

# Domain Name Server (DNS)

## Instructions

You will set up two DNS servers on R1 and R2 that will host a primary and secondary zone, respectively.

R1 will be configured as the primary DNS server which will host the primary zone "cn.". This zone will contain R1, R2, and Kali. R2 will host the secondary zone, "second.cn.", that will contain R2, R3, R4 and Ubuntu.

\*Please note that the zone names should be named with a period (.) at the end.

Your goal is to configure a DNS server using [BIND9](#) such that each machine can ping another by name. (e.g. `ping Kali`).

## Part 1: Setup DNS Resolution

Prior to configuring our DNS servers, you need to setup our DNS resolution.

For each machine in Area 0, go to `/etc/resolv.conf` and replace any existing configuration directives with the following:

```
nameserver<eth1 interface address of R1>
domain <name of primary zone>
search <name of primary zone>
```

## Part 2: Configuring the Primary Zone

On R1, edit `/etc/bind/named.conf.local` to include forward and reverse DNS zone names to BIND9.

Using the below template, name the primary zone, "cn." and the forward zone file as "db.cn":

```
zone "<primary zone>" {
    type master;
    file "/etc/bind/db.example";
};
```

1

Create another entry for the reverse zone, but this time you will name it according to the first three octets of our primary zone server; that is, "10.10.10." and "db.10.10.10" for the reverse zone name and the reverse zone file, respectively.

Next, you will need to create and edit the forward and reverse zone files. The below command will allow you to copy an existing template:

```
sudo cp /etc/bind/db.local /etc/bind/db.cn
```

Edit this file by adding *A records* for R1, R2, and Kali.

You will do the same steps with the Reverse zone file which allows the DNS to resolve an address to a name. The above steps are roughly equivalent, except that you should create pointers for each A record that you configured in the forward zone file.

A pointer should be formatted like so:

```
10.X.X.X IN PTR <machine>.cn.
```

Once you've configured the forward and reverse zone files, restart the DNS service on

```
R1.sudo systemctl restart bind9.service
```

At this stage, you should be able to ping each machine by name from any machine in Area 0.

## Part 3: Configuring the Secondary Zone

You will follow roughly the same steps in Parts 1 and 2 to configure the forward and reverse zone files for the secondary zone on R2. You will name the secondary zone `second.cn.` and use the IP interface configurations for R3, R4 and Ubuntu in the forward zone file.

Remember that your reverse zone file must be named according to the first 3 octets of your zone name.

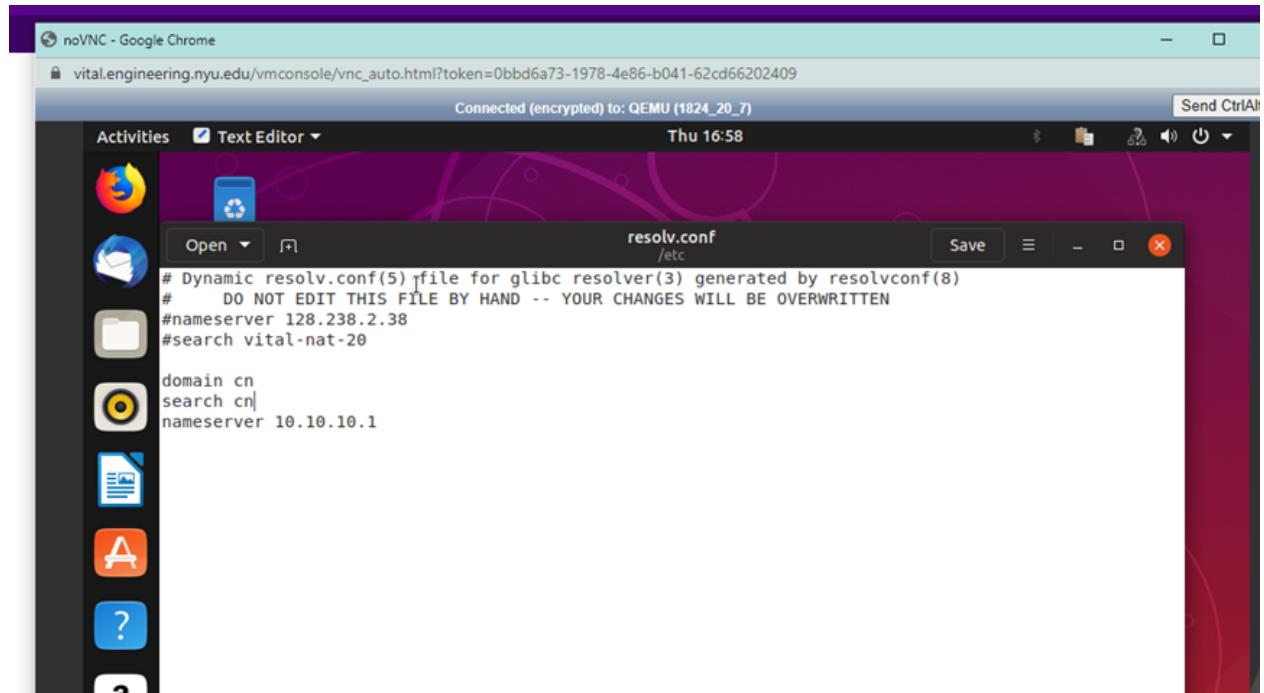
You should be able to ping R2, R3, R4, and Ubuntu from any machine in Area 1.

To link the subzone (`second.cn.`) to the main zone (`cn.`) add a NS record to the `cn.` zone file (`/etc/bind/db.cn`) which points to the address (R2) which hosts the `second.cn.` zone file.

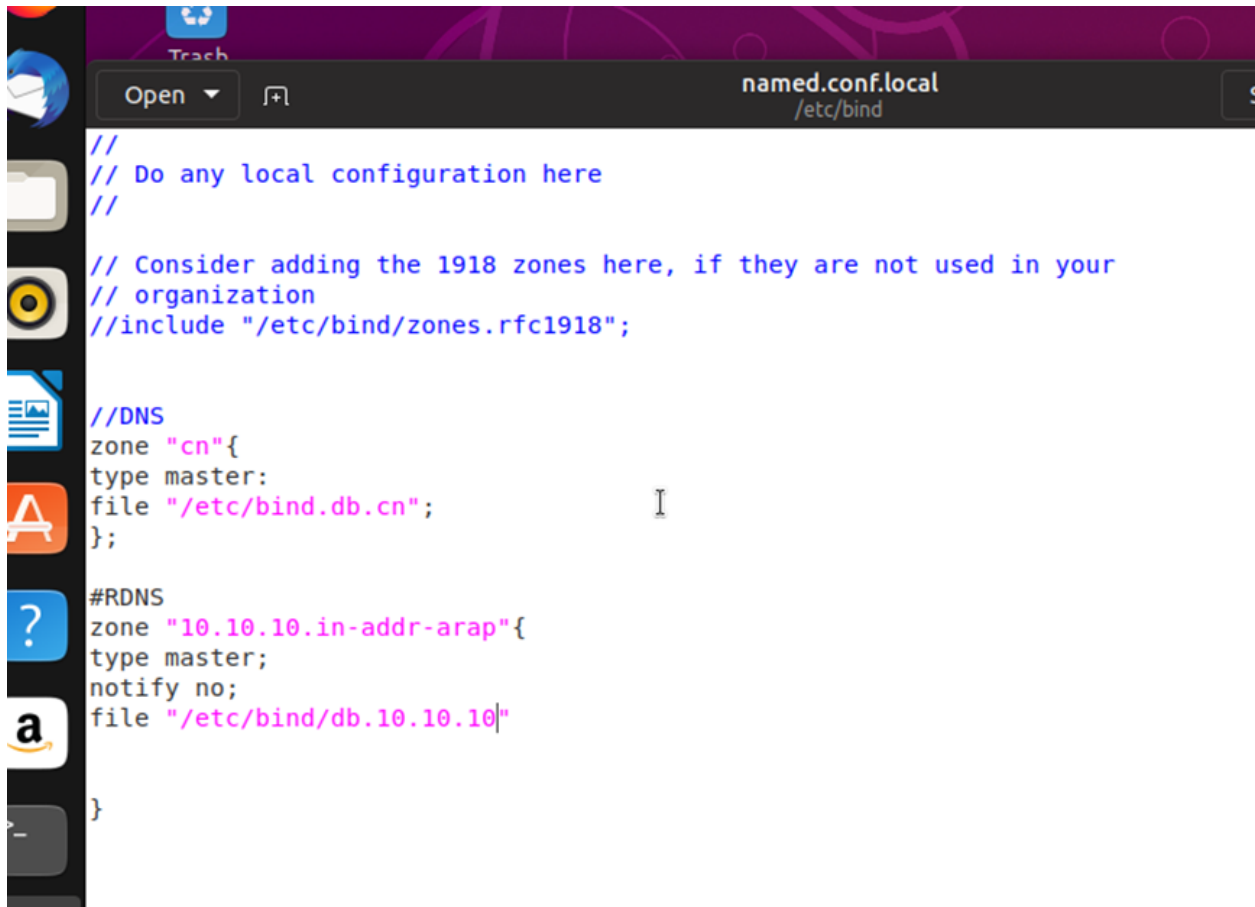
# Submissions

[20 points] Forward and Reverse zone files for primary DNS server.

Resolv.conf in R1, R2 and Kali

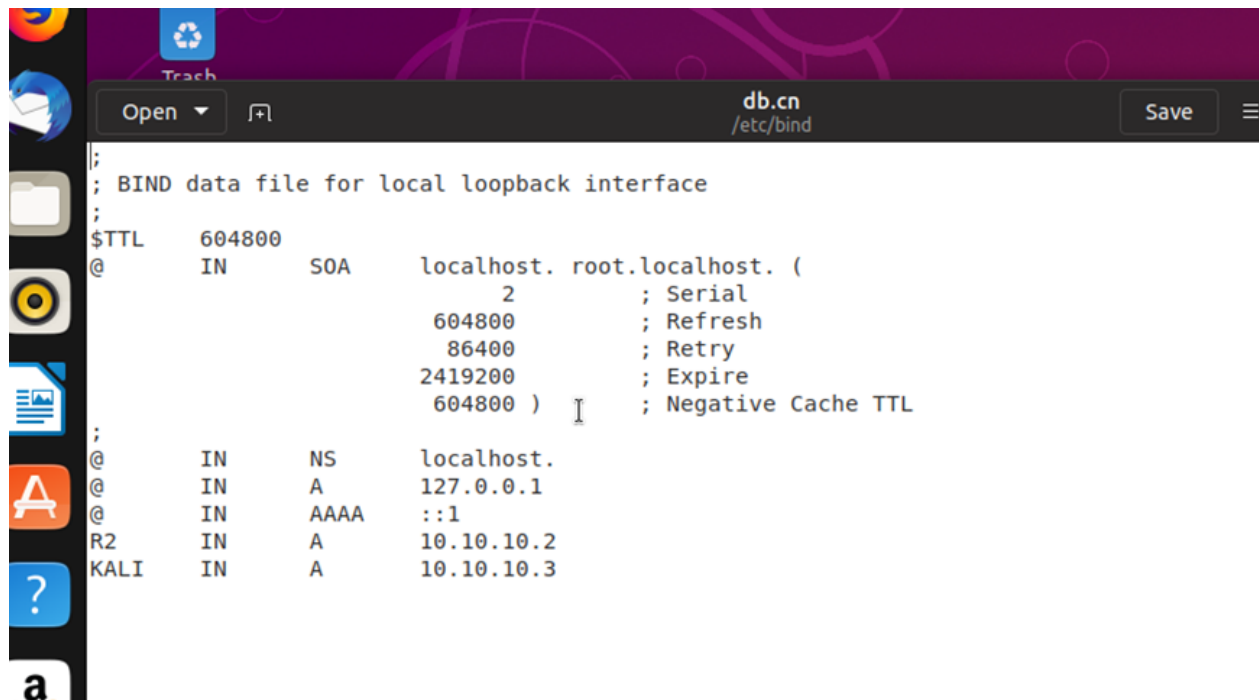


Named.conf.local file in R1



```
//  
// Do any local configuration here  
//  
  
// Consider adding the 1918 zones here, if they are not used in your  
// organization  
//include "/etc/bind/zones.rfc1918";  
  
//DNS  
zone "cn"{  
type master;  
file "/etc/bind.db.cn";  
};  
  
#RDNS  
zone "10.10.10.in-addr-arap"{  
type master;  
notify no;  
file "/etc/bind/db.10.10.10"  
}  
}
```

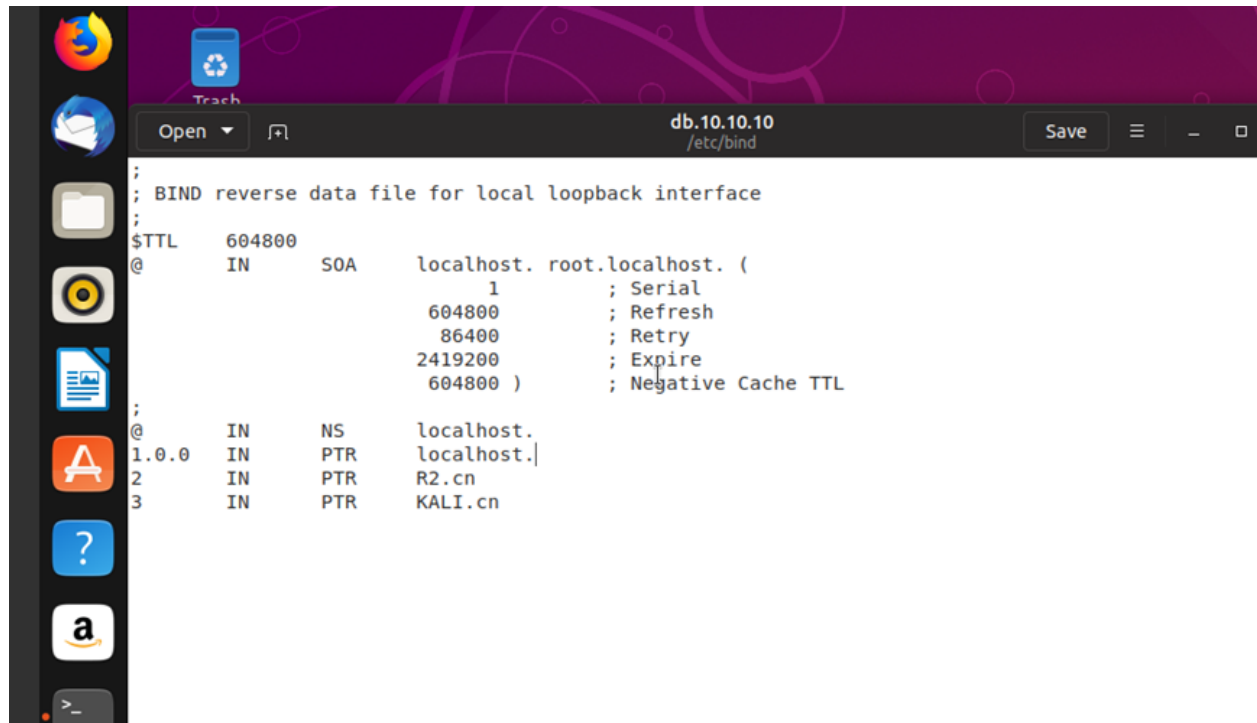
Forward zone file db.cn



The image shows a text editor window with a dark theme. The title bar at the top indicates the file is 'db.cn' located at '/etc/bind'. The editor contains a BIND zone file configuration for the 'db.cn' domain. The configuration includes a header comment, a TTL setting, an SOA record, and several A and AAAA records. The left sidebar shows a vertical stack of application icons, including a terminal, a file manager, and a web browser.

```
;
; BIND data file for local loopback interface
;
$TTL      604800
@         IN      SOA     localhost. root.localhost. (
                        2      ; Serial
                        604800 ; Refresh
                        86400  ; Retry
                        2419200 ; Expire
                        604800 ) ; Negative Cache TTL
;
@         IN      NS      localhost.
@         IN      A       127.0.0.1
@         IN      AAAA    ::1
R2        IN      A       10.10.10.2
KALI      IN      A       10.10.10.3
```

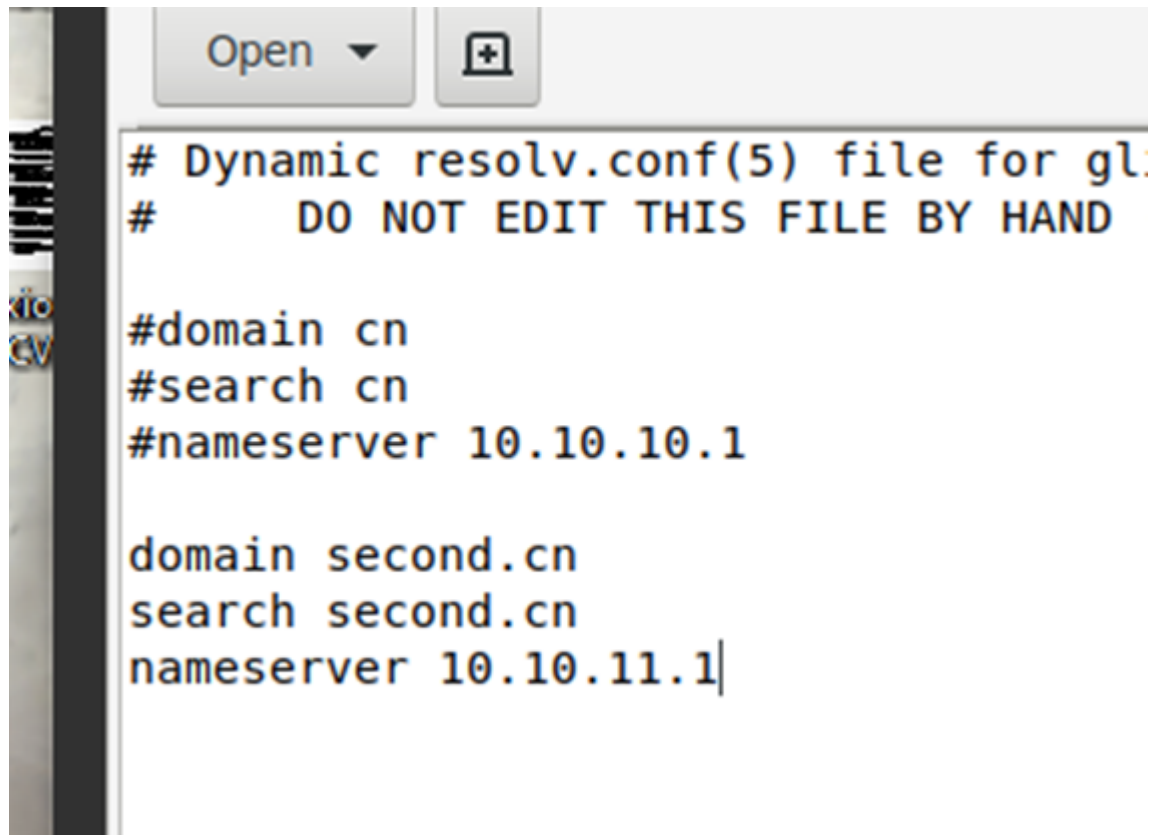
Reverse zone file db.10.10.10



The screenshot shows a Linux desktop environment with a purple background. On the left is a vertical dock with icons for Firefox, Trash, a file manager, a terminal, a web browser, and an application store. The main window is a text editor titled "db.10.10.10 /etc/bind". The editor contains the following text:

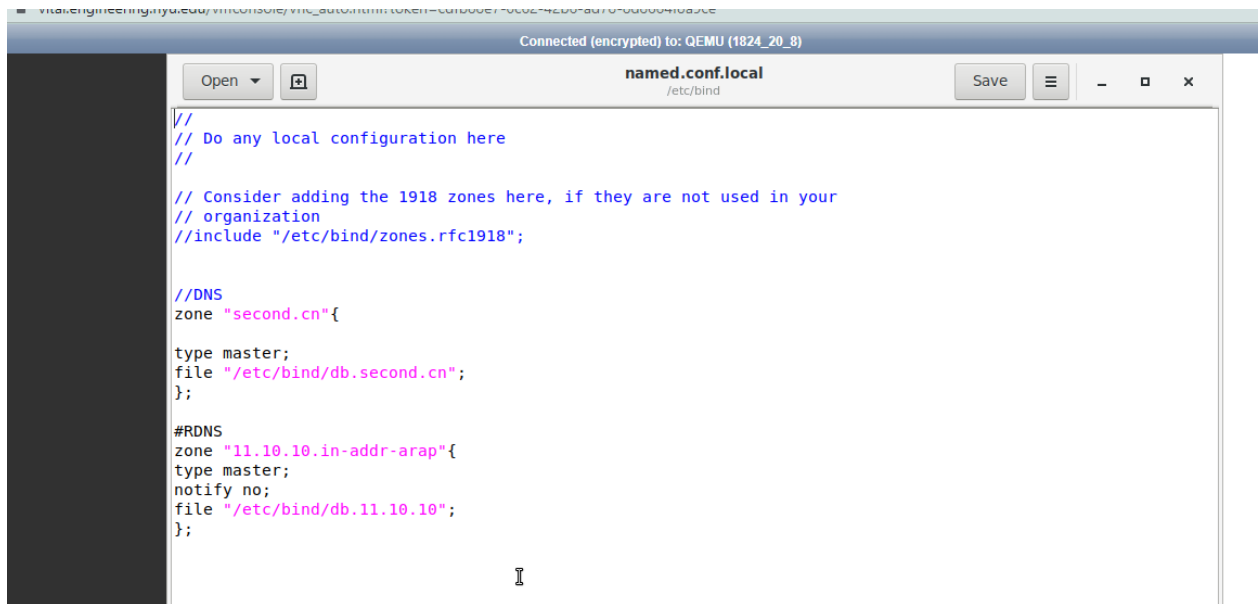
```
;
; BIND reverse data file for local loopback interface
;
$TTL      604800
@         IN      SOA      localhost. root.localhost. (
                        1      ; Serial
                        604800  ; Refresh
                        86400   ; Retry
                        2419200 ; Expire
                        604800 ) ; Negative Cache TTL
;
@         IN      NS       localhost.
1.0.0     IN      PTR      localhost.
2         IN      PTR      R2.cn
3         IN      PTR      KALI.cn
```

[30 points] Forward and Reverse zone files for secondary DNS server.  
Resolv.conf file in R2 R3 R4 and Ubuntu



```
# Dynamic resolv.conf(5) file for glibc >= 2.4. Note that this file should not be edited using a text editor, but with the utility 'resolvconf' (see resolv.conf(8)).  
# DO NOT EDIT THIS FILE BY HAND.  
  
#domain cn  
#search cn  
#nameserver 10.10.10.1  
  
domain second.cn  
search second.cn  
nameserver 10.10.11.1|
```

## Named.conf.local in R2




The screenshot shows a terminal window with a dark background. The title bar at the top reads "Connected (encrypted) to: QEMU (1824\_20\_8)". Below the title bar is a toolbar with an "Open" button, a file icon, and a "Save" button. The main text area displays the contents of the file `named.conf.local`, which is located at `/etc/bind`. The file content 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";  
  
//DNS  
zone "second.cn"{  
    type master;  
    file "/etc/bind/db.second.cn";  
};  
  
#RDNS  
zone "11.10.10.in-addr-arap"{  
    type master;  
    notify no;  
    file "/etc/bind/db.11.10.10";  
};
```



Forward zone file in R2 db.second.cn

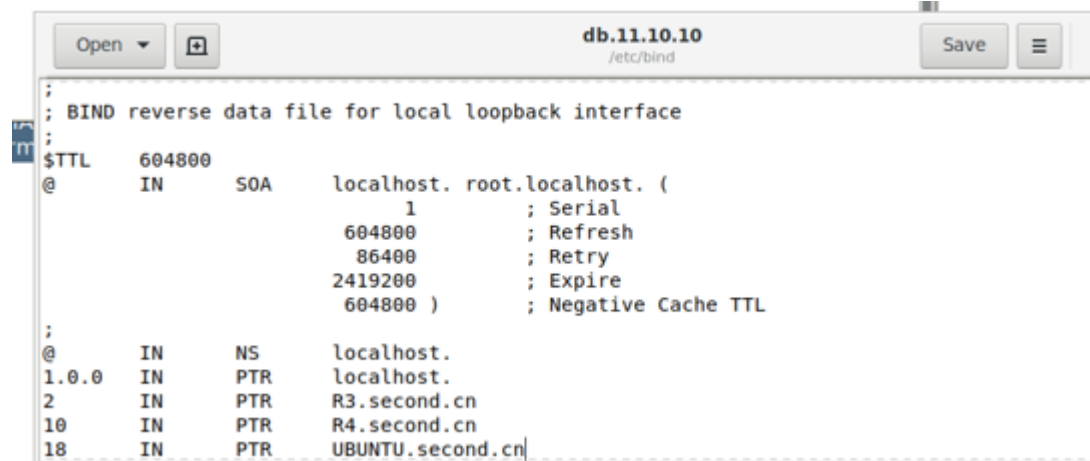
Open ▾  db.second.cn [Read-Only]  
/etc/bind Save

```
;  
; BIND data file for local loopback interface  
;  
$TTL      604800  
@         IN      SOA     localhost. root.localhost. (  
                2      ; Serial  
                604800  ; Refresh  
                86400   ; Retry  
                2419200 ; Expire  
                604800 ) ; Negative Cache TTL  
;  
@         IN      NS      localhost.  
@         IN      A       127.0.0.1  
@         IN      AAAA    ::1  
R3        IN      A       10.10.11.2  
R4        IN      A       10.10.11.10  
UBUNTU    IN      A       10.10.11.18
```

Plain Text ▾ Tab Width: 8 ▾ Ln 1



Reverse zone file in R2



The screenshot shows a text editor window with a title bar containing "db.11.10.10" and the file path "/etc/bind". The editor has "Open" and "Save" buttons. The content is a BIND reverse zone file for the local loopback interface. It starts with a comment line, followed by a \$TTL directive, an SOA record for localhost, and several PTR records for the 1.0.0, 2, 10, and 18 octets of the 127.0.0.0 network.

```
;
; BIND reverse data file for local loopback interface
;
$TTL      604800
@         IN      SOA      localhost. root.localhost. (
                        1          ; Serial
                        604800     ; Refresh
                        86400      ; Retry
                        2419200    ; Expire
                        604800 )   ; Negative Cache TTL
;
@         IN      NS       localhost.
1.0.0     IN      PTR      localhost.
2         IN      PTR      R3.second.cn
10        IN      PTR      R4.second.cn
18        IN      PTR      UBUNTU.second.cn
```

[20 points] Screenshots of R1 pinging R2 and Kali

```
student@CN-R1:~$ ping R2.cn
PING R2.cn (10.10.10.2) 56(84) bytes of data.
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=1 ttl=64 time=0.364 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=2 ttl=64 time=0.340 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=3 ttl=64 time=0.343 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=4 ttl=64 time=0.685 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=5 ttl=64 time=0.364 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=6 ttl=64 time=0.328 ms
64 bytes from 10.10.10.2 (10.10.10.2): icmp_seq=7 ttl=64 time=0.772 ms
^C
--- R2.cn ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 128ms
rtt min/avg/max/mdev = 0.328/0.456/0.772/0.175 ms
student@CN-R1:~$ ping KALI.cn
PING KALI.cn (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3 (10.10.10.3): icmp_seq=1 ttl=64 time=0.343 ms
64 bytes from 10.10.10.3 (10.10.10.3): icmp_seq=2 ttl=64 time=0.331 ms
64 bytes from 10.10.10.3 (10.10.10.3): icmp_seq=3 ttl=64 time=0.365 ms
^C
--- KALI.cn ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 52ms
rtt min/avg/max/mdev = 0.331/0.346/0.365/0.020 ms
student@CN-R1:~$ █
```

[30 points] Screenshots of R2 pinging R3, R4, and Ubuntu

```
student@CN-R2:~$ ping R3.second.cn
PING R3.second.cn (10.10.11.2) 56(84) bytes of data.
64 bytes from 10.10.11.2 (10.10.11.2): icmp_seq=1 ttl=64 time=0.300 ms
64 bytes from 10.10.11.2 (10.10.11.2): icmp_seq=2 ttl=64 time=0.307 ms
64 bytes from 10.10.11.2 (10.10.11.2): icmp_seq=3 ttl=64 time=0.328 ms
64 bytes from 10.10.11.2 (10.10.11.2): icmp_seq=4 ttl=64 time=0.296 ms
^C
--- R3.second.cn ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 45ms
rtt min/avg/max/mdev = 0.296/0.307/0.328/0.024 ms
student@CN-R2:~$ ping R4.second.cn
PING R4.second.cn (10.10.11.10) 56(84) bytes of data.
64 bytes from 10.10.11.10 (10.10.11.10): icmp_seq=1 ttl=64 time=0.320 ms
64 bytes from 10.10.11.10 (10.10.11.10): icmp_seq=2 ttl=64 time=0.349 ms
^C
--- R4.second.cn ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 31ms
rtt min/avg/max/mdev = 0.320/0.334/0.349/0.023 ms
student@CN-R2:~$ ping UBUNTU.second.cn
PING UBUNTU.second.cn (10.10.11.18) 56(84) bytes of data.
64 bytes from 10.10.11.18 (10.10.11.18): icmp_seq=1 ttl=63 time=0.647 ms
64 bytes from 10.10.11.18 (10.10.11.18): icmp_seq=2 ttl=63 time=0.661 ms
64 bytes from 10.10.11.18 (10.10.11.18): icmp_seq=3 ttl=63 time=0.552 ms
64 bytes from 10.10.11.18 (10.10.11.18): icmp_seq=4 ttl=63 time=0.582 ms
64 bytes from 10.10.11.18 (10.10.11.18): icmp_seq=5 ttl=63 time=0.713 ms
^C
--- UBUNTU.second.cn ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 63ms
rtt min/avg/max/mdev = 0.552/0.631/0.713/0.057 ms
student@CN-R2:~$
```

Please remember to submit your lab results as a single PDF document. While you may work in groups, you MUST submit your own work.

