.3 <>> yahoo.com MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50119
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8
;
;; QUESTION SECTION:
;yahoo.com.           IN      MX
;
;; ANSWER SECTION:
yahoo.com.          619     IN      MX      1 mta6.am0.yahoodns.net.
yahoo.com.          619     IN      MX      1 mta7.am0.yahoodns.net.
@yahoo.com.         619     IN      MX      1 mta5.am0.yahoodns.net.

;;
;; AUTHORITY SECTION:
@yahoo.com.        65171   IN      NS      ns5.yahoo.com.
@yahoo.com.        65171   IN      NS      ns3.yahoo.com.
@yahoo.com.        65171   IN      NS      ns1.yahoo.com.
@yahoo.com.        65171   IN      NS      ns4.yahoo.com.
@yahoo.com.        65171   IN      NS      ns2.yahoo.com.

;;
;; ADDITIONAL SECTION:
ns1.yahoo.com.    151559  IN      A       68.180.131.16
ns1.yahoo.com.    40243   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.    127656  IN      A       68.142.255.16
ns2.yahoo.com.    30710   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.    318640  IN      A       203.84.221.53
ns3.yahoo.com.    137619  IN      AAAA    2406:8600:b8:fe03::1003
ns4.yahoo.com.    134460  IN      A       98.138.11.157
ns5.yahoo.com.    124183  IN      A       119.160.253.83
;
;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Wed Aug 15 23:33:55 2018
;; MSG SIZE rcvd: 360
```

Q9.

A NS query is made to obtain authoritative answers from yahoo.com mail servers. The authoritative answers are listed under authority section.

Q10.

1. First, find the name server (query type NS) of the "." domain (root domain).

```
weber % dig ns .

; <>> DiG 9.7.3 <>> ns .
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 37661
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 13

;; QUESTION SECTION:
.; IN NS

;; ANSWER SECTION:
. 61451 IN NS j.root-servers.net.
. 61451 IN NS g.root-servers.net.
. 61451 IN NS f.root-servers.net.
. 61451 IN NS d.root-servers.net.
. 61451 IN NS e.root-servers.net.
. 61451 IN NS a.root-servers.net.
. 61451 IN NS c.root-servers.net.
. 61451 IN NS l.root-servers.net.
. 61451 IN NS m.root-servers.net.
. 61451 IN NS b.root-servers.net.
. 61451 IN NS i.root-servers.net.
. 61451 IN NS k.root-servers.net.
. 61451 IN NS h.root-servers.net.

;; ADDITIONAL SECTION:
a.root-servers.net. 70749 IN A 198.41.0.4
a.root-servers.net. 188997 IN AAAA 2001:503:ba3e::2:30
b.root-servers.net. 573933 IN A 199.9.14.201
b.root-servers.net. 335348 IN AAAA 2001:500:200::b
c.root-servers.net. 320805 IN A 192.33.4.12
c.root-servers.net. 558274 IN AAAA 2001:500:2::c
d.root-servers.net. 384985 IN A 199.7.91.13
d.root-servers.net. 384985 IN AAAA 2001:500:2d::d
e.root-servers.net. 30894 IN A 192.203.230.10
e.root-servers.net. 346248 IN AAAA 2001:500:a8::e
f.root-servers.net. 225031 IN A 192.5.5.241
f.root-servers.net. 10448 IN AAAA 2001:500:2f::f
g.root-servers.net. 313143 IN A 192.112.36.4

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:36:24 2018
;; MSG SIZE rcvd: 508
```

2. Query this nameserver to find the authoritative name server for the "au." domain.

```
weber % dig ns au.

; <>> DiG 9.7.3 <>> ns au.
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 65416
;; flags: qr rd ra; QUERY: 1, ANSWER: 10, AUTHORITY: 0, ADDITIONAL: 15

;; QUESTION SECTION:
;au.                      IN      NS

;; ANSWER SECTION:
au.          44006    IN      NS      r.au.
au.          44006    IN      NS      c.au.
au.          44006    IN      NS      d.au.
au.          44006    IN      NS      b.au.
au.          44006    IN      NS      t.au.
au.          44006    IN      NS      u.au.
au.          44006    IN      NS      a.au.
au.          44006    IN      NS      q.au.
au.          44006    IN      NS      v.au.
au.          44006    IN      NS      s.au.

;; ADDITIONAL SECTION:
a.au.        36179    IN      A       58.65.254.73
a.au.        26948    IN      AAAA    2407:6e00:254:306::73
b.au.        44572    IN      A       58.65.253.73
b.au.        38996    IN      AAAA    2407:6e00:253:306::73
c.au.        55090    IN      A       162.159.24.179
c.au.        54696    IN      AAAA    2400:cb00:2049:1::a29f:18b3
d.au.        41877    IN      A       162.159.25.38
d.au.        38996    IN      AAAA    2400:cb00:2049:1::a29f:1926
q.au.        71863    IN      A       65.22.196.1
q.au.        47176    IN      AAAA    2a01:8840:be::1
r.au.        49435    IN      A       65.22.197.1
r.au.        41467    IN      AAAA    2a01:8840:bf::1
s.au.        55865    IN      A       65.22.198.1
s.au.        55865    IN      AAAA    2a01:8840:c0::1
t.au.        38650    IN      A       65.22.199.1

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:36:34 2018
;; MSG SIZE  rcvd: 504
```

3. Query this second server to find the authoritative nameserver for the "edu.au." domain.

```
weber % dig ns edu.au.

; <>> DiG 9.7.3 <>> ns edu.au.
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29565
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 8

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

;; ANSWER SECTION:
edu.au.          669     IN      NS      r.au.
edu.au.          669     IN      NS      s.au.
edu.au.          669     IN      NS      q.au.
edu.au.          669     IN      NS      t.au.

;; ADDITIONAL SECTION:
q.au.            71853   IN      A       65.22.196.1
q.au.            47166   IN      AAAA    2a01:8840:be::1
r.au.            49425   IN      A       65.22.197.1
r.au.            41457   IN      AAAA    2a01:8840:bf::1
s.au.            55855   IN      A       65.22.198.1
s.au.            55855   IN      AAAA    2a01:8840:c0::1
t.au.            38640   IN      A       65.22.199.1
t.au.            55288   IN      AAAA    2a01:8840:c1::1

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:36:44 2018
;; MSG SIZE  rcvd: 264
```

4. Now query this nameserver to find the authoritative nameserver for "unsw.edu.au".

```

weber % dig ns unsw.edu.au

; <>> DiG 9.7.3 <>> ns unsw.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 54192
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 6

;; QUESTION SECTION:
;unsw.edu.au.           IN      NS

;; ANSWER SECTION:
unsw.edu.au.        5226    IN      NS      ns3.unsw.edu.au.
unsw.edu.au.        5226    IN      NS      ns2.unsw.edu.au.
unsw.edu.au.        5226    IN      NS      ns1.unsw.edu.au.

;; ADDITIONAL SECTION:
ns1.unsw.edu.au.    1159    IN      A       129.94.0.192
ns1.unsw.edu.au.    1159    IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au.    1159    IN      A       129.94.0.193
ns2.unsw.edu.au.    6881    IN      AAAA    2001:388:c:35::2
ns3.unsw.edu.au.    1159    IN      A       192.155.82.178
ns3.unsw.edu.au.    1166    IN      AAAA    2600:3c01::f03c:91ff:fe73:5f10

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:36:56 2018
;; MSG SIZE  rcvd: 215

```

5 & 6. Next query the nameserver of unsw.edu.au to find the authoritative name server of cse.unsw.edu.au. Now query the nameserver of cse.unsw.edu.au to find the IP address of your host.

```

weber % dig ns cse.unsw.edu.au.

; <>> DiG 9.7.3 <>> ns cse.unsw.edu.au.
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 25925
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 2

;; QUESTION SECTION:
;cse.unsw.edu.au.           IN      NS

;; ANSWER 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: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:37:11 2018
;; MSG SIZE rcvd: 121

weber % dig a beethoven orchestra.cse.unsw.edu.au.

; <>> DiG 9.7.3 <>> a beethoven orchestra.cse.unsw.edu.au.
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 59363
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 1

;; QUESTION SECTION:
;beethoven orchestra.cse.unsw.edu.au. IN      A

;; ANSWER SECTION:
beethoven orchestra.cse.unsw.edu.au. 3600 IN A      129.94.242.2

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

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

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug 16 00:37:31 2018
;; MSG SIZE rcvd: 121

```

Hence around 6 DNS servers goes through query to get an authoritative answer.

Q11.

Most machines have multiple interfaces in network, in turn an interface can be associated with multiple IP addresses at the same time. Also an IP can have several aliases as well, hence while “dig”, query type cname is needed to find the canonical name of the machine.