

COMP3331 Computer Networks and Applications
Lab Exercise 03: DNS & Socket Programming

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Exercise 1: Explore DNS records (Not marked, No need to submit)

Exercise 2: Tracing DNS with Wireshark (Not marked, No need to submit)

Exercise 3: Digging into DNS

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

- Type A. IP address: 150.203.161.98 (Type A is used to map hostnames to an IP address of the host.)

```
~/Desktop
▶ dig www.cecs.anu.edu.au

; <<>> DiG 9.10.6 <<>> www.cecs.anu.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14125
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 3, ADDITIONAL: 7
;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:;, udp: 4096
;; QUESTION SECTION:
;www.cecs.anu.edu.au.          IN      A

;; ANSWER SECTION:
www.cecs.anu.edu.au. 3600    IN      CNAME   rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au. 3600    IN      A       150.203.161.98

;; AUTHORITY SECTION:
cecs.anu.edu.au. 300     IN      NS       ns2.cecs.anu.edu.au.
cecs.anu.edu.au. 300     IN      NS       ns3.cecs.anu.edu.au.
cecs.anu.edu.au. 300     IN      NS       ns4.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns2.cecs.anu.edu.au. 300     IN      A       150.203.161.36
ns2.cecs.anu.edu.au. 629     IN      AAAA    2001:388:1034:2905::24
ns3.cecs.anu.edu.au. 300     IN      A       150.203.161.50
ns3.cecs.anu.edu.au. 3125    IN      AAAA    2001:388:1034:2905::32
ns4.cecs.anu.edu.au. 300     IN      A       150.203.161.38
ns4.cecs.anu.edu.au. 3125    IN      AAAA    2001:388:1034:2905::26

;; Query time: 35 msec
;; SERVER: 129.94.0.196#53(129.94.0.196)
;; WHEN: Wed Oct 09 12:42:49 AEDT 2019
;; MSG SIZE rcvd: 271
```

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

- Canonical name: rproxy.cecs.anu.edu.au. (According to output for question1)
- Reason: convenient when running multiple services from a single IP address

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: displays the DNS name server that has the authority to respond to this query.
- Additional section: displays the ip address of the name servers listed in the authority section.

(from <https://www.thegeekstuff.com/2012/02/dig-command-examples/>)

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

- 129.94.0.196 (According to output for question1)

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?

- DNS nameservers: ns3.cecs.anu.edu.au.
ns2.cecs.anu.edu.au.
ns4.cecs.anu.edu.au.
- IP address: 150.203.161.50
150.203.161.36
150.203.161.38
- Query type: NS

(from <https://www.thegeekstuff.com/2012/02/dig-command-examples/>)

```
~/Desktop
▶ dig cecs.anu.edu.au -t NS

; <<>> DiG 9.10.6 <<>> cecs.anu.edu.au -t NS
;; global options: +cmd
;; Got answer:
;; -->HEADER<< opcode: QUERY, status: NOERROR, id: 10870
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 7

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;cecs.anu.edu.au.          IN      NS

;; ANSWER SECTION:
cecs.anu.edu.au.          61      IN      NS      ns3.cecs.anu.edu.au.
cecs.anu.edu.au.          61      IN      NS      ns2.cecs.anu.edu.au.
cecs.anu.edu.au.          61      IN      NS      ns4.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns3.cecs.anu.edu.au.      61      IN      A        150.203.161.50
ns3.cecs.anu.edu.au.      3361    IN      AAAA     2001:388:1034:2905::32
ns2.cecs.anu.edu.au.      61      IN      A        150.203.161.36
ns2.cecs.anu.edu.au.      3361    IN      AAAA     2001:388:1034:2905::24
ns4.cecs.anu.edu.au.      3361    IN      A        150.203.161.38
ns4.cecs.anu.edu.au.      3361    IN      AAAA     2001:388:1034:2905::26

;; Query time: 5 msec
;; SERVER: 129.94.0.196#53(129.94.0.196)
;; WHEN: Mon Oct 14 09:36:50 AEDT 2019
;; MSG SIZE rcvd: 230
```

Question 6. What is the DNS name associated with the IP address 111.68.101.54? What type of DNS query is sent to obtain this information?

- Associated DNS name with the IP address: webserver.seecs.nust.edu.pk.
- Query type: PTR

PTR record is like a reverse version of A record. A record maps domain name to an IP address, PTR maps an IP address to a hostname.

(from <https://www.hostinger.com/tutorials/what-is-a-ptr-record-and-how-to-do-reverse-ip-lookup>)

```
~/Desktop
▶ dig -x 111.68.101.54

; <<> DiG 9.10.6 <<> -x 111.68.101.54
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 59730
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;54.101.68.111.in-addr.arpa.      IN      PTR

;; ANSWER SECTION:
54.101.68.111.in-addr.arpa. 3039 IN     PTR     webserver.seecs.nust.edu.pk.

;; AUTHORITY SECTION:
101.68.111.in-addr.arpa. 49898 IN     NS      ns1.hec.gov.pk.
101.68.111.in-addr.arpa. 49898 IN     NS      ns2.hec.gov.pk.

;; ADDITIONAL SECTION:
ns2.hec.gov.pk.           3038 IN     A       103.4.93.6
ns1.hec.gov.pk.           3038 IN     A       103.4.93.5

;; Query time: 14 msec
;; SERVER: 129.94.0.196#53(129.94.0.196)
;; WHEN: Mon Oct 14 09:26:13 AEDT 2019
;; MSG SIZE rcvd: 172
```

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? (HINT: Just because a response contains information in the authoritative part of the DNS response message does not mean it came from an authoritative name server. You should examine the flags in the response to determine the answer)

- We cannot get an authoritative answer. When we look at the flags, there is no “aa”, which means authoritative answer.

Flags:

AA = Authoritative Answer

TC = Truncation

RD = Recursion Desired

RA = Recursion Available

AD = Authenticated Data

CD = Checking Disabled

(from <http://roberto.perdisci.com/useful-links/dig-info>)

```
~/Desktop
▶ dig @129.94.242.33 yahoo.com -t MX

; <<>> DiG 9.10.6 <<>> @129.94.242.33 yahoo.com -t MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 20399
;; 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.                1766    IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.                1766    IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.                1766    IN      MX      1 mta6.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.                2183    IN      NS      ns5.yahoo.com.
yahoo.com.                2183    IN      NS      ns3.yahoo.com.
yahoo.com.                2183    IN      NS      ns2.yahoo.com.
yahoo.com.                2183    IN      NS      ns4.yahoo.com.
yahoo.com.                2183    IN      NS      ns1.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.            265171  IN      A        68.180.131.16
ns1.yahoo.com.            26496   IN      AAAA     2001:4998:130::1001
ns2.yahoo.com.            264980  IN      A        68.142.255.16
ns2.yahoo.com.            18421   IN      AAAA     2001:4998:140::1002
ns3.yahoo.com.            410     IN      A        27.123.42.42
ns3.yahoo.com.            410     IN      AAAA     2406:8600:f03f:1f8::1003
ns4.yahoo.com.            96630   IN      A        98.138.11.157
ns5.yahoo.com.            122561  IN      A        119.160.253.83

;; Query time: 10 msec
;; SERVER: 129.94.242.33#53(129.94.242.33)
;; WHEN: Mon Oct 14 09:29:30 AEDT 2019
;; MSG SIZE rcvd: 371
```

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

- We don't get a response.

```
~/Desktop
> dig @ns3.cecs.anu.edu.au. yahoo.com -t MX

; <<>> DiG 9.10.6 <<>> @ns3.cecs.anu.edu.au. yahoo.com -t MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: REFUSED, id: 1120
;; 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: 9 msec
;; SERVER: 150.203.161.50#53(150.203.161.50)
;; WHEN: Mon Oct 14 09:48:40 AEDT 2019
;; MSG SIZE rcvd: 38
```

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

- Query Type: MX

(Ran dig and query the ns5.yahoo.com to obtain authoritative answer. — have aa flag)

```
~/Desktop
> dig @ns5.yahoo.com. yahoo.com -t MX

; <<>> DiG 9.10.6 <<>> @ns5.yahoo.com. yahoo.com -t MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28641
;; 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      ns3.yahoo.com.
yahoo.com.                172800  IN      NS      ns1.yahoo.com.
yahoo.com.                172800  IN      NS      ns2.yahoo.com.
yahoo.com.                172800  IN      NS      ns4.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.            1800    IN      A       27.123.42.42
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.            1800    IN      AAAA    2406:8600:f03f:1f8::1003

;; Query time: 139 msec
;; SERVER: 119.160.253.83#53(119.160.253.83)
;; WHEN: Mon Oct 14 09:51:32 AEDT 2019
;; 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). First, find the name server (query type NS) of the "." domain (root domain). Query this nameserver to find the authoritative name server for the "au." domain. Query this second server to find the authoritative nameserver for the "edu.au." domain. Now query this nameserver to find the authoritative nameserver for "unsw.edu.au". 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. How many DNS servers do you have to query to get the authoritative answer?

- name server of the root domain: 129.94.0.196

```
~/Desktop
▶ dig . -t NS

; <<>> DiG 9.10.6 <<>> . -t NS
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 19700
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 27

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
; .                IN      NS

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

;; ADDITIONAL SECTION:
e.root-servers.net. 274196 IN      A       192.203.230.10
e.root-servers.net. 93125  IN      AAAA    2001:500:a8::e
l.root-servers.net. 281341 IN      A       199.7.83.42
l.root-servers.net. 100487 IN      AAAA    2001:500:9f::42
i.root-servers.net. 352362 IN      A       192.36.148.17
i.root-servers.net. 108402 IN      AAAA    2001:7fe::53
m.root-servers.net. 497469 IN      A       202.12.27.33
m.root-servers.net. 108402 IN      AAAA    2001:dc3::35
d.root-servers.net. 197632 IN      A       199.7.91.13
d.root-servers.net. 455036 IN      AAAA    2001:500:2d::d
k.root-servers.net. 267015 IN      A       193.0.14.129
k.root-servers.net. 100487 IN      AAAA    2001:7fd::1
g.root-servers.net. 20601  IN      A       192.112.36.4
g.root-servers.net. 100487 IN      AAAA    2001:500:12::d0d
b.root-servers.net. 206927 IN      A       199.9.14.201
b.root-servers.net. 100487 IN      AAAA    2001:500:200::b
c.root-servers.net. 197904 IN      A       192.33.4.12
c.root-servers.net. 516127 IN      AAAA    2001:500:2::c
h.root-servers.net. 287343 IN      A       198.97.190.53
h.root-servers.net. 455036 IN      AAAA    2001:500:1::53
a.root-servers.net. 86688  IN      A       198.41.0.4
a.root-servers.net. 90807  IN      AAAA    2001:503:ba3e::2:30
f.root-servers.net. 268862 IN      A       192.5.5.241
f.root-servers.net. 134204 IN      AAAA    2001:500:2f::f
j.root-servers.net. 274197 IN      A       192.58.128.30
j.root-servers.net. 134204 IN      AAAA    2001:503:c27::2:30

;; Query time: 8 msec
;; SERVER: 129.94.0.196#53(129.94.0.196)
;; WHEN: Mon Oct 14 09:57:34 AEDT 2019
;; MSG SIZE rcvd: 811
```

- authoritative name server for the “au.”: a.au(58.65.254.73)

```
~/Desktop
> dig @192.203.230.10 au. -t NS

; <<> DiG 9.10.6 <<> @192.203.230.10 au. -t NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 16238
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 9, ADDITIONAL: 18
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:: udp: 4096
;; QUESTION SECTION:
;au.                                IN      NS

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

;; ADDITIONAL SECTION:
a.au.    172800 IN      A       58.65.254.73
v.au.    172800 IN      A       202.12.31.53
c.au.    172800 IN      A       162.159.24.179
d.au.    172800 IN      A       162.159.25.38
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
u.au.    172800 IN      A       211.29.133.32
a.au.    172800 IN      AAAA    2407:6e00:254:306::73
v.au.    172800 IN      AAAA    2001:dd8:12::53
c.au.    172800 IN      AAAA    2400:cb00:2049:1::a29f:18b3
d.au.    172800 IN      AAAA    2400:cb00:2049:1::a29f:1926
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

;; Query time: 47 msec
;; SERVER: 192.203.230.10#53(192.203.230.10)
;; WHEN: Mon Oct 14 10:01:39 AEDT 2019
;; MSG SIZE rcvd: 543
```

- authoritative nameserver for the "edu.au." domain: q.au(65.22.196.1)

```
~/Desktop
▶ dig @58.65.254.73 edu.au. -t NS

; <<>> DiG 9.10.6 <<>> @58.65.254.73 edu.au. -t NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; -->HEADER<<-- opcode: QUERY, status: NOERROR, id: 36267
;; 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:
;edu.au.                                IN      NS

;; AUTHORITY SECTION:
edu.au.      86400    IN      NS      s.au.
edu.au.      86400    IN      NS      r.au.
edu.au.      86400    IN      NS      q.au.
edu.au.      86400    IN      NS      t.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: 17 msec
;; SERVER: 58.65.254.73#53(58.65.254.73)
;; WHEN: Mon Oct 14 10:06:13 AEDT 2019
;; MSG SIZE rcvd: 275
```

- authoritative nameserver for "unsw.edu.au": ns1.unsw.edu.au(129.94.0.192)

```
~/Desktop
▶ dig @65.22.196.1 unsw.edu.au -t NS

; <<>> DiG 9.10.6 <<>> @65.22.196.1 unsw.edu.au -t NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; -->HEADER<<-- opcode: QUERY, status: NOERROR, id: 24960
;; 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:
;unsw.edu.au.                          IN      NS

;; AUTHORITY SECTION:
unsw.edu.au.    900      IN      NS      ns1.unsw.edu.au.
unsw.edu.au.    900      IN      NS      ns3.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: 8 msec
;; SERVER: 65.22.196.1#53(65.22.196.1)
;; WHEN: Mon Oct 14 10:10:05 AEDT 2019
;; MSG SIZE rcvd: 198
```


- authoritative name server of cse.unsw.edu.au: beethoven.orchestra.cse.unsw.edu.au.
(129.94.208.3)

```
~/Desktop
▶ dig @129.94.0.192 cse.unsw.edu.au -t NS

; <<>> DiG 9.10.6 <<>> @129.94.0.192 cse.unsw.edu.au -t NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 33313
;; 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:
;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.a
u.

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

;; Query time: 5 msec
;; SERVER: 129.94.0.192#53(129.94.0.192)
;; WHEN: Mon Oct 14 10:11:31 AEDT 2019
;; MSG SIZE rcvd: 164
```

- IP address of your host: 129.94.208.3

```
~/Desktop
▶ hostname
MacBook-Pro-2.local

~/Desktop
▶ dig @129.94.208.3 MacBook-Pro-2.local -t NS

; <<>> DiG 9.10.6 <<>> @129.94.208.3 MacBook-Pro-2.local -t NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; WARNING: .local is reserved for Multicast DNS
;; You are currently testing what happens when an mDNS query is leaked to DNS
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 38430
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;MacBook-Pro-2.local.          IN      NS

;; AUTHORITY SECTION:
.                10800   IN      SOA      a.root-servers.net. nstld.verisi
gn-grs.com. 2019101301 1800 900 604800 86400

;; Query time: 116 msec
;; SERVER: 129.94.208.3#53(129.94.208.3)
;; WHEN: Mon Oct 14 10:15:58 AEDT 2019
;; MSG SIZE rcvd: 123
```

- How many DNS servers do you have to query to get the authoritative answer?
 - 6

Question 11. Can one physical machine have several names and/or IP addresses associated with it?
- Yes for both host names/ IP address. It is possible with multiple network interface cards or NICs installed in it.
(from <https://www.quora.com/Can-a-computer-have-two-IP-addresses>)