

Lab Exercises

Lab 5

Objective

You will install, configure and explore DNS, BIND and `dig`.

BIND (Berkley Internet Naming Daemon) is the DNS server on Linux.

1. Install BIND

On the sever,

```
sudo apt-get install bind9 dnsutils
```

There are many common ways to configure BIND9. The most common three configurations are:

- Caching/forwarder nameserver - it find name queries and remember the answers for later queries.
- Primary master nameserver - it reads the data for a zone from a file and is authoritative for the zone.
- Secondary nameserver - it gets the zone data from another nameserver that is authoritative for the zone.

Configuration files are stored in the `/etc/bind` folder. The primary configuration file is `/etc/bind/named.conf`.

As a way of verifying that the installation succeeded, have a look at `/etc/bind/db.root` that describes the root nameservers in the world.

```
less /etc/bind/db.root
```

(It might be easier if you just change to the `/etc/bind` directory for the remainder of this lab)

```
cd /etc/bind
```

In this lab, we can setup a caching nameserver and a primary master nameserver.

2. Set up a cache/forwarder nameserver

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

Under `options`, uncomment the section about forwarders and edit it to look like this:

```
forwarders {  
    202.119.24.18;      # SEU DNS
```

```
8.8.8.8;          # Google Public DNS
};
```

Note: Punctuation is of crucial importance in DNS configurations! Be very careful to match the supplied configs, especially where full stops are involved.

Save the file.

Now restart the `bind9` service.

```
sudo service bind9 restart
```

Let us test by querying the often mistyped `uniseu.edu` (that is, no trailing `.au`):

```
dig uniseu.edu
```

If you don't specify the type of record you desire be returned, then `dig` will respond with the A record (if it exists).

You should see an answer, but with a large *Query Time* value (in the hundreds of milliseconds).

Wait 5-10 seconds and run the query again. Now what value for Query Time do you see?

It should be significantly lower now (≈ 10 milliseconds is typical) since this is a cached result.

3. Set up static IP for VMs

- Find out the LAN router (gateway) IP. On the server,

```
route -n
```

The gateway is likely to be `10.0.2.1`.

- Setting the *server's* IP to `10.0.2.100`. On the server

```
sudo pico /etc/netplan/50-cloud-init.yaml
```

under the interface `enp0s3`, remove the `dhcp4` line and modify the content to:

```
ethernets:
  enp0s3:
    addresses:
      - 10.0.2.100/24
    gateway4: 10.0.2.1
    nameservers:
      addresses: [10.0.2.100]
    optional: true
  version: 2
```

Save the file and apply the new configuration:

```
sudo netplan apply
```

- Setting the *desktop's* IP to `10.0.2.200`. On the desktop, click at the `network icon` at the top-right corner then select `Wired Connected -> Wired Settings`. Under `Wired`, click at the setting icon

(gear) then IPv4 tab. Under IPv4 Method, tick `manual`. Put the following in the form:

```
Address: 10.0.2.200
Netmask: 255.255.255.0
Gateway: 10.0.2.1
DNS: 10.0.2.100
```

Turn the *Automatic* off under DNS.

Then press the Apply button. Now turn the Wired off and on again to pick up the new configuration. You close the network settings.

4. Set up zone files for the `abc123.test` domain

(We are going to set up an RFC2606 ".test" domain here. This is unavailable to the wider internet by design.)

On the *server*,

```
sudo pico /etc/bind/named.conf.local
```

Add the following lines to that file:

```
zone "abc123.test"{
    type master;
    file "/etc/bind/db.abc123.test";
};

zone "2.0.10.in-addr.arpa" {
    type master;
    notify no;
    file "/etc/bind/db.10";
};
```

Save the file.

```
sudo cp /etc/bind/db.local /etc/bind/db.abc123.test
```

And edit the new **forward zone file**.

```
sudo pico /etc/bind/db.abc123.test
```

Most importantly you must change the serial number in the SOA appropriately. I highly encourage the use of dates followed by a 2 digit count for the day: `YYYYMMDD01`. But also you will need to add A records for new hosts, CNAMEs for aliases and some other details in red.

Modify the file as follows:

```
;
; This is the forward zone for abc123.test internal domain ;
;
$TTL 604800
```

```

@      IN      SOA      server.abc123.test. asl.seu.edu.cn. (
                                2019112001          ; Serial
                                604800              ; Refresh
                                86400               ; Retry
                                2419200            ; Expire
                                604800 )          ; Negative Cache TTL
;
@      IN      NS       server.abc123.test.
@      IN      A        127.0.0.1
@      IN      AAAA     ::1

gateway IN  A    10.0.2.1
server  IN  A    10.0.2.100
desktop IN  A    10.0.2.200

dns     IN  CNAME server
www     IN  CNAME server

```

Similarly for the **reverse zone file**:

```
sudo cp /etc/bind/db.127 /etc/bind/db.10
```

And edit the new file appropriately:

```
sudo pico /etc/bind/db.10
```

Modify the file as follows:

```

;
; This is the reverse zone for abc213.test. internal domain ;
$TTL 604800
@      IN      SOA      server.abc123.test. asl.seu.edu.cn. (
                                2019112001          ; Serial
                                604800              ; Refresh
                                86400               ; Retry
                                2419200            ; Expire
                                604800 )          ; Negative Cache TTL
;
@      IN      NS       server.abc123.test.
1      IN      PTR      gateway.abc123.test.
100    IN      PTR      server.abc123.test.
200    IN      PTR      desktop.abc123.test.

```

And restart the **bind9** service.

```
sudo service bind9 restart
```

Check your DNS configuration on the *server*:

```

sudo named-checkconf
sudo named-checkzone abc123.test db.abc123.test
sudo named-checkzone 2.0.10.in-addr.arpa. db.10

```

- Restart both server and desktop VMs for them to pick up the new configuration.

5. Test your DNS for the abc123.test domain on the *server*

- Test the forward zone

```
dig desktop.abc123.test
```

You should have:

```
;; ANSWER SECTION:
desktop.abc123.test. 604800 IN A 10.0.2.200
```

You can query the master nameserver by specifying the DNS:

```
dig desktop.abc123.test @server.abc123.test
```

Then you should have:

```
;; ANSWER SECTION:
desktop.abc123.test. 604800 IN A 10.0.2.200

;; AUTHORITY SECTION:
abc123.test. 604800 IN NS server.abc123.test.
```

- Test the reverse zone

```
dig -x 10.0.2.200 @server.abc123.test
```

You should have:

```
;; ANSWER SECTION:
200.2.0.10.in-addr.arpa. 604800 IN PTR
desktop.abc123.test.

;; AUTHORITY SECTION:
2.0.10.in-addr.arpa. 604800 IN NS server.abc123.test.
```

6. Access your Dokuwiki using a hostname on the *desktop*

On the desktop, start the browser and point it to: `www.abc123.test/dokuwiki`.

Bookmark it for later use.

7. Other useful dig commands

- Lookup an address from a specific DNS server

```
dig @seic8.seu.edu.cn www.seu.edu.cn
```

- A reverse lookup (address to name): This is not guaranteed to be present and configured on all name servers.

```
dig -x 121.248.60.55
```

- Look for a specific type of record, e.g. MX

```
dig -t MX seu.edu.cn
```

What is the name of the front SEU Mail host (internally)?

Submission and mark

For full marks today, show your teacher

- 1.5 mark for demonstrating the cache/forwarder nameserver working;
- 1.5 mark for demonstrating forward lookups working;
- 1.5 mark for demonstrating reverse lookups working;
- 1.5 mark for accessing your `Dokuwiki` using the server's hostname.

You should be ready to answer any questions to demonstrate that all work is done by yourself otherwise you may receive 0 mark.

IMPORTANT NOTE: You will need to document all of your lab work in your wiki.