Exercise 3: Digging into DNS (marked, include in the lab report)

Question 1. What is the IP address of www.cecs.anu.edu.au . What type of DNS query is sent to get this answer?

The IP address of www.cecs.anu.edu.au is 150.203.161.98

The DNS query is type A.

```
-bash-4.2$ dig www.cecs.anu.edu.au -t A

; <<>> DiG 9.7.3 <<>> www.cecs.anu.edu.au -t A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 30507
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 4, ADDITIONAL: 8

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

;; ANSWER SECTION:
www.cecs.anu.edu.au.    838     IN      CNAME   rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au. 838     IN      A       150.203.161.98

;; AUTHORITY SECTION:
edu.au.                 67543   IN      NS      s.au.
edu.au.                 67543   IN      NS      t.au.
edu.au.                 67543   IN      NS      q.au.
edu.au.                 67543   IN      NS      r.au.

;; ADDITIONAL SECTION:
q.au.                   52117   IN      A       65.22.196.1
q.au.                   59893   IN      AAAA    2a01:8840:be::1
r.au.                   21560   IN      A       65.22.197.1
r.au.                   21560   IN      AAAA    2a01:8840:bf::1
s.au.                   54075   IN      A       65.22.198.1
s.au.                   49466   IN      AAAA    2a01:8840:c0::1
t.au.                   50013   IN      A       65.22.199.1
t.au.                   11371   IN      AAAA    2a01:8840:c1::1

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 21:04:06 2018
;; MSG SIZE  rcvd: 314
```

Question 2. What is the canonical name for the CECS ANU web server? What is its IP address? Suggest a reason for having an alias for this server.

The canonical name for the CECS ANU web server is **rproxy.cecs.anu.edu.au** and its IP address is 150.203.161.98. A host or s server can have multiple alias, this is like having many accesses to the same resource, this can make a host or a server more reachable and have better scalability.

*Question 3. What can you make of the rest of the response (i.e. the details available in the Authority and Additional sections)?

AUTHORITY SECTION: shows all the other authoritative servers.

ADDITIONAL SECTION: IP address of the authoritative servers.

Question 4. What is the IP address of the local nameserver for your machine?

```
-bash-4.2$ dig www.cecs.anu.edu.au -t A

; <<>> DiG 9.7.3 <<>> www.cecs.anu.edu.au -t A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 30507
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 4, ADDITIONAL: 8

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

;; ANSWER SECTION:
www.cecs.anu.edu.au.    838     IN      CNAME   rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au. 838     IN      A       150.203.161.98

;; AUTHORITY SECTION:
edu.au.                 67543   IN      NS      s.au.
edu.au.                 67543   IN      NS      t.au.
edu.au.                 67543   IN      NS      q.au.
edu.au.                 67543   IN      NS      r.au.

;; ADDITIONAL SECTION:
q.au.                   52117   IN      A       65.22.196.1
q.au.                   59893   IN      AAAA    2a01:8840:be::1
r.au.                   21560   IN      A       65.22.197.1
r.au.                   21560   IN      AAAA    2a01:8840:bf::1
s.au.                   54075   IN      A       65.22.198.1
s.au.                   49466   IN      AAAA    2a01:8840:c0::1
t.au.                   50013   IN      A       65.22.199.1
t.au.                   11371   IN      AAAA    2a01:8840:c1::1

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 21:04:06 2018
;; MSG SIZE  rcvd: 314
```

IP address is 129.94.242.2

Question 5. What are the DNS nameservers for the "cecs.anu.edu.au" domain (note: the domain name is cecs.anu.edu.au and not www.cecs.anu.edu.au)? Find out their IP addresses? What type of DNS query is sent to obtain this information?

The type of DNS query is NS.

```
-bash-4.2$ dig cecs.anu.edu.au -t NS

; <<>> DiG 9.7.3 <<>> cecs.anu.edu.au -t NS
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 49739
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 6

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

;; ANSWER SECTION:
cecs.anu.edu.au.        593     IN      NS      ns3.cecs.anu.edu.au.
cecs.anu.edu.au.        593     IN      NS      ns4.cecs.anu.edu.au.
cecs.anu.edu.au.        593     IN      NS      ns2.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns2.cecs.anu.edu.au.    593     IN      A       150.203.161.36
ns2.cecs.anu.edu.au.    593     IN      AAAA    2001:388:1034:2905::24
ns3.cecs.anu.edu.au.    593     IN      A       150.203.161.50
ns3.cecs.anu.edu.au.    593     IN      AAAA    2001:388:1034:2905::32
ns4.cecs.anu.edu.au.    593     IN      A       150.203.161.38
ns4.cecs.anu.edu.au.    593     IN      AAAA    2001:388:1034:2905::26

;; Query time: 6 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 22:32:39 2018
;; MSG SIZE  rcvd: 219
```

The DNS nameservers for the "cecs.anu.edu.au" domain and their IP address are

The DNS nameservers	IP address
ns2.cecs.anu.edu.au.	150.203.161.36
ns3.cecs.anu.edu.au.	150.203.161.50
ns4.cecs.anu.edu.au.	150.203.161.38

150.203.161.36

Question 6. What is the DNS name associated with the IP address 149.171.158.109? What type of DNS query is sent to obtain this information?

```
-bash-4.2$ 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: 59616
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 3, ADDITIONAL: 6

;; QUESTION SECTION:
;109.158.171.149.in-addr.arpa.  IN      PTR

;; ANSWER SECTION:
109.158.171.149.in-addr.arpa. 3600 IN   PTR     engplws008.eng.unsw.edu.au.
109.158.171.149.in-addr.arpa. 3600 IN   PTR     www.engineering.unsw.edu.au.
109.158.171.149.in-addr.arpa. 3600 IN   PTR     engplws008.ad.unsw.edu.au.

;; AUTHORITY SECTION:
158.171.149.in-addr.arpa. 10800 IN      NS      ns2.unsw.edu.au.
158.171.149.in-addr.arpa. 10800 IN      NS      ns1.unsw.edu.au.
158.171.149.in-addr.arpa. 10800 IN      NS      ns3.unsw.edu.au.

;; ADDITIONAL SECTION:
ns1.unsw.edu.au.        6487    IN      A       129.94.0.192
ns1.unsw.edu.au.        47      IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au.        6487    IN      A       129.94.0.193
ns2.unsw.edu.au.        47      IN      AAAA    2001:388:c:35::2
ns3.unsw.edu.au.        6487    IN      A       192.155.82.178
ns3.unsw.edu.au.        47      IN      AAAA    2600:3c01::f03c:91ff:fe73:5f10

;; Query time: 5 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 22:49:20 2018
;; MSG SIZE  rcvd: 330
```

The DNS name associated with IP address 149.171.158.109 are engplsw008.eng.unsw.edu.au;
www.engineering.unsw.edu.au;
engplws008.ad.unsw.edu.au
The type of DNS query is PTR.

Question 7. Run dig and query the CSE nameserver (129.94.242.33) for the mail servers for Yahoo! Mail (again the domain name is yahoo.com, not www.yahoo.com). Did you get an authoritative answer? Why?

```
~bash-4.2$ dig 129.94.242.33 yahoo.com -t MX

; <<>> DiG 9.7.3 <<>> 129.94.242.33 yahoo.com -t MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 51922
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
;129.94.242.33.                 IN      A

;; AUTHORITY SECTION:
.                       10800   IN      SOA     a.root-servers.net. nstld.verisign-grs.com. 2018080900 1800 900 604800 86400

;; Query time: 50 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 23:03:15 2018
;; MSG SIZE  rcvd: 106

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50583
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8

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

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

;; AUTHORITY SECTION:
yahoo.com.              68100   IN      NS      ns1.yahoo.com.
yahoo.com.              68100   IN      NS      ns5.yahoo.com.
yahoo.com.              68100   IN      NS      ns4.yahoo.com.
yahoo.com.              68100   IN      NS      ns3.yahoo.com.
yahoo.com.              68100   IN      NS      ns2.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.          385503  IN      A       68.180.131.16
ns1.yahoo.com.          39851   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.          43091   IN      A       68.142.255.16
ns2.yahoo.com.          45142   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.          394294  IN      A       203.84.221.53
ns3.yahoo.com.          56328   IN      AAAA    2406:8600:b8:fe03::1003
ns4.yahoo.com.          124567  IN      A       98.138.11.157
ns5.yahoo.com.          57943   IN      A       119.160.253.83

;; Query time: 195 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
```

I didn't get an authoritative answer, because there is no 'aa' in the content of flag, where 'aa'stands for Authoritative Answer.

Question 8. Repeat the above (i.e. Question 7) but use one of the nameservers obtained in Question 5. What is the result?

The server I chose is

ns2.cecs.anu.edu.au.	150.203.161.36

```
~bash-4.2$ dig 150.203.161.36 yahoo.com -t MX

; <<>> DiG 9.7.3 <<>> 150.203.161.36 yahoo.com -t MX
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 52379
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0

;; QUESTION SECTION:
;150.203.161.36.                IN      A

;; AUTHORITY SECTION:
.                       10800   IN      SOA     a.root-servers.net. nstld.verisign-grs.com. 2018080900 1800 900 604800 86400

;; Query time: 161 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Thu Aug  9 23:24:57 2018
;; MSG SIZE  rcvd: 107

;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 23721
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8

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

;; ANSWER SECTION:
yahoo.com.              498     IN      MX      1 mta6.am0.yahoodns.net.
yahoo.com.              498     IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.              498     IN      MX      1 mta5.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.              66798   IN      NS      ns2.yahoo.com.
yahoo.com.              66798   IN      NS      ns5.yahoo.com.
yahoo.com.              66798   IN      NS      ns3.yahoo.com.
yahoo.com.              66798   IN      NS      ns1.yahoo.com.
yahoo.com.              66798   IN      NS      ns4.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.          384201  IN      A       68.180.131.16
ns1.yahoo.com.          38549   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.          41789   IN      A       68.142.255.16
ns2.yahoo.com.          43848   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.          392992  IN      A       203.84.221.53
ns3.yahoo.com.          55826   IN      AAAA    2406:8600:b8:fe03::1003
ns4.yahoo.com.          123265  IN      A       98.138.11.157
ns5.yahoo.com.          56641   IN      A       119.160.253.83

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
```

I still didn't get an authoritative answer.

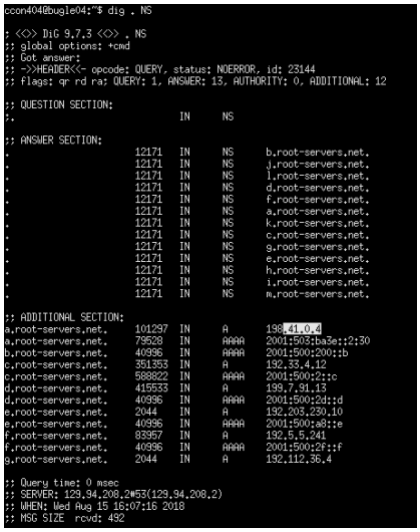
Question 9. Obtain the authoritative answer for the mail servers for Yahoo! mail. What type of DNS query is sent to obtain this information?

To obtain an authoritative answer for the mail servers for Yahoo!mail, I chose to query one of its authoritative nameservers: ns2.yahoo.com, and I obtain:

```
CongdeMacBook-Pro:week2 congcong$ dig @ns2.yahoo.com yahoo.com MX

; <<>> DiG 9.10.6 <<>> @ns2.yahoo.com yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 18643
;; flags: qr aa rd; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 9
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1272
;; QUESTION SECTION:
;yahoo.com.                     IN      MX

;; ANSWER SECTION:
yahoo.com.              1800    IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.              1800    IN      MX      1 mta5.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      ns3.yahoo.com.
yahoo.com.              172800  IN      NS      ns4.yahoo.com.
yahoo.com.              172800  IN      NS      ns1.yahoo.com.
yahoo.com.              172800  IN      NS      ns5.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       119.160.253.83
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: 366 msec
;; SERVER: 68.142.255.16#53(68.142.255.16)
;; WHEN: Thu Aug 09 23:42:18 AEST 2018
;; MSG SIZE  rcvd: 371
```

Question 10. In this exercise you simulate the iterative DNS query process to find the IP address of your machine (e.g. lyre00.cse.unsw.edu.au). How many DNS servers do you have to query to get the authoritative answer?

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



```
ccon404@bugle04:~$ dig . NS

; <<>> DiG 9.7.3 <<>> . NS
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 23144
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 12

;; QUESTION SECTION:
;.                              IN      NS

;; ANSWER SECTION:
.                       12171   IN      NS      b.root-servers.net.
.                       12171   IN      NS      j.root-servers.net.
.                       12171   IN      NS      l.root-servers.net.
.                       12171   IN      NS      d.root-servers.net.
.                       12171   IN      NS      f.root-servers.net.
.                       12171   IN      NS      a.root-servers.net.
.                       12171   IN      NS      k.root-servers.net.
.                       12171   IN      NS      c.root-servers.net.
.                       12171   IN      NS      g.root-servers.net.
.                       12171   IN      NS      e.root-servers.net.
.                       12171   IN      NS      h.root-servers.net.
.                       12171   IN      NS      i.root-servers.net.
.                       12171   IN      NS      m.root-servers.net.

;; ADDITIONAL SECTION:
a.root-servers.net.     101297  IN      A       198.41.0.4
a.root-servers.net.     79528   IN      AAAA    2001:503:ba3e::2:30
b.root-servers.net.     40996   IN      AAAA    2001:500:200::b
c.root-servers.net.     351353  IN      A       192.33.4.12
c.root-servers.net.     588822  IN      AAAA    2001:500:2::c
d.root-servers.net.     415533  IN      A       199.7.91.13
d.root-servers.net.     40996   IN      AAAA    2001:500:2d::d
e.root-servers.net.     2044    IN      A       192.203.230.10
e.root-servers.net.     40996   IN      AAAA    2001:500:a8::e
f.root-servers.net.     83957   IN      A       192.5.5.241
f.root-servers.net.     40996   IN      AAAA    2001:500:2f::f
g.root-servers.net.     2044    IN      A       192.112.36.4

;; Query time: 0 msec
;; SERVER: 129.94.208.2#53(129.94.208.2)
;; WHEN: Wed Aug 15 16:07:16 2018
;; MSG SIZE  rcvd: 492
```

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

```
ccon4040bugle04:~$ dig @198.41.0.4 bugle04.cse.unsw.edu.au NS

; <<>> DiG 9.7.3 <<>> @198.41.0.4 bugle04.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 54016
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 10, ADDITIONAL: 14
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;bugle04.cse.unsw.edu.au.       IN      NS

;; AUTHORITY SECTION:
au.                     172800  IN      NS      d.au.
au.                     172800  IN      NS      v.au.
au.                     172800  IN      NS      u.au.
au.                     172800  IN      NS      q.au.
au.                     172800  IN      NS      t.au.
au.                     172800  IN      NS      s.au.
au.                     172800  IN      NS      r.au.
au.                     172800  IN      NS      b.au.
au.                     172800  IN      NS      a.au.
au.                     172800  IN      NS      c.au.

;; ADDITIONAL SECTION:
d.au.                   172800  IN      A       162.159.25.38
d.au.                   172800  IN      AAAA    2400:cb00:2049:1::a29f:1926
v.au.                   172800  IN      A       202.12.31.53
v.au.                   172800  IN      AAAA    2001:dd8:12::53
u.au.                   172800  IN      A       211.29.133.32
q.au.                   172800  IN      A       65.22.196.1
q.au.                   172800  IN      AAAA    2a01:8840:be::1
t.au.                   172800  IN      A       65.22.199.1
t.au.                   172800  IN      AAAA    2a01:8840:cd::1
s.au.                   172800  IN      A       65.22.198.1
s.au.                   172800  IN      AAAA    2a01:8840:c0::1
r.au.                   172800  IN      A       65.22.197.1
r.au.                   172800  IN      AAAA    2a01:8840:bf::1
b.au.                   172800  IN      A       58.65.253.73

;; Query time: 213 msec
;; SERVER: 198.41.0.4#53(198.41.0.4)
;; WHEN: Wed Aug 15 16:16:18 2018
;; MSG SIZE  rcvd: 497
```

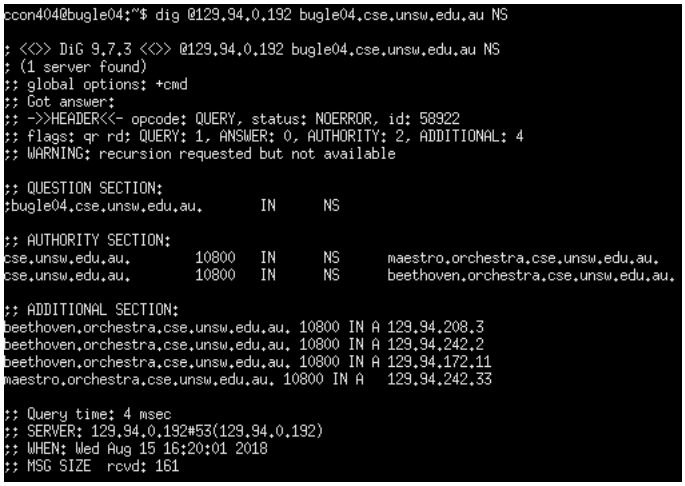
3. Query this second server to find the authoritative nameserver for the "edu.au." domain.

```
ccon4040bugle04:~$ dig @162.159.25.38 bugle04.cse.unsw.edu.au NS

; <<>> DiG 9.7.3 <<>> @162.159.25.38 bugle04.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 17504
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 8
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;bugle04.cse.unsw.edu.au.       IN      NS

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

;; Query time: 15 msec
;; SERVER: 162.159.25.38#53(162.159.25.38)
;; WHEN: Wed Aug 15 16:18:15 2018
;; MSG SIZE  rcvd: 281
```

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

```
ccon4040bugle04:~$ dig @65.22.196.1 bugle04.cse.unsw.edu.au NS

; <<>> DiG 9.7.3 <<>> @65.22.196.1 bugle04.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29045
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 5
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;bugle04.cse.unsw.edu.au.       IN      NS

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

;; Query time: 14 msec
;; SERVER: 65.22.196.1#53(65.22.196.1)
;; WHEN: Wed Aug 15 16:19:08 2018
;; MSG SIZE  rcvd: 199
```

5. Next query the nameserver of unsw.edu.au to find the authoritative name server of cse.unsw.edu.au.



6. Now query the nameserver of cse.unsw.edu.au to find the IP address of your host.

1.I query the a.root-server.net; 2.I query d.au; 3. I query q.au; 4.I query ns1.unsw.edu.au 5.I query Beethoven.orchestra.cse.unsw.edu.au. Thus, I need to query 5 DNS server to obtain the authoritative answer.

Question 11. Can one physical machine have several names and/or IP addresses associated with it?

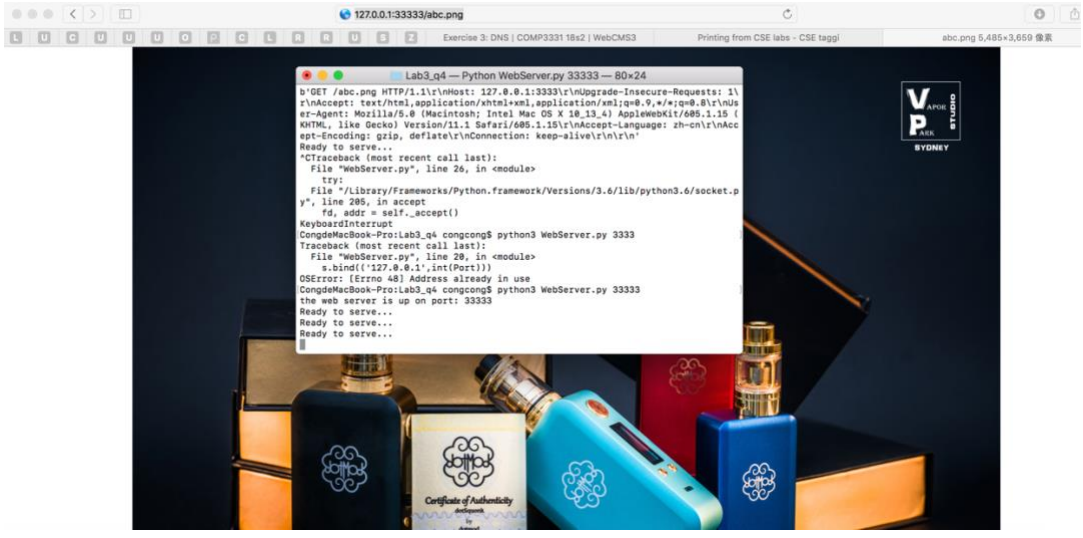
Yes, one physical machine is able to have several names and IP addresses. These names are called network interfaces, these interfaces have one or more IP addresses associated with them. Moreover, like the cases in question 1 and question 2, an IP address can be associated to one or more hostnames.

Exercise 4: A Simple Web Server

```python
from socket import *
import sys
#(i) create a connection socket when contacted by a client (browser).
#
#(ii) receive HTTP request from this connection. Your server should only process GET request. You may assume that on

#(iii) parse the request to determine the specific file being requested.

#(iv) get the requested file from the server's file system.

#(v) create an HTTP response message consisting of the requested file preceded by header lines.

#(vi) send the response over the TCP connection to the requesting browser.

#(vii) If the requested file is not present on the server, the server should send an HTTP "404 Not Found" message bac

#(viii) the server should listen in a loop, waiting for next request from the browser.
Port=sys.argv[1]
s = socket(AF_INET, SOCK_STREAM)
s.bind(('127.0.0.1',int(Port)))
s.listen(1)
print('the web server is up on port:',Port)
while True:
    print('Ready to serve...')
    connection, addr = s.accept()
    try:
        GET_head=str.encode("GET")
        message = connection.recv(1024)
        if GET_head in message.split()[0]:
            filename = message.split()[1]
            typ=filename.split('.'.encode())[-1]
            f = open(filename[1:],'rb')
            data = f.read()
            leng=len(data)
            head=f'HTTP/1.1 200 OK\r\nConnection: Closed\r\nContent-Length: {leng}\r\nContent-Type: {typ}\r\n\r\n'
            output_header=str.encode(head)
            connection.send(output_header)
            connection.send(data)
            connection.close()
    except IOError:
        Error='HTTP/1.1 404 Not Found\r\n\r\n'
        out_error=str.encode(Error)
        error_message="HTTP '404 Not Found'"
        data_error=str.encode(error_message)
        connection.send(out_error)
        connection.send(data_error)
        connection.close()
```

1.

2.



3. 
127.0.0.1:3333/bio.html
HTTP '404 Not Found'
Lab3_q4 — Python WebServer.py 3333 — 80×24
CongdeMacBook-Pro:Lab3_q4 congcong$ python3 WebServer.py 3333
the web server is up on port: 3333
Ready to serve...
Ready to serve...