NETENG Assignment 3
ENGR3821
Network Engineering
Hidden Primary DNS

24/06/2019

Consent

I, the author, give consent to ENGR3821 Topic Staff to distribute this document for the purposes of peer marking and assessment.

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Definitions

Term	Definition
A	(DNS Record) Address
DNS	Domain Name Service
FQDN	Fully Qualified Domain Name
IN	(DNS Record) Internet
IP	Internet Protocol
NS	(DNS Record) NameServer
PTR	(DNS Record) Pointer
SOA	(DNS Record) Start of Authority
UFW	Uncomplicated FireWall
VM	Virtual Machine

0 Introduction

0.0 Revision History

Table 1 - Author and Revision History

Revision No.	Author	Date	Details
0	<REDACTED1>	15/06/19	Initial Documentation

0.1 Purpose

This document is intended to be a procedure of the setup required to configure a master and slave DNS server on two separate Linux Ubuntu 18.04 VMs. This document will detail testing of the restriction of connections to the primary DNS.

0.2 Scope

The setup of the DNS server(s) could not be completed due to an unknown phenomenon even on a clean install of Ubuntu 18.04 as detailed in later sections. This report shall restrict its scope such that the reproduction of the error can be created. The configuration will detail exclusively IPv4 addressing.

1 Installation Procedure

1.0 Initial Software

Bind9 is the system to be used to set up and configure the DNS servers[1]. Along with this, netplan is needed to write and manage files and network interfaces in backend Ubuntu networking software. To install these packages, use the following command.

```
sudo apt-get install bind9 netplan.io
```

Ensure the system has some sort of tool to view the current network interfaces and environment such as `ip` or `ifconfig`.
The initial addresses per zone shall be as follows:

Table 2 - neteng FQDN domain zone hosts

Server	Name	Address
Domain (FQDN) e.g.	neteng.com.	
Primary nameserver (master)	ns1.neteng.com	10.1.1.1/24
Secondary nameserver (slave)	ns2.neteng.com	10.1.1.2/24
Web server	host.neteng.com	10.1.1.100/24
FTP server	ftp.neteng.com	10.1.1.101/24
Mail Server	mail.neteng.com	10.1.1.102/24

1.1 Configure Bind Options

After installation of `bind9` and its automatic documentation and utilities, modify the file `/etc/bind/named.conf.options` with a text editor. The images in this documentation use `nano`.

For example:

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

Create and `acl` block with the private addresses for the domain as entries. Note that the addresses of all hosts in the zone should be specified as well; this is not shown properly in the capture below. Allow recursive DNS queries from the trusted `acl` named `neteng`, for example, and apply name server settings as below.

Figure 1 - Modify the bind options

Within the options block, specify servers to forward DNS queries to in the case of failure or otherwise. The servers specified here are owned by Google, which are free to use.

```
forwarders {
        8.8.8.8;
        8.8.4.4;
}
```

1.2 Specify Zones

Using a text editor, edit the file `/etc/bind/named.conf.local` and specify the DNS zones required along with the corresponding reverse zones. Insert more zones as required such as those from ENGR3821 Workshop Unit 2. Specify the master/slave behaviour of the server, its zone file location and allow query transfer from the secondary DNS server. Note the reverse octet order of the reverse zone.
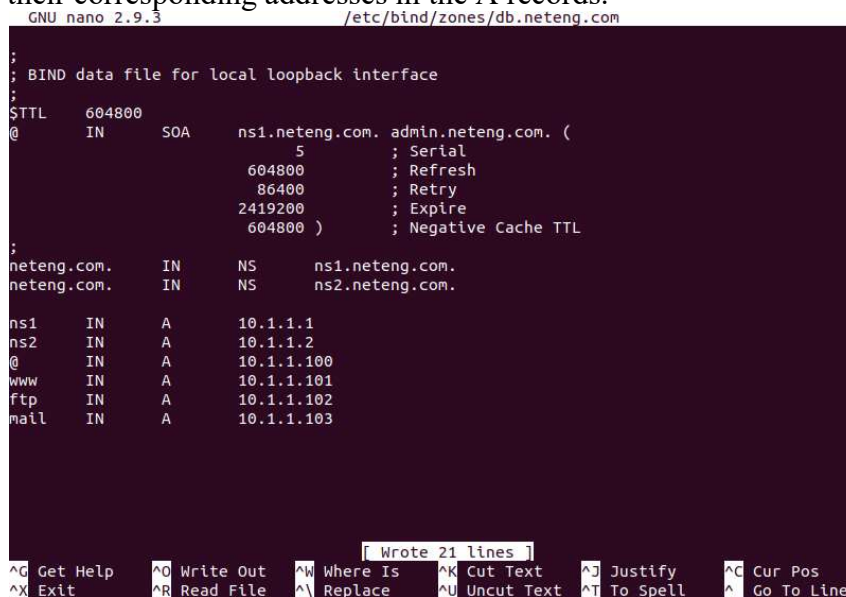

Figure 2 - Modify the bind local config

1.3 Create Zone Files

For each zone in /etc/bind/named.conf.local, create a file at the location specified in Step 1.2 and edit it with a text editor. For example:

```
cd /etc/bind
mkdir zones
cd zones
sudo nano db.neteng.com
```
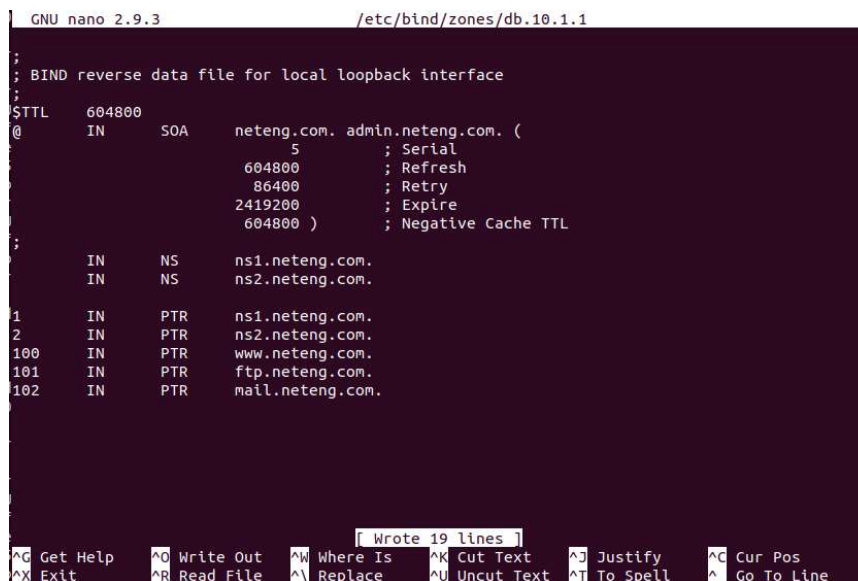
Increment the Serial value for human version control and specify the NS records to each name server. Ensure that FQDNs are used by inserting a full stop at the end of each name. Specify the hosts and their corresponding addresses in the A records.

```
  GNU nano 2.9.3                    /etc/bind/zones/db.neteng.com
;
; BIND data file for local loopback interface
;
$TTL    604800
@       IN      SOA     ns1.neteng.com. admin.neteng.com. (
                              5         ; Serial
                         604800         ; Refresh
                          86400         ; Retry
                        2419200         ; Expire
                         604800 )       ; Negative Cache TTL
;
neteng.com.     IN      NS      ns1.neteng.com.
neteng.com.     IN      NS      ns2.neteng.com.

ns1     IN      A       10.1.1.1
ns2     IN      A       10.1.1.2
@       IN      A       10.1.1.100
www     IN      A       10.1.1.101
ftp     IN      A       10.1.1.102
mail    IN      A       10.1.1.103




                              [ Wrote 21 lines ]
^G Get Help    ^O Write Out   ^W Where Is    ^K Cut Text    ^J Justify     ^C Cur Pos
^X Exit        ^R Read File   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line
```

Figure 3 - neteng.com forward zone

Specify the same details in the reverse DNS zone file.

```
  GNU nano 2.9.3                    /etc/bind/zones/db.10.1.1
;
; BIND reverse data file for local loopback interface
;
$TTL    604800
@       IN      SOA     neteng.com. admin.neteng.com. (
                              5         ; Serial
                         604800         ; Refresh
                          86400         ; Retry
                        2419200         ; Expire
                         604800 )       ; Negative Cache TTL
;
        IN      NS      ns1.neteng.com.
        IN      NS      ns2.neteng.com.

1       IN      PTR     ns1.neteng.com.
2       IN      PTR     ns2.neteng.com.
100     IN      PTR     www.neteng.com.
101     IN      PTR     ftp.neteng.com.
102     IN      PTR     mail.neteng.com.




                              [ Wrote 19 lines ]
^G Get Help    ^O Write Out   ^W Where Is    ^K Cut Text    ^J Justify     ^C Cur Pos
^X Exit        ^R Read File   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line
```

Figure 4 - neteng.com reverse zone

1.4 Check Syntax and Allow Through Firewall

Use the following commands to check the syntax and layout of each of the specified config files.

```
sudo named-checkconf
sudo named-checkzone neteng.com db.neteng.com
sudo named-checkzone neteng.com db.neteng.com
```


Figure 5 - syntax checks using sudo named-check*

Restart the service and then allow the service through the ufw firewall.

```
sudo systemctl restart bind9
sudo ufw allow bind9
```

Ensure that ufw is enabled.

Figure 6 - Allow bind9 through the firewall

Repeat Step 1.1 and 1.4 on the secondary DNS server with Bind9 installed with the adjustments as follows:

1. In the local file change the type of each of the zones from `master` to `slave`

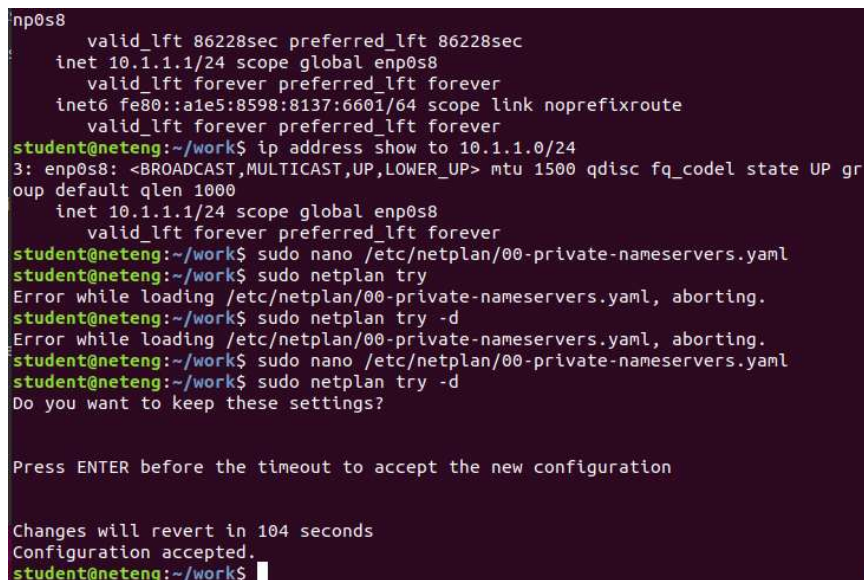2. Add the line to each zone: `masters { 10.1.1.1; };`

1.5 Configuration of DNS Clients

On each host machine, configure it to search for the relevant name servers in the zones specified by using `netplan` and modifying `/etc/netplan/00-private-nameservers.yaml`

```
network:
    version: 5
    ethernets:
        enp0s8:
        interface:
            nameservers:
                addresses:
                - 10.1.1.1
                - 10.1.1.2
                search: [ neteng.com ]
```

Ensure the yaml indentation is precise as this may cause errors if whitespace is not properly utilised.

Use netplan try with an optional -d (debug) flag to attempt to restart the networking features on the VM. On success, the following output should appear.

Figure 7 - Successful netplan configuration on client

Test the DNS configuration on the DNS client using the following command.

```
sudo system-resolve –status
```

The name servers should be visible under the network interface enp0s8 key for DNS Servers. However, the values 10.1.1.1 and 10.1.1.2 do not appear. Since the steps to complete the rest of the requirements of this Assignment extend from the success of this step, this marks the end of the available documentation.

Figure 8 - Created name servers do not appear

END OF DOCUMENTATION

2 Bibliography

[1]   J. Ellingwood and M. Anical. (2018, 23/06/2019). *How To Configure BIND as a Private Network DNS Server on Ubuntu 18.04* Available: https://www.digitalocean.com/community/tutorials/how-to-configure-bind-as-a-private-network-dns-server-on-ubuntu-18-04