Question 1

- IP address of www.eecs.berkeley.edu is 23.185.0.1, to get this I send an A query type.

```
;; ANSWER SECTION:
www.eecs.berkeley.edu.  85345   IN      CNAME   live-eecs.pantheonsite.io.
live-eecs.pantheonsite.io. 600  IN      CNAME   fe1.edge.pantheon.io.
fe1.edge.pantheon.io.   126     IN      A       23.185.0.1
```

Question 2

- Conical name is live-eecs.pantheonsite.io.
- One benefit to have an alias is that it allows running multiple service in a single IP address.

Question 3

- ns-924.awsdns-51.net, ns-1857.awsdns-40.co.uk, ns-1096.awsdns-09.org, ns-148.awsdns-18.com are the authoritative name serves for eecs.berkeley.edu.
- The addition section contains IP address for these four authoritative name servers. The AAAA records are for IPv6 address

```
;; AUTHORITY SECTION:
pantheon.io.            15371   IN      NS      ns-924.awsdns-51.net.
pantheon.io.            15371   IN      NS      ns-1857.awsdns-40.co.uk.
pantheon.io.            15371   IN      NS      ns-1096.awsdns-09.org.
pantheon.io.            15371   IN      NS      ns-148.awsdns-18.com.

;; ADDITIONAL SECTION:
ns-148.awsdns-18.com.   3999    IN      A       205.251.192.148
ns-148.awsdns-18.com.   2473    IN      AAAA    2600:9000:5300:9400::1
ns-924.awsdns-51.net.   6254    IN      A       205.251.195.156
ns-924.awsdns-51.net.   6254    IN      AAAA    2600:9000:5303:9c00::1
ns-1096.awsdns-09.org.  45432   IN      A       205.251.196.72
ns-1857.awsdns-40.co.uk. 4798   IN      A       205.251.199.65
```

Question 4

- It is 129.94.242.2

```
;; Query time: 17 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Tue Jun 29 12:31:52 AEST 2021
;; MSG SIZE  rcvd: 397
```

Question 5

DNS name server	IP address	Record type
ns.CS	169.229.60.61	A
	2607:f140:f000:1260::30	AAAA
ns.eecs	169.229.60.153	A
	2607:f140:f000:2160::30	AAAA

adns1	128.32.136.3	A
	2607:f140:ffff:fffe::3	AAAA
adns2	128.32.136.14	A
	2607:f140:ffff:fffe::e	AAAA
adns3	192.107.102.142	A
	2607:f140:a000:d::abc	AAAA

- Type A query is sent to get this answer.

```
; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> eecs.berkeley.edu
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 34836
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 5, ADDITIONAL: 11

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

;; ANSWER SECTION:
eecs.berkeley.edu.      43415   IN      A       23.185.0.1

;; AUTHORITY SECTION:
eecs.berkeley.edu.      31163   IN      NS      adns1.berkeley.edu.
eecs.berkeley.edu.      31163   IN      NS      adns3.berkeley.edu.
eecs.berkeley.edu.      31163   IN      NS      ns.CS.berkeley.edu.
eecs.berkeley.edu.      31163   IN      NS      adns2.berkeley.edu.
eecs.berkeley.edu.      31163   IN      NS      ns.eecs.berkeley.edu.

;; ADDITIONAL SECTION:
ns.CS.berkeley.edu.     34250   IN      A       169.229.60.61
ns.CS.berkeley.edu.     34313   IN      AAAA    2607:f140:f000:1260::30
ns.eecs.berkeley.edu.   9761    IN      A       169.229.60.153
ns.eecs.berkeley.edu.   34253   IN      AAAA    2607:f140:f000:2160::30
adns1.berkeley.edu.     1444    IN      A       128.32.136.3
adns1.berkeley.edu.     1444    IN      AAAA    2607:f140:ffff:fffe::3
adns2.berkeley.edu.     1444    IN      A       128.32.136.14
adns2.berkeley.edu.     8046    IN      AAAA    2607:f140:ffff:fffe::e
adns3.berkeley.edu.     1444    IN      A       192.107.102.142
adns3.berkeley.edu.     8046    IN      AAAA    2607:f140:a000:d::abc

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Tue Jun 29 12:46:28 AEST 2021
;; MSG SIZE  rcvd: 379
```

Question 6

- DNS name associated with 111.68.101.54 is webserver.seecs.nust.edu.pk. DNS query type is A.

```
weber % dig -x 111.68.101.54

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> -x 111.68.101.54
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 51064
;; 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. 110 IN      PTR     webserver.seecs.nust.edu.pk.

;; AUTHORITY SECTION:
101.68.111.in-addr.arpa. 45724  IN      NS      ns1.hec.gov.pk.
101.68.111.in-addr.arpa. 45724  IN      NS      ns2.hec.gov.pk.

;; ADDITIONAL SECTION:
ns1.hec.gov.pk.          34910   IN      A       103.4.93.5
ns2.hec.gov.pk.          110     IN      A       103.4.93.6

;; Query time: 5 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Tue Jun 29 13:01:25 AEST 2021
;; MSG SIZE  rcvd: 172
```

Question 7

- I did not get an authoritative answer from the server we queried (orchestra.cse.unsw.edu.au) since the flags do not contain aa, where aa represents authoritative answer. This is because it only has authority for the cse.unsw.edu.au domain, but not for the Yahoo domain.

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

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @129.94.242.33 yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 30601
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 10

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

;; ANSWER SECTION:
yahoo.com.              1705    IN      MX      1 mta7.am0.yahoodns.net.
yahoo.com.              1705    IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.              1705    IN      MX      1 mta6.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.              14164   IN      NS      ns1.yahoo.com.
yahoo.com.              14164   IN      NS      ns3.yahoo.com.
yahoo.com.              14164   IN      NS      ns5.yahoo.com.
yahoo.com.              14164   IN      NS      ns4.yahoo.com.
yahoo.com.              14164   IN      NS      ns2.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.          256516  IN      A       68.180.131.16
ns1.yahoo.com.          13846   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.          85463   IN      A       68.142.255.16
ns2.yahoo.com.          15675   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.          730     IN      A       27.123.42.42
ns3.yahoo.com.          410     IN      AAAA    2406:8600:f03f:1f8::1003
ns4.yahoo.com.          601024  IN      A       98.138.11.157
ns5.yahoo.com.          14991   IN      A       202.165.97.53
ns5.yahoo.com.          14991   IN      AAAA    2406:2000:ff60::53

;; Query time: 0 msec
;; SERVER: 129.94.242.33#53(129.94.242.33)
;; WHEN: Tue Jun 29 13:13:12 AEST 2021
;; MSG SIZE  rcvd: 399
```

Question 8

- when we try the Berkeley nameservers we do not get a response. The status of the reply is REFUSED. The reason could be that these name servers do not reply to DNS queries that are sent from devices which are not part of the Berkeley network, for security measure.

```
weber % dig @ns.eecs.berkeley.edu yahoo.com MX

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @ns.eecs.berkeley.edu yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: REFUSED, id: 43344
;; 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: 167 msec
;; SERVER: 169.229.60.153#53(169.229.60.153)
;; WHEN: Tue Jun 29 13:30:29 AEST 2021
;; MSG SIZE  rcvd: 38
```

Question 9

- Run command: dig @ns3.yahoo.com yahoo.com MX, the query type is MX.

```
weber % dig @ns3.yahoo.com yahoo.com MX

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @ns3.yahoo.com yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31859
;; flags: qr aa rd; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 10
;; 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 mta6.am0.yahoodns.net.
yahoo.com.              1800    IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.              1800    IN      MX      1 mta7.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.              172800  IN      NS      ns5.yahoo.com.
yahoo.com.              172800  IN      NS      ns4.yahoo.com.
yahoo.com.              172800  IN      NS      ns2.yahoo.com.
yahoo.com.              172800  IN      NS      ns3.yahoo.com.
yahoo.com.              172800  IN      NS      ns1.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.          86400   IN      A       202.165.97.53
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
ns5.yahoo.com.          86400   IN      AAAA    2406:2000:ff60::53

;; Query time: 274 msec
;; SERVER: 27.123.42.42#53(27.123.42.42)
;; WHEN: Tue Jun 29 13:35:54 AEST 2021
;; MSG SIZE  rcvd: 399
```

Question 10

- Find name server of root domain:

```
weber % dig . NS

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> . NS
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 16243
;; 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:
.                      154876   IN      NS      c.root-servers.net.
.                      154876   IN      NS      h.root-servers.net.
.                      154876   IN      NS      b.root-servers.net.
.                      154876   IN      NS      d.root-servers.net.
.                      154876   IN      NS      g.root-servers.net.
.                      154876   IN      NS      e.root-servers.net.
.                      154876   IN      NS      l.root-servers.net.
.                      154876   IN      NS      k.root-servers.net.
.                      154876   IN      NS      a.root-servers.net.
.                      154876   IN      NS      m.root-servers.net.
.                      154876   IN      NS      f.root-servers.net.
.                      154876   IN      NS      i.root-servers.net.
.                      154876   IN      NS      j.root-servers.net.

;; ADDITIONAL SECTION:
a.root-servers.net.    257988   IN      A       198.41.0.4
a.root-servers.net.    155758   IN      AAAA    2001:503:ba3e::2:30
b.root-servers.net.    266010   IN      A       199.9.14.201
b.root-servers.net.    266010   IN      AAAA    2001:500:200::b
c.root-servers.net.    351208   IN      A       192.33.4.12
c.root-servers.net.    104481   IN      AAAA    2001:500:2::c
d.root-servers.net.    604328   IN      A       199.7.91.13
d.root-servers.net.    25576    IN      AAAA    2001:500:2d::d
e.root-servers.net.    173202   IN      A       192.203.230.10
e.root-servers.net.    72656    IN      AAAA    2001:500:a8::e
f.root-servers.net.    517348   IN      A       192.5.5.241
f.root-servers.net.    25576    IN      AAAA    2001:500:2f::f
g.root-servers.net.    25576    IN      A       192.112.36.4
g.root-servers.net.    25576    IN      AAAA    2001:500:12::d0d
h.root-servers.net.    537008   IN      A       198.97.190.53
h.root-servers.net.    537008   IN      AAAA    2001:500:1::53
i.root-servers.net.    351208   IN      A       192.36.148.17
i.root-servers.net.    25575    IN      AAAA    2001:7fe::53
j.root-servers.net.    117221   IN      A       192.58.128.30
j.root-servers.net.    25576    IN      AAAA    2001:503:c27::2:30
k.root-servers.net.    327349   IN      A       193.0.14.129
k.root-servers.net.    104481   IN      AAAA    2001:7fd::1
l.root-servers.net.    543481   IN      A       199.7.83.42
l.root-servers.net.    104481   IN      AAAA    2001:500:9f::42
m.root-servers.net.    32539    IN      A       202.12.27.33
m.root-servers.net.    104482   IN      AAAA    2001:dc3::35
```

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

```
weber % dig @198.41.0.4 lyre00.cse.unsw.edu.au NS

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @198.41.0.4 lyre00.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 42095
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 9, ADDITIONAL: 19
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;lyre00.cse.unsw.edu.au.            IN      NS

;; AUTHORITY SECTION:
au.                     172800  IN      NS      m.au.
au.                     172800  IN      NS      d.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      n.au.
au.                     172800  IN      NS      a.au.
au.                     172800  IN      NS      c.au.

;; ADDITIONAL SECTION:
m.au.                   172800  IN      A       37.209.192.5
m.au.                   172800  IN      AAAA    2001:502:2eda::24
d.au.                   172800  IN      A       162.159.25.38
d.au.                   172800  IN      AAAA    2400:cb00:2049:1::a29f:1926
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:c1::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
n.au.                   172800  IN      A       37.209.194.5
n.au.                   172800  IN      AAAA    2001:502:ad09::24
a.au.                   172800  IN      A       58.65.254.73
a.au.                   172800  IN      AAAA    2407:6e00:254:306::73
c.au.                   172800  IN      A       162.159.24.179
c.au.                   172800  IN      AAAA    2400:cb00:2049:1::a29f:18b3

;; Query time: 146 msec
;; SERVER: 198.41.0.4#53(198.41.0.4)
;; WHEN: Tue Jun 29 14:01:00 AEST 2021
;; MSG SIZE  rcvd: 591
```

- Then query this second server to find the authoritative nameserver for the "edu.au." Domain:

```
weber % dig @58.65.254.73 lyre00.cse.unsw.edu.au NS

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @58.65.254.73 lyre00.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 20927
;; 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:
;lyre00.cse.unsw.edu.au.                IN      NS

;; 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

;; Query time: 159 msec
;; SERVER: 58.65.254.73#53(58.65.254.73)
;; WHEN: Tue Jun 29 14:09:16 AEST 2021
;; MSG SIZE  rcvd: 291
```

- Then query this nameserver to find the authoritative nameserver for "unsw.edu.au" domain:

```
weber % dig @65.22.196.1 lyre00.cse.unsw.edu.au NS

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @65.22.196.1 lyre00.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29743
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 3, ADDITIONAL: 6
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
;; QUESTION SECTION:
;lyre00.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: 24 msec
;; SERVER: 65.22.196.1#53(65.22.196.1)
;; WHEN: Tue Jun 29 14:10:51 AEST 2021
;; MSG SIZE  rcvd: 209
```

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

```
weber % dig @129.94.0.192 lyre00.cse.unsw.edu.au NS

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @129.94.0.192 lyre00.cse.unsw.edu.au NS
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 45459
;; 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:
;lyre00.cse.unsw.edu.au.              IN      NS

;; AUTHORITY SECTION:
cse.unsw.edu.au.        300     IN      NS      beethoven.orchestra.cse.unsw.edu.au.
cse.unsw.edu.au.        300     IN      NS      maestro.orchestra.cse.unsw.edu.au.

;; ADDITIONAL SECTION:
beethoven.orchestra.cse.unsw.edu.au. 300 IN A   129.94.172.11
beethoven.orchestra.cse.unsw.edu.au. 300 IN A   129.94.208.3
beethoven.orchestra.cse.unsw.edu.au. 300 IN A   129.94.242.2
maestro.orchestra.cse.unsw.edu.au. 300 IN A     129.94.242.33

;; Query time: 4 msec
;; SERVER: 129.94.0.192#53(129.94.0.192)
;; WHEN: Tue Jun 29 14:14:19 AEST 2021
;; MSG SIZE  rcvd: 171
```

- Now query the nameserver of cse.unsw.edu.au to find the IP address of my host:

```
weber % dig @129.94.242.2 lyre00.cse.unsw.edu.au A

; <<>> DiG 9.9.5-9+deb8u19-Debian <<>> @129.94.242.2 lyre00.cse.unsw.edu.au A
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 57596
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 3

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;lyre00.cse.unsw.edu.au.              IN      A

;; ANSWER SECTION:
lyre00.cse.unsw.edu.au. 3600     IN     A       129.94.210.20

;; AUTHORITY SECTION:
cse.unsw.edu.au.        3600    IN      NS      maestro.orchestra.cse.unsw.edu.au.
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
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: Tue Jun 29 14:15:32 AEST 2021
;; MSG SIZE  rcvd: 155
```

- The IP address for lyre00.cse.unsw.edu.au is 129.94.210.20. Starting from the root name serve, 5 DNS servers need to be queried.

Question 11

- Yes, one device can have multiple IP addresses. The usual reason for a device to have more than one IP address is that it is present on more than one separate subnet, or network.