

## **Linux report**

### **Index**

<b>Sr. No.</b>	<b>Topic</b>
1	Introduction
1	DNS
2	DHCP
3	Web server
4	Firewall
5	Backup
6	Testing
7	Integration
7	Improvements

**DNS server:**

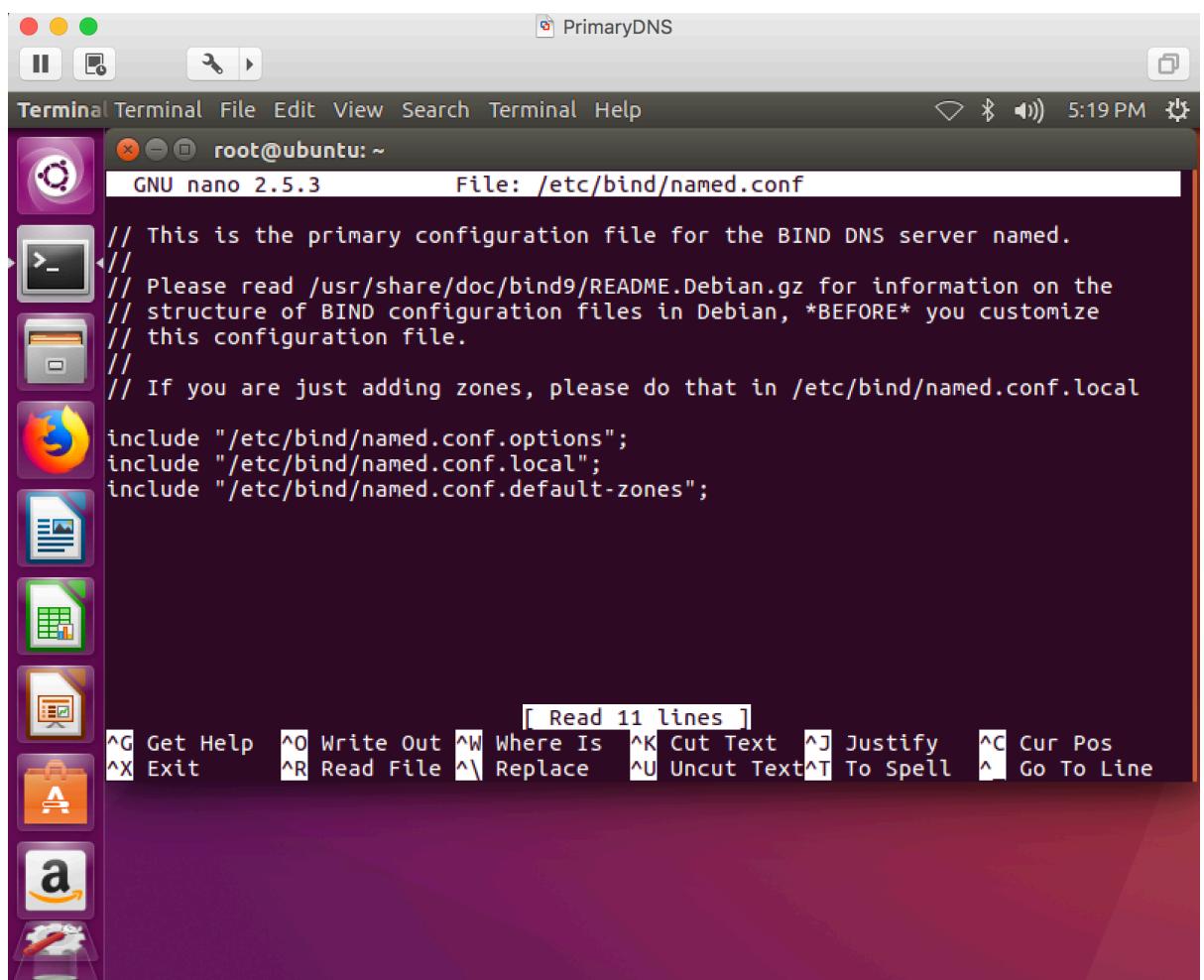
Domain name for startup	crazyfordn.lan
Addressing	Ipv4: 192.168.177.0/24 ipv6: 2001:db8:1:2:2e0:81ff:fe2e:b6d1
DNS servers	Primary: pri.crazyfordn.lan 192.168.177.120/24 Secondary: sec.crazyfordn.lan 192.168.177.121/24

1. Berkley Internet Name Domain (BIND) is a program which enables Ubuntu to serve as a DNS server for private or public network.
2. Therefore, ‘bind9’ is installed to configure Ubuntu as a DNS server using the command:

```
sudo apt-get install bind9 bind9utils bind9-doc
```

3. Configuring ‘Primary DNS server’

```
sudo nano /etc/bind/named.conf
```



4. Defining forward and reverse zones:

```
// Do any local configuration here
// Consider adding the 1918 zones here, if they are not used in your
// organization
//include "/etc/bind/zones.rfc1918";

zone "crazyfordn.lan" {
    type master;
    file "/etc/bind/for.crazyfordn.lan";
    allow-transfer { 192.168.177.121; };
    also-notify { 192.168.177.121; };
};

zone "177.168.192.in-addr.arpa" {
    type master;
    file "/etc/bind/rev.crazyfordn.lan";
    allow-transfer { 192.168.177.121; };
    also-notify { 172.16.57.201; };
};

// 2001:db8:1:2::/64
zone "2.0.0.0.1.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa" {
    type master;
    file "/etc/bind/db.v6.1";
};

[ Read 28 lines ]
^G Get Help      ^O Write Out   ^W Where Is     ^K Cut Text   ^J Justify   ^C Cur Pos     ^Y Prev Page
^X Exit          ^R Read File   ^A Replace      ^U Uncut Text  ^T To Spell   ^H Go To Line  ^V Next Page
```

- i. Here we specify the zones.
- ii. This is the main DNS server. Therefore, its type is master.
- iii. The records for the zones are defined under filename.
- iv. Allow-transfer enables the slave DNS server. That is the backup DNS server.
- v. Also-notify helps the backup to be updated with the changes in the zones from the primary DNS server.
- vi. For forward and reverse mapping, two different zones are defined.
- vii. For ipv6 reverse mapping, new zone is defined.
- viii. Each zone has different set of records (database) and therefore new files are created.

## 5. The forward zone file:

```
root@ubuntu:~# sudo cat /etc/bind/for.crazyfordn.lan
$TTL 86400
@ IN SOA pri.crazyfordn.lan. root.crazyfordn.lan. (
    001 ;Serial
    3600 ;Refresh
    1800 ;Retry
    604800 ;Expire
    86400 ;Minimum TTL
)
@ IN NS pri.crazyfordn.lan.
@ IN NS sec.crazyfordn.lan.

@ IN A 192.168.177.120
@ IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d1

@ IN A 192.168.177.121
@ IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d2

@ IN A 192.168.177.122
@ IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d3

@ IN MX 10 mail

pri IN A 192.168.177.120
pri IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d1

sec IN A 192.168.177.121
sec IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d2

client IN A 192.168.177.122
client IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d3

mail IN A 192.168.177.123
mail IN AAAA 2001:db8:1:2:2e0:81ff:fe2e:b6d4

abc IN CNAME pri
root@ubuntu:~#
```

- i. The start of authority record(SOA) specifies core information about the DNS zone. including the primary name server, the contact of the domain administrator, the domain serial number, and the timers relating to refreshing the zone.
  - ii. Serial is for indicating the number of time the zone file has been edited. Time-to-live(TTL) of the DNS record(in seconds).
  - iii. ‘A’ records for mapping hostname to IPv4 address. ‘AAAA’ records for mapping hostname to IPv6 address. ‘NS’ records for mapping hostname to DNS server. ‘abc’ is the CNAME and ‘mail’ is the MX record.
6. The reverse zone file:

```

Terminal Terminal File Edit View Search Terminal Help
root@ubuntu:~#
addy@ubuntu:~$ sudo -s
[sudo] password for addy:
root@ubuntu:~# cat /etc/bind/rev.crazyfordn.lan
$TTL 86400
@ IN SOA pri.crazyfordn.lan. root.pri.crazyfordn.lan. (
    002           ;Serial
    3600          ;Refresh
    1800          ;Retry
    604800        ;Expire
    86400         ;Minimum TTL
)
@ IN NS      pri.crazyfordn.lan.
@ IN NS      sec.crazyfordn.lan.
@ IN PTR     crazyfordn.lan.
pri  IN A      192.168.177.120
sec  IN A      192.168.177.121
client  IN A   192.168.177.122
120  IN PTR    pri.crazyfordn.lan. ; 192.168.177.120
121  IN PTR    sec.crazyfordn.lan. ; 192.168.177.121
122  IN PTR    client.crazyfordn.lan. ; 192.168.177.120
root@ubuntu:~#

```

- i. PTR, reverse mapping records are defined in this file for the ipv4 addresses.
  - ii. NS, A and SOA records are also added.
7. Permissions and ownerships:
- ```

root@ubuntu:~# sudo chmod -R 755 /etc/bind
root@ubuntu:~# sudo chown -R bind:bind /etc/bind

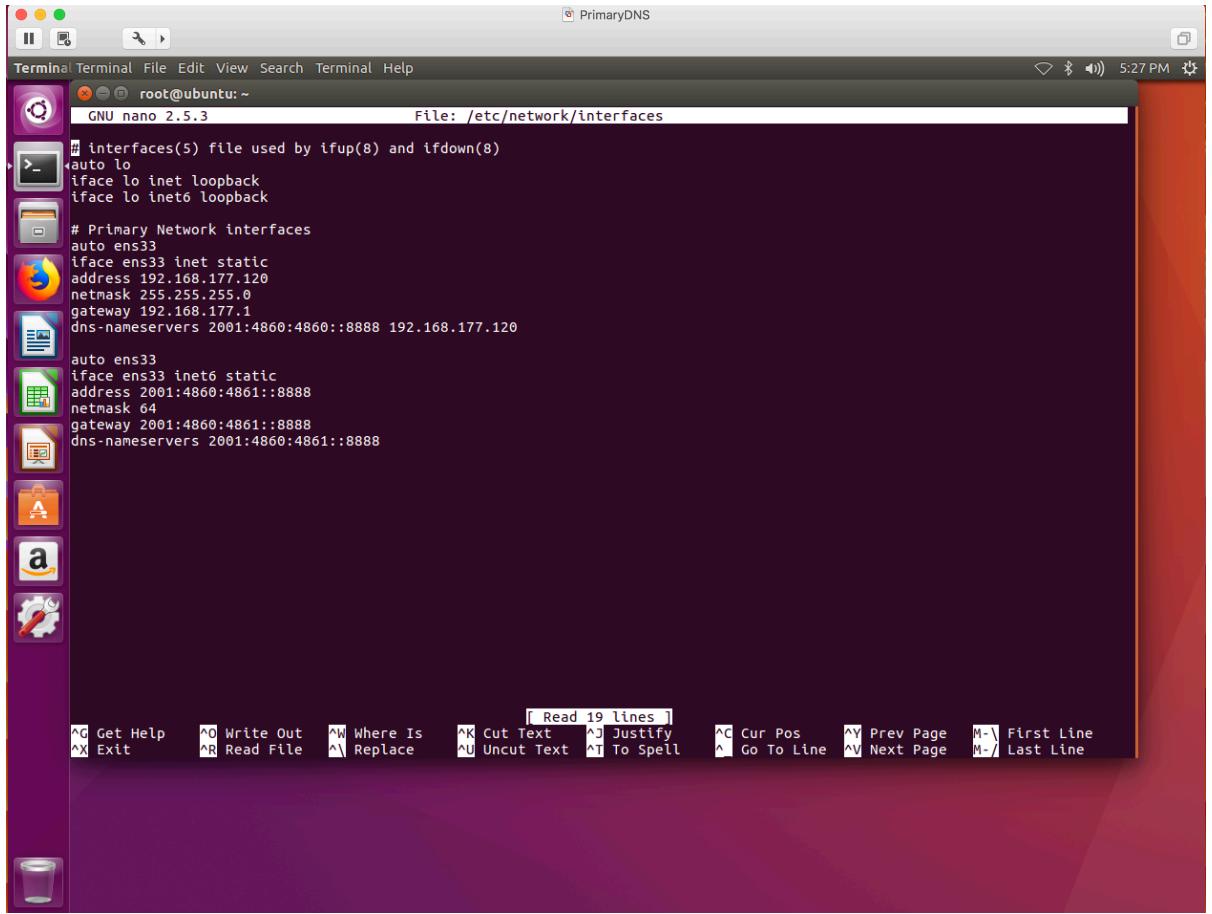
```
- i. chmod 755 for the directory /etc/bind gives the owner (7) the permission to read write and execute while for the group and others, it is restricted to reading and executing only (4 + 1).
  - ii. ‘chown’ –R with bind:/etc/bind changes the owner of directory and file in /etc/bind to bind.
  - iii. –R changes the ownership of the directory and its files recursively.
8. Verifying the configuration files:

```

root@ubuntu:~# sudo named-checkconf /etc/bind/named.conf
root@ubuntu:~# sudo named-checkconf /etc/bind/named.conf.local
root@ubuntu:~# sudo named-checkzone crazyfordn.lan /etc/bind/for.crazyfordn.lan
zone crazyfordn.lan/IN: loaded serial 1
OK
root@ubuntu:~# sudo named-checkzone crazyfordn.lan /etc/bind/rev.crazyfordn.lan
zone crazyfordn.lan/IN: loaded serial 2
OK
root@ubuntu:~# sudo named-checkzone crazyfordn.lan /etc/bind/db.v6.1
zone crazyfordn.lan/IN: loaded serial 2011071002
OK
root@ubuntu:~#

```

9. DNS name servers in the network interfaces:



```
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
iface lo inet loopback
iface lo inet6 loopback

# Primary Network interfaces
auto ens33
iface ens33 inet static
    address 192.168.177.120
    netmask 255.255.255.0
    gateway 192.168.177.1
    dns-nameservers 2001:4860:4860::8888 192.168.177.120

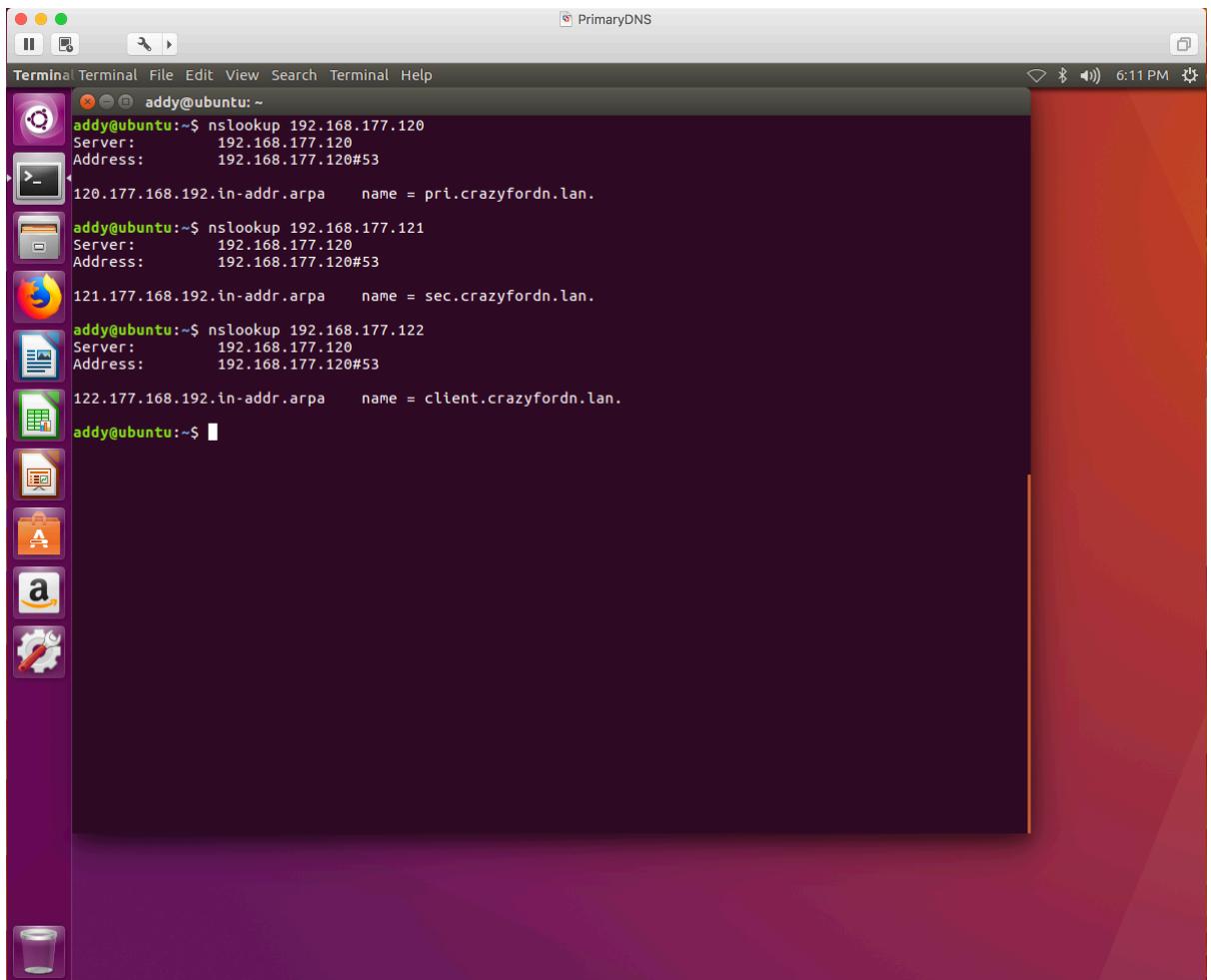
auto ens33
iface ens33 inet6 static
    address 2001:4860:4861::8888
    netmask 64
    gateway 2001:4860:4861::8888
    dns-nameservers 2001:4860:4861::8888
```

- i. The ip address (both ipv4 and ipv6) of the primary DNS server are added to the ens33 interface.

10. Restarting bind to install all the implementations:

```
sudo systemctl restart bind9
```

11. Testing the primary DNS server:

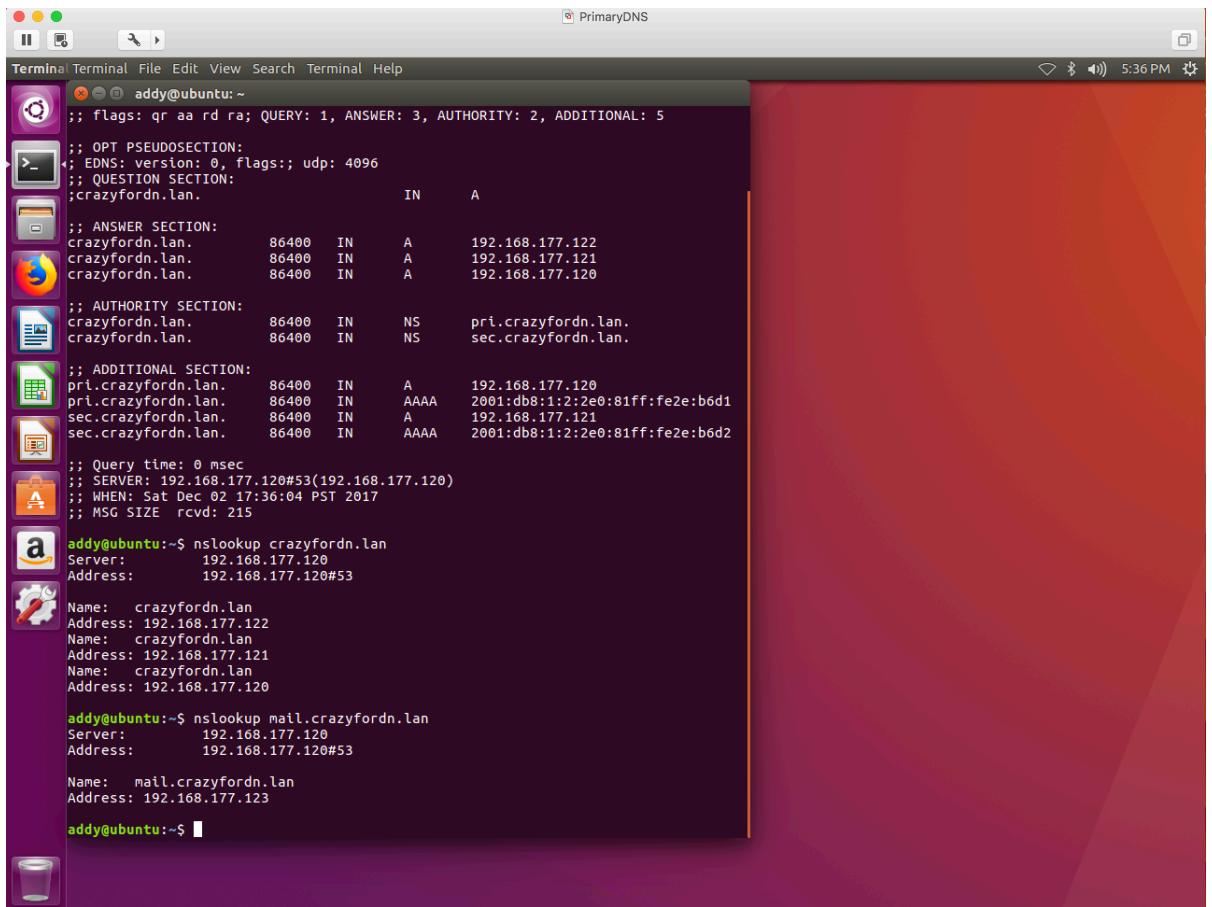


(Reverse mappings ipv4)

```
root@ubuntu:~#
root@ubuntu:~# nslookup abc.crazyfordn.lan
Server:      192.168.177.120
Address:     192.168.177.120#53
abc.crazyfordn.lan      canonical name = pri.crazyfordn.lan.
Name:  pri.crazyfordn.lan
Address: 192.168.177.120

root@ubuntu:~#
```

(Canonical name)



```

PrimaryDNS
Terminal Terminal File Edit View Search Terminal Help
addy@ubuntu: ~
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 2, ADDITIONAL: 5
;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;crazyfordn.lan.           IN      A
;;
;; ANSWER SECTION:
crazyfordn.lan.    86400   IN      A      192.168.177.122
crazyfordn.lan.    86400   IN      A      192.168.177.121
crazyfordn.lan.    86400   IN      A      192.168.177.120
;;
;; AUTHORITY SECTION:
crazyfordn.lan.    86400   IN      NS     pri.crazyfordn.lan.
crazyfordn.lan.    86400   IN      NS     sec.crazyfordn.lan.
;;
;; ADDITIONAL SECTION:
pri.crazyfordn.lan. 86400   IN      A      192.168.177.120
pri.crazyfordn.lan. 86400   IN      AAAA   2001:db8:1::2:2e0:81ff:fe2e:b6d1
sec.crazyfordn.lan. 86400   IN      A      192.168.177.121
sec.crazyfordn.lan. 86400   IN      AAAA   2001:db8:1:2:2e0:81ff:fe2e:b6d2
;;
Query time: 0 msec
;; SERVER: 192.168.177.120#53(192.168.177.120)
;; WHEN: Sat Dec 02 17:36:04 PST 2017
;; MSG SIZE rcvd: 215
addy@ubuntu:~$ nslookup crazyfordn.lan
Server:          192.168.177.120
Address:         192.168.177.120#53
Name:  crazyfordn.lan
Address: 192.168.177.122
Name:  crazyfordn.lan
Address: 192.168.177.121
Name:  crazyfordn.lan
Address: 192.168.177.120
addy@ubuntu:~$ nslookup mail.crazyfordn.lan
Server:          192.168.177.120
Address:         192.168.177.120#53
Name:  mail.crazyfordn.lan
Address: 192.168.177.123
addy@ubuntu:~$ 

```

(Dig and nslookup)

Dig: Domain information groper is used for querying DNS servers.

Nslookup: To obtain domain name or IP address mapping or for any other specific DNS record.

12. .

- i. A secondary or a slave DNS server is implemented to continue the address mapping even when the primary DNS server fails to function.
- ii. The same process is implemented for configuring Ubuntu as slave server, only the **/etc/bind/named.conf.local** file has the zone type as ‘slave’.
- iii. Defining the forward and reverse zones along with their masters as the IP address of the primary DNS server.
- iv. Adding the IP address of the slave DNS server in the interfaces will help the interface to obtain the mappings from both slave and master, so that when master fails, the slave can backup for the master.

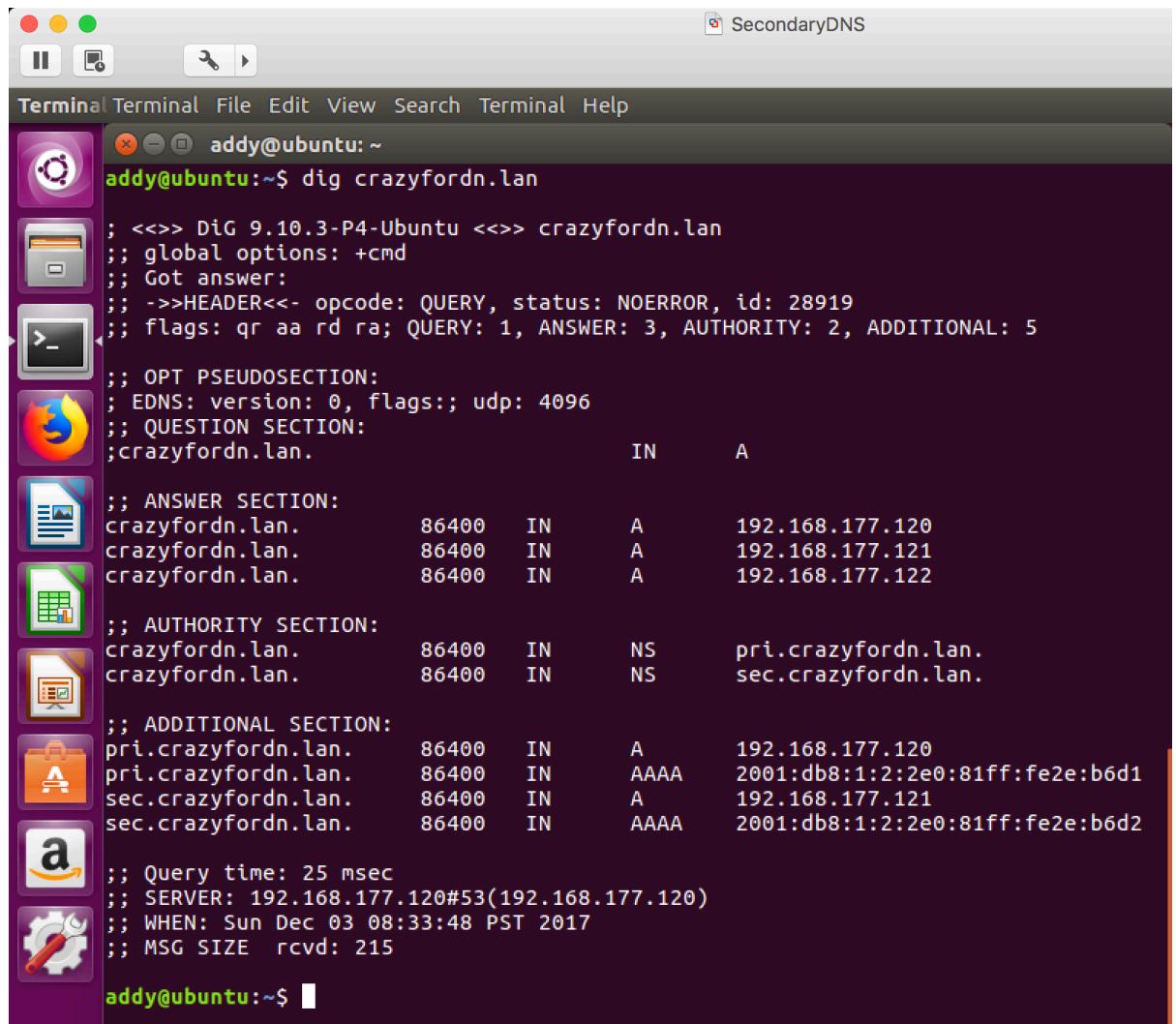
The screenshot shows a Linux desktop environment with a terminal window open. The terminal title is "Terminal" and the command line shows "addy@ubuntu: ~". The file being edited is "/etc/bind/named.conf.local" using the "GNU nano 2.5.3" editor. The content of the file is as follows:

```
//  
// Do any local configuration here  
//  
// Consider adding the 1918 zones here, if they are not used in your  
// organization  
//include "/etc/bind/zones.rfc1918";  
  
zone "crazyfordn.lan" {  
    type slave;  
    file "/var/cache/bind/for.crazyfordn.lan";  
    masters { 192.168.177.120; };  
};  
zone "177.168.192.in-addr.arpa" {  
    type slave;  
    file "/var/cache/bind/rev.crazyfordn.lan";  
    masters { 192.168.177.120; };  
};
```

13. Testing secondary DNS server:

The screenshot shows a Linux desktop environment with a terminal window open. The terminal title is "Terminal" and the command line shows "addy@ubuntu: ~". The user has run the command "nslookup crazyfordn.lan" which outputs the following information:

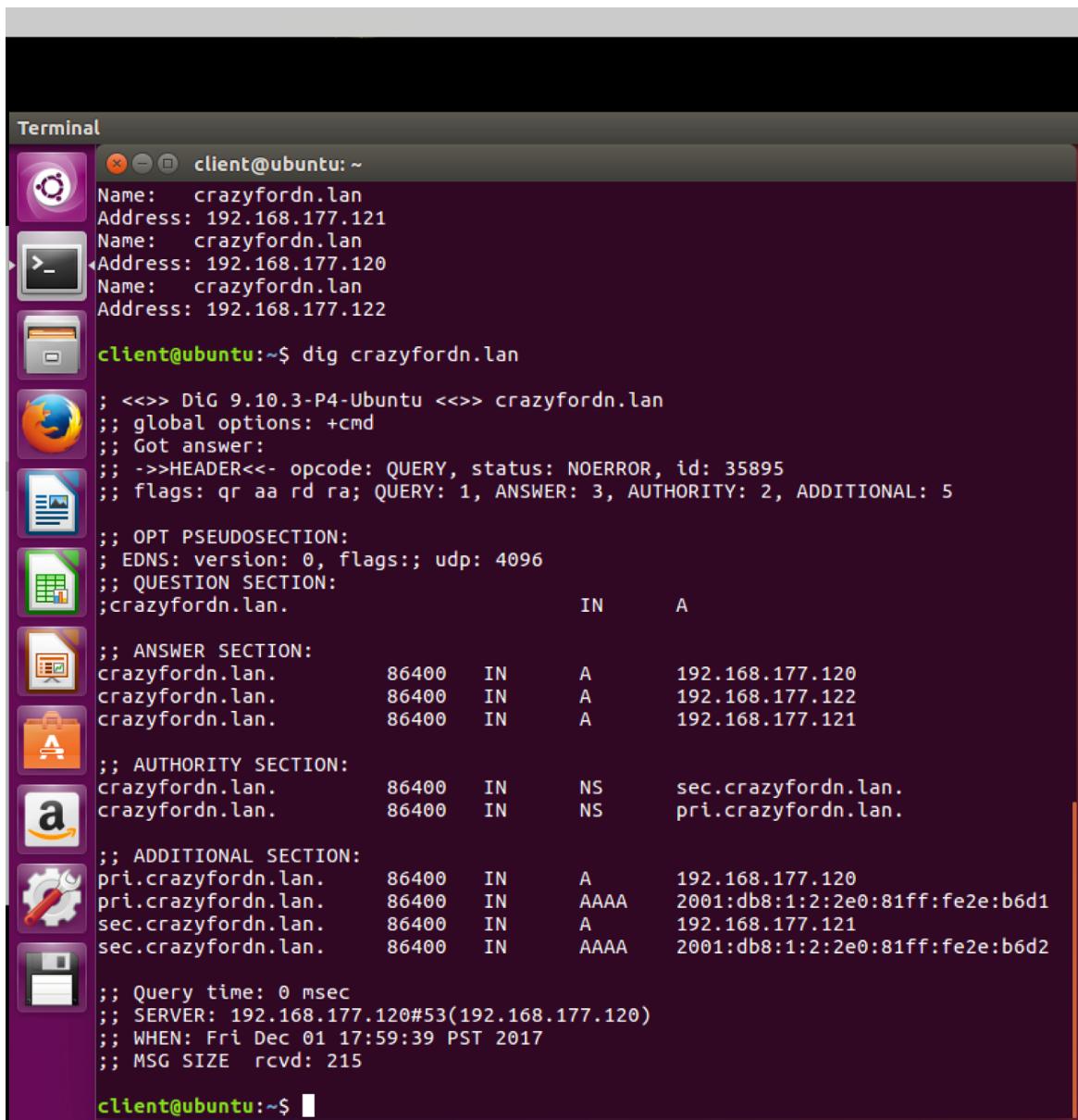
```
Server: 192.168.177.120  
Address: 192.168.177.120#53  
  
Name: crazyfordn.lan  
Address: 192.168.177.120  
Name: crazyfordn.lan  
Address: 192.168.177.121  
Name: crazyfordn.lan  
Address: 192.168.177.122
```



The image shows a screenshot of an Ubuntu desktop environment. A terminal window titled "SecondaryDNS" is open, displaying the output of a "dig" command. The command was run from the user "addy" at the terminal prompt. The output shows a DNS query for "crazyfordn.lan" with responses for A and AAAA records, along with NS records for the authority section. The terminal window has a dark background and is surrounded by various icons representing different applications like file manager, browser, and system tools.

```
Terminal Terminal File Edit View Search Terminal Help
addy@ubuntu:~$ dig crazyfordn.lan
; <>> DiG 9.10.3-P4-Ubuntu <>> crazyfordn.lan
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28919
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 2, ADDITIONAL: 5
;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;crazyfordn.lan.           IN      A
;; ANSWER SECTION:
crazyfordn.lan.      86400   IN      A      192.168.177.120
crazyfordn.lan.      86400   IN      A      192.168.177.121
crazyfordn.lan.      86400   IN      A      192.168.177.122
;; AUTHORITY SECTION:
crazyfordn.lan.      86400   IN      NS     pri.crazyfordn.lan.
crazyfordn.lan.      86400   IN      NS     sec.crazyfordn.lan.
;; ADDITIONAL SECTION:
pri.crazyfordn.lan.  86400   IN      A      192.168.177.120
pri.crazyfordn.lan.  86400   IN      AAAA   2001:db8:1:2:2e0:81ff:fe2e:b6d1
sec.crazyfordn.lan.  86400   IN      A      192.168.177.121
sec.crazyfordn.lan.  86400   IN      AAAA   2001:db8:1:2:2e0:81ff:fe2e:b6d2
;; Query time: 25 msec
;; SERVER: 192.168.177.120#53(192.168.177.120)
;; WHEN: Sun Dec  3 08:33:48 PST 2017
;; MSG SIZE rcvd: 215
addy@ubuntu:~$
```

14. Testing with the client:



Terminal

```
client@ubuntu: ~
Name: crazyfordn.lan
Address: 192.168.177.121
Name: crazyfordn.lan
Address: 192.168.177.120
Name: crazyfordn.lan
Address: 192.168.177.122

client@ubuntu:~$ dig crazyfordn.lan

; <>> DiG 9.10.3-P4-Ubuntu <>> crazyfordn.lan
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 35895
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 2, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;crazyfordn.lan.           IN      A

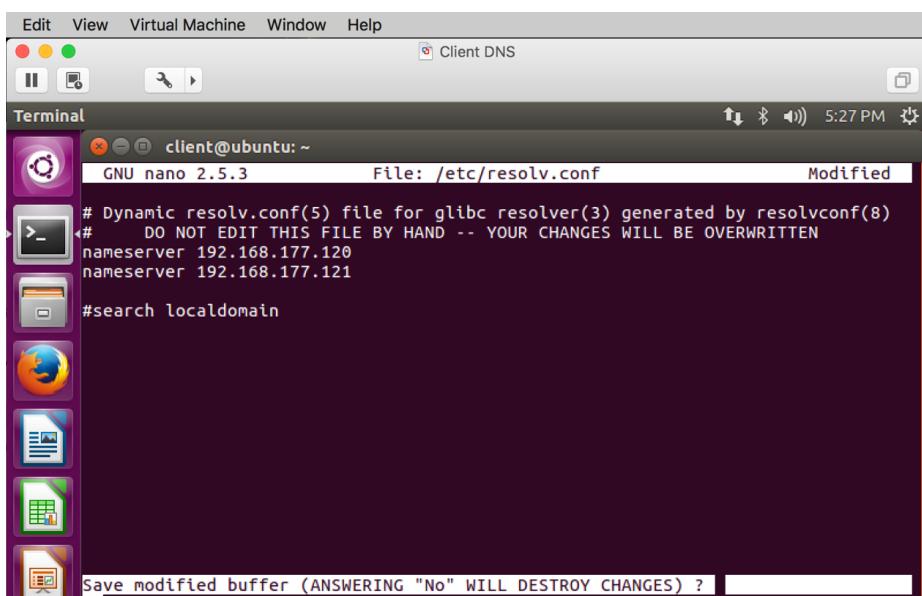
;; ANSWER SECTION:
crazyfordn.lan.      86400   IN      A      192.168.177.120
crazyfordn.lan.      86400   IN      A      192.168.177.122
crazyfordn.lan.      86400   IN      A      192.168.177.121

;; AUTHORITY SECTION:
crazyfordn.lan.      86400   IN      NS     sec.crazyfordn.lan.
crazyfordn.lan.      86400   IN      NS     pri.crazyfordn.lan.

;; ADDITIONAL SECTION:
pri.crazyfordn.lan.  86400   IN      A      192.168.177.120
pri.crazyfordn.lan.  86400   IN      AAAA   2001:db8:1:2:2e0:81ff:fe2e:b6d1
sec.crazyfordn.lan.  86400   IN      A      192.168.177.121
sec.crazyfordn.lan.  86400   IN      AAAA   2001:db8:1:2:2e0:81ff:fe2e:b6d2

;; Query time: 0 msec
;; SERVER: 192.168.177.120#53(192.168.177.120)
;; WHEN: Fri Dec  1 17:59:39 PST 2017
;; MSG SIZE rcvd: 215

client@ubuntu:~$
```



Edit View Virtual Machine Window Help

Client DNS

5:27 PM

Terminal

```
client@ubuntu: ~
GNU nano 2.5.3          File: /etc/resolv.conf          Modified
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
# DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
nameserver 192.168.177.120
nameserver 192.168.177.121
#search localdomain
```

Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) ?