

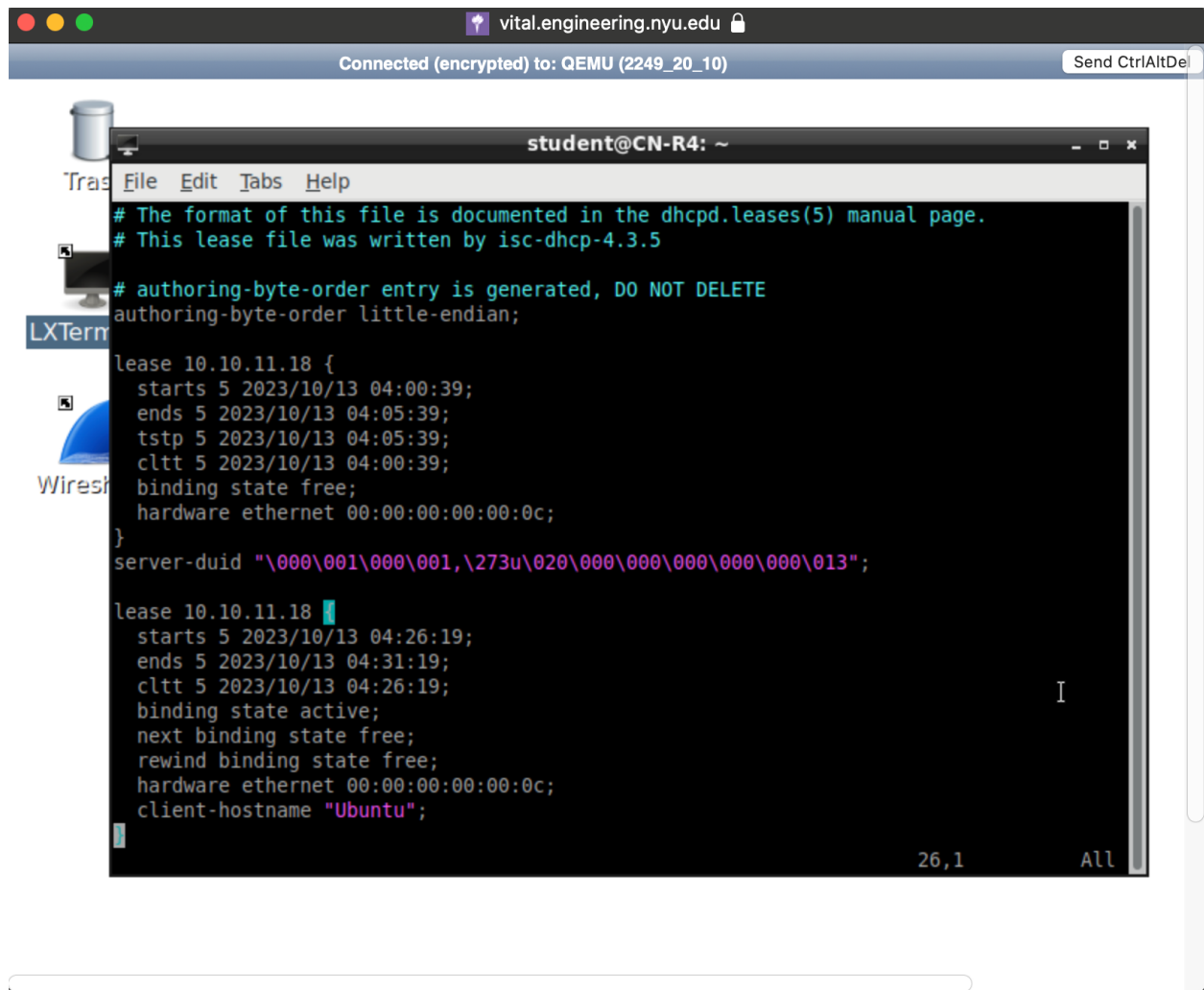
CN ASSIGNMENT

DHCP

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The leases file on R4 found in */var/lib/dhcp/dhcpd.leases*

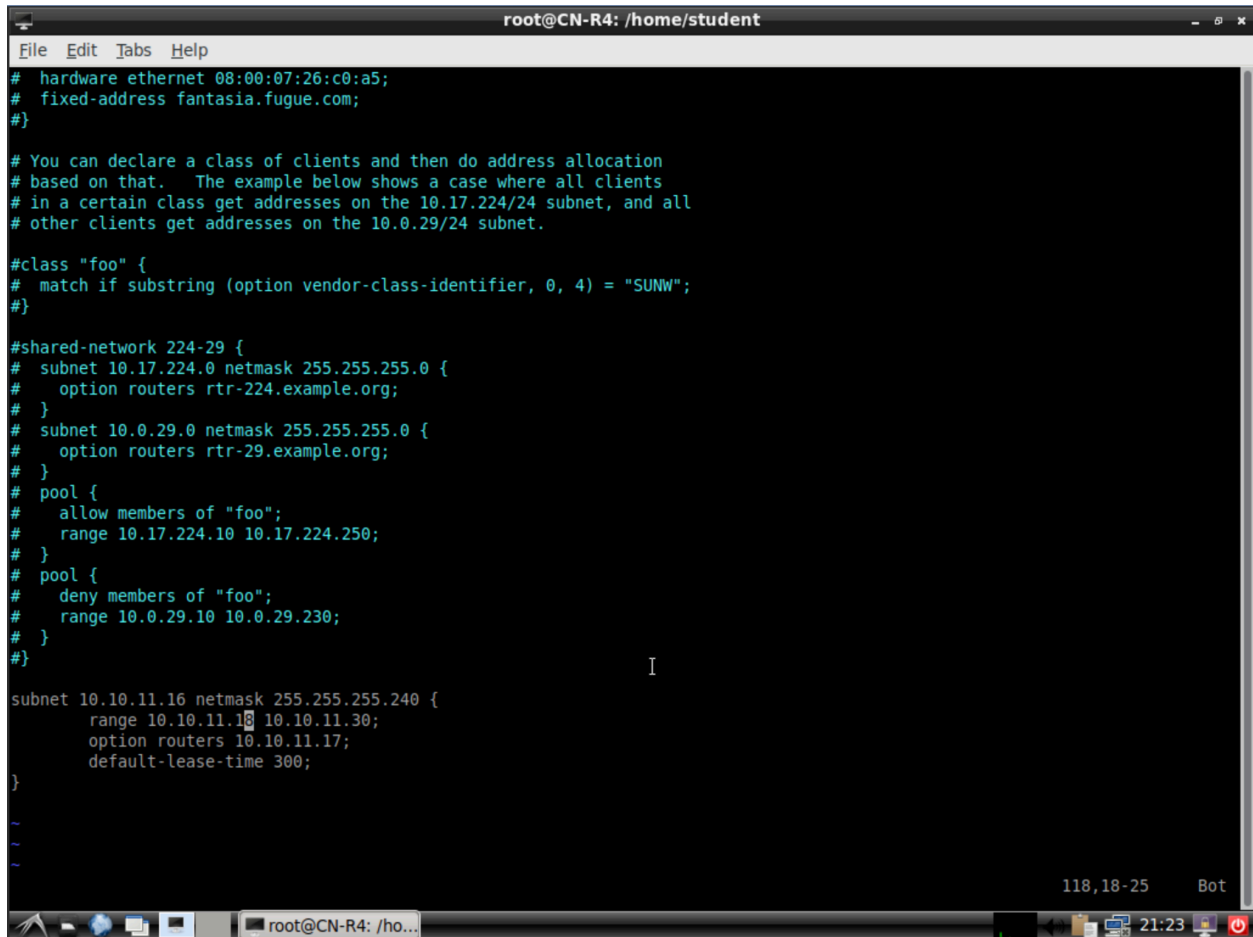


The screenshot shows a terminal window titled "student@CN-R4: ~" connected to a QEMU virtual machine. The terminal displays the contents of the DHCP leases file, which includes two lease entries for the IP address 10.10.11.18. The first entry is for a lease starting at 2023/10/13 04:00:39 and ending at 04:05:39. The second entry is for a lease starting at 2023/10/13 04:26:19 and ending at 04:31:19. The terminal also shows the DHCP server's unique identifier (server-uid) and the client's hostname "Ubuntu".

```
student@CN-R4: ~  
# The format of this file is documented in the dhcpd.leases(5) manual page.  
# This lease file was written by isc-dhcp-4.3.5  
# authoring-byte-order entry is generated, DO NOT DELETE  
authoring-byte-order little-endian;  
  
lease 10.10.11.18 {  
  starts 5 2023/10/13 04:00:39;  
  ends 5 2023/10/13 04:05:39;  
  tstp 5 2023/10/13 04:05:39;  
  cltt 5 2023/10/13 04:00:39;  
  binding state free;  
  hardware ethernet 00:00:00:00:00:0c;  
}  
server-uid "\000\001\000\001,\273u\020\000\000\000\000\000\013";  
  
lease 10.10.11.18 {  
  starts 5 2023/10/13 04:26:19;  
  ends 5 2023/10/13 04:31:19;  
  cltt 5 2023/10/13 04:26:19;  
  binding state active;  
  next binding state free;  
  rewind binding state free;  
  hardware ethernet 00:00:00:00:00:0c;  
  client-hostname "Ubuntu";  
}
```

Configuration for the DHCP server

dhcpcd.conf file at /etc/dhcp/dhcpd.conf



```
root@CN-R4: /home/student
File Edit Tabs Help
# hardware ethernet 08:00:07:26:c0:a5;
# fixed-address fantasia.fugue.com;
#}

# You can declare a class of clients and then do address allocation
# based on that.  The example below shows a case where all clients
# in a certain class get addresses on the 10.17.224/24 subnet, and all
# other clients get addresses on the 10.0.29/24 subnet.

#class "foo" {
# match if substring (option vendor-class-identifier, 0, 4) = "SUNW";
#}

#shared-network 224-29 {
# subnet 10.17.224.0 netmask 255.255.255.0 {
#   option routers rtr-224.example.org;
# }
# subnet 10.0.29.0 netmask 255.255.255.0 {
#   option routers rtr-29.example.org;
# }
# pool {
#   allow members of "foo";
#   range 10.17.224.10 10.17.224.250;
# }
# pool {
#   deny members of "foo";
#   range 10.0.29.10 10.0.29.230;
# }
#}

subnet 10.10.11.16 netmask 255.255.255.240 {
    range 10.10.11.18 10.10.11.30;
    option routers 10.10.11.17;
    default-lease-time 300;
}

~
~
118,18-25 Bot
root@CN-R4: /ho...
```

isc-dhcp-server file at /etc/default

```

File Edit Tabs Help
# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPDv4_CONF=/etc/dhcp/dhcpd.conf
#DHCPDv6_CONF=/etc/dhcp/dhcpd6.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPDv4_PID=/var/run/dhcpd.pid
#DHCPDv6_PID=/var/run/dhcpd6.pid

# Additional options to start dhcpd with.
# Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""

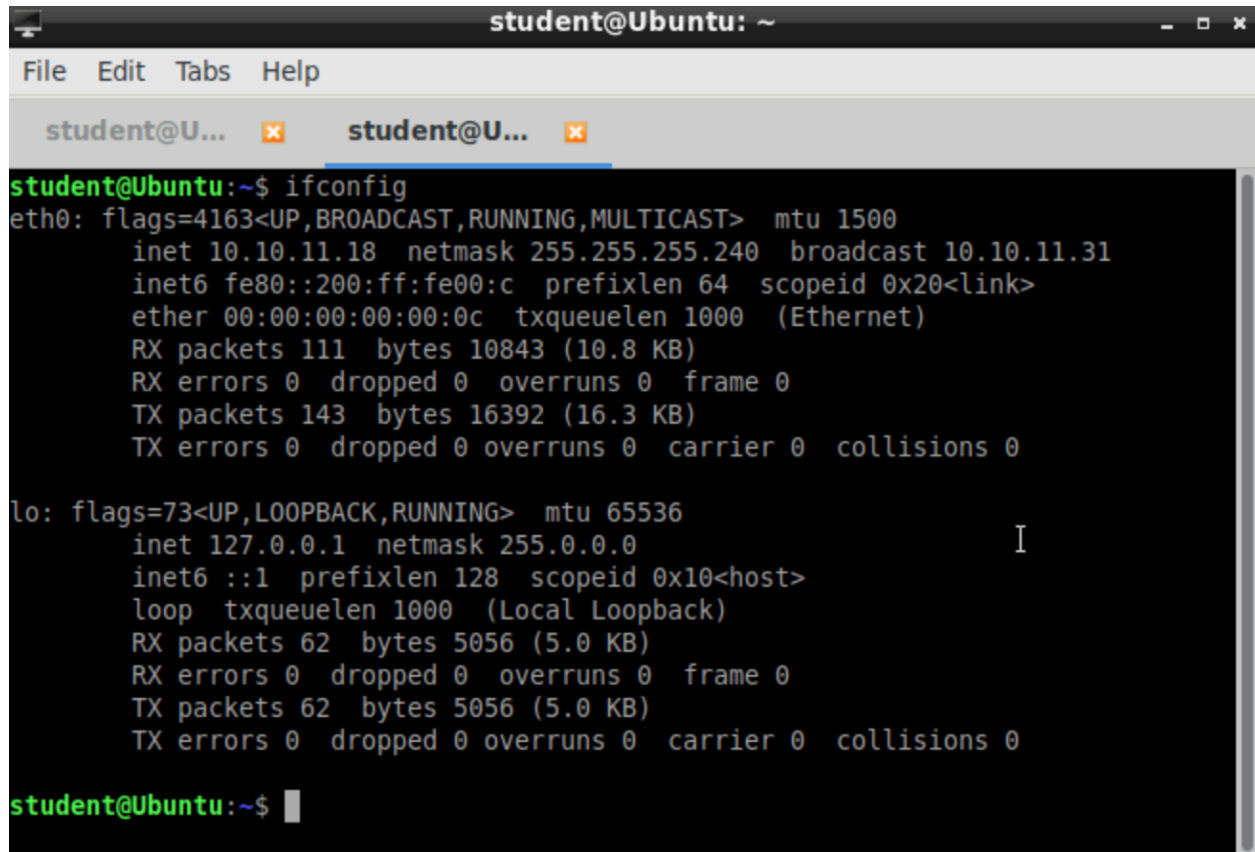
# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
# Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACESv4="eth2"
INTERFACESv6=""

...

"/etc/default/isc-dhcp-server" 18L, 629C
1,1 All

```

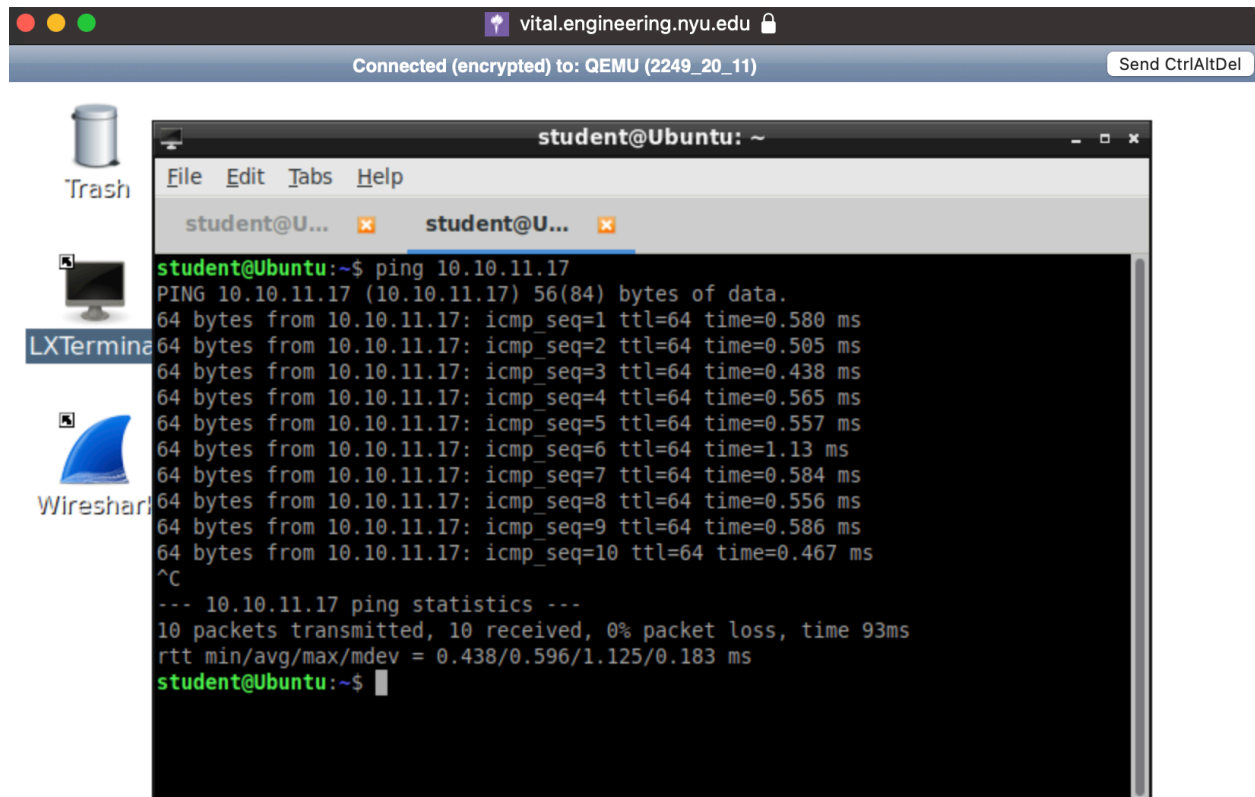
Screenshot of ifconfig on Ubuntu



```
student@Ubuntu: ~  
File Edit Tabs Help  
student@U... x student@U... x  
student@Ubuntu:~$ ifconfig  
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 10.10.11.18 netmask 255.255.255.240 broadcast 10.10.11.31  
    inet6 fe80::200:ff:fe00:c prefixlen 64 scopeid 0x20<link>  
    ether 00:00:00:00:00:0c txqueuelen 1000 (Ethernet)  
    RX packets 111 bytes 10843 (10.8 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 143 bytes 16392 (16.3 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
    inet 127.0.0.1 netmask 255.0.0.0  
    inet6 ::1 prefixlen 128 scopeid 0x10<host>  
    loop txqueuelen 1000 (Local Loopback)  
    RX packets 62 bytes 5056 (5.0 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 62 bytes 5056 (5.0 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
student@Ubuntu:~$
```

Screenshot showing Ubuntu ping R4

Pinging R4 from Ubuntu



The screenshot displays an Ubuntu desktop environment. At the top, a browser window shows the URL `vital.engineering.nyu.edu` and a status bar indicating "Connected (encrypted) to: QEMU (2249_20_11)". On the left sidebar, icons for "Trash", "LXTerminal", and "Wireshark" are visible. The main window is a terminal titled `student@Ubuntu: ~`. It shows the execution of the command `ping 10.10.11.17`. The output displays 10 successful ping requests, each with a 64-byte payload, TTL of 64, and varying response times. The statistics section at the bottom indicates 10 packets transmitted, 10 received, 0% packet loss, and a total time of 93ms. The round-trip time (rtt) statistics are: min/avg/max/mdev = 0.438/0.596/1.125/0.183 ms.

```
student@Ubuntu:~$ ping 10.10.11.17
PING 10.10.11.17 (10.10.11.17) 56(84) bytes of data.
64 bytes from 10.10.11.17: icmp_seq=1 ttl=64 time=0.580 ms
64 bytes from 10.10.11.17: icmp_seq=2 ttl=64 time=0.505 ms
64 bytes from 10.10.11.17: icmp_seq=3 ttl=64 time=0.438 ms
64 bytes from 10.10.11.17: icmp_seq=4 ttl=64 time=0.565 ms
64 bytes from 10.10.11.17: icmp_seq=5 ttl=64 time=0.557 ms
64 bytes from 10.10.11.17: icmp_seq=6 ttl=64 time=1.13 ms
64 bytes from 10.10.11.17: icmp_seq=7 ttl=64 time=0.584 ms
64 bytes from 10.10.11.17: icmp_seq=8 ttl=64 time=0.556 ms
64 bytes from 10.10.11.17: icmp_seq=9 ttl=64 time=0.586 ms
64 bytes from 10.10.11.17: icmp_seq=10 ttl=64 time=0.467 ms
^C
--- 10.10.11.17 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 93ms
rtt min/avg/max/mdev = 0.438/0.596/1.125/0.183 ms
student@Ubuntu:~$
```

Screenshot showing Wireshark DHCP messages (4 Types)

The screenshot displays the Wireshark network protocol analyzer interface. The top status bar indicates a connection to 'vital.engineering.nyu.edu' and 'QEMU (2249_20_11)'. The main window title is 'student@Ubuntu: ~'. The interface shows the capture of traffic on the 'eth0' interface, filtered by the expression 'udp.port == 67'.

The packet list table shows the following DHCP messages:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xde
2	14.443734181	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xde
34	22.151112623	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xde
37	23.153702154	10.10.11.17	10.10.11.18	DHCP	342	DHCP Offer - Transaction ID 0xde
38	23.153994525	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0xde
39	23.164760168	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transaction ID 0xde

The packet details pane for the first packet (Frame 1) shows the following structure:

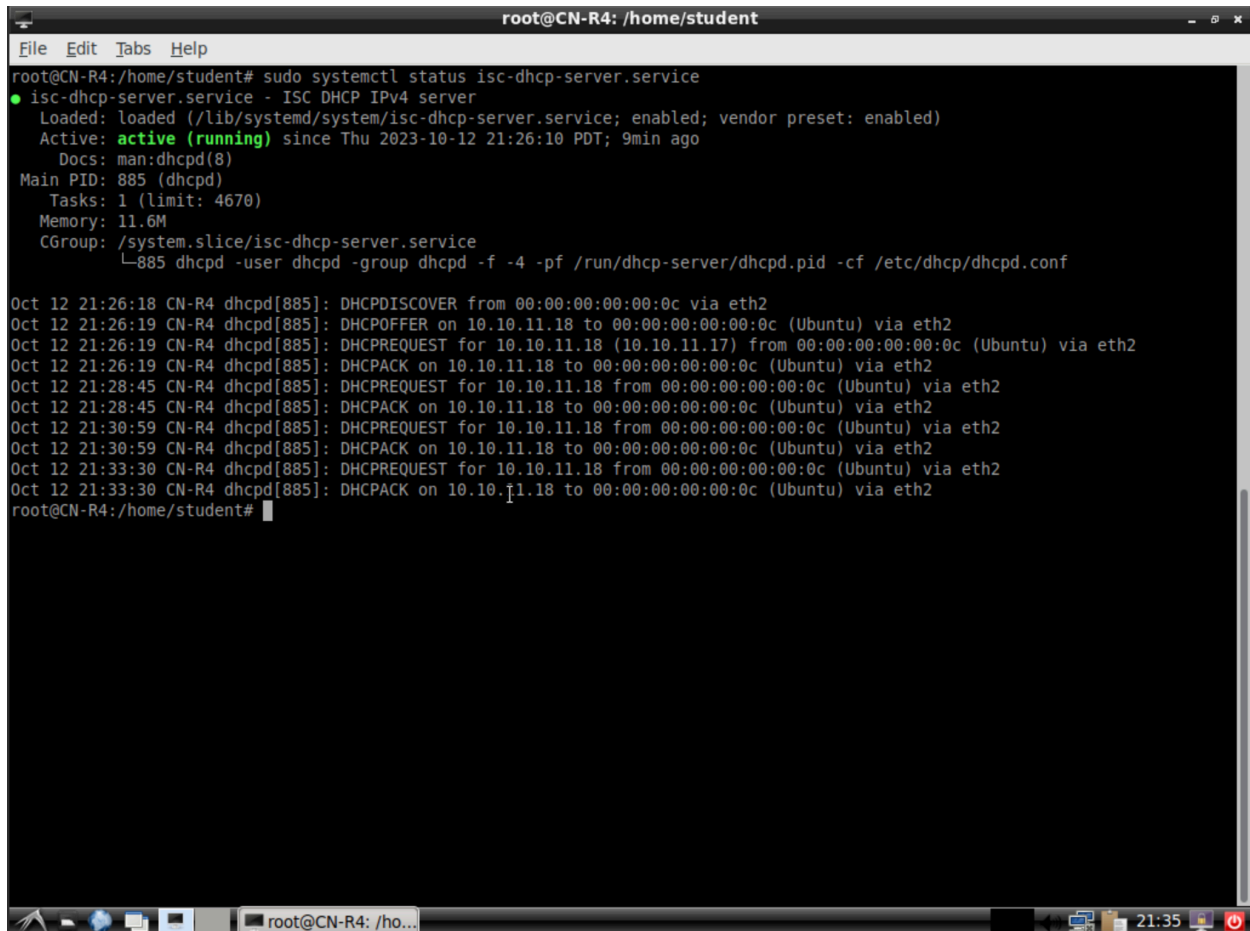
- Frame 1: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface 0
- Ethernet II, Src: 00:00:00_00:00:0c (00:00:00:00:00:0c), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
- Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
- User Datagram Protocol, Src Port: 68, Dst Port: 67
- Bootstrap Protocol (Discover)

The packet bytes pane shows the raw data of the first packet, with hexadecimal and ASCII representations. The ASCII representation shows the DHCP Discover message structure, including the magic number 'E.' and the transaction ID '9'.

The bottom status bar indicates the capture file is 'wireshark_eth0_20231012202939_jzwDSt.pcapng', with 204 packets displayed (6 shown, 2.9% displayed).

Extra Screenshots

DHCP service running status

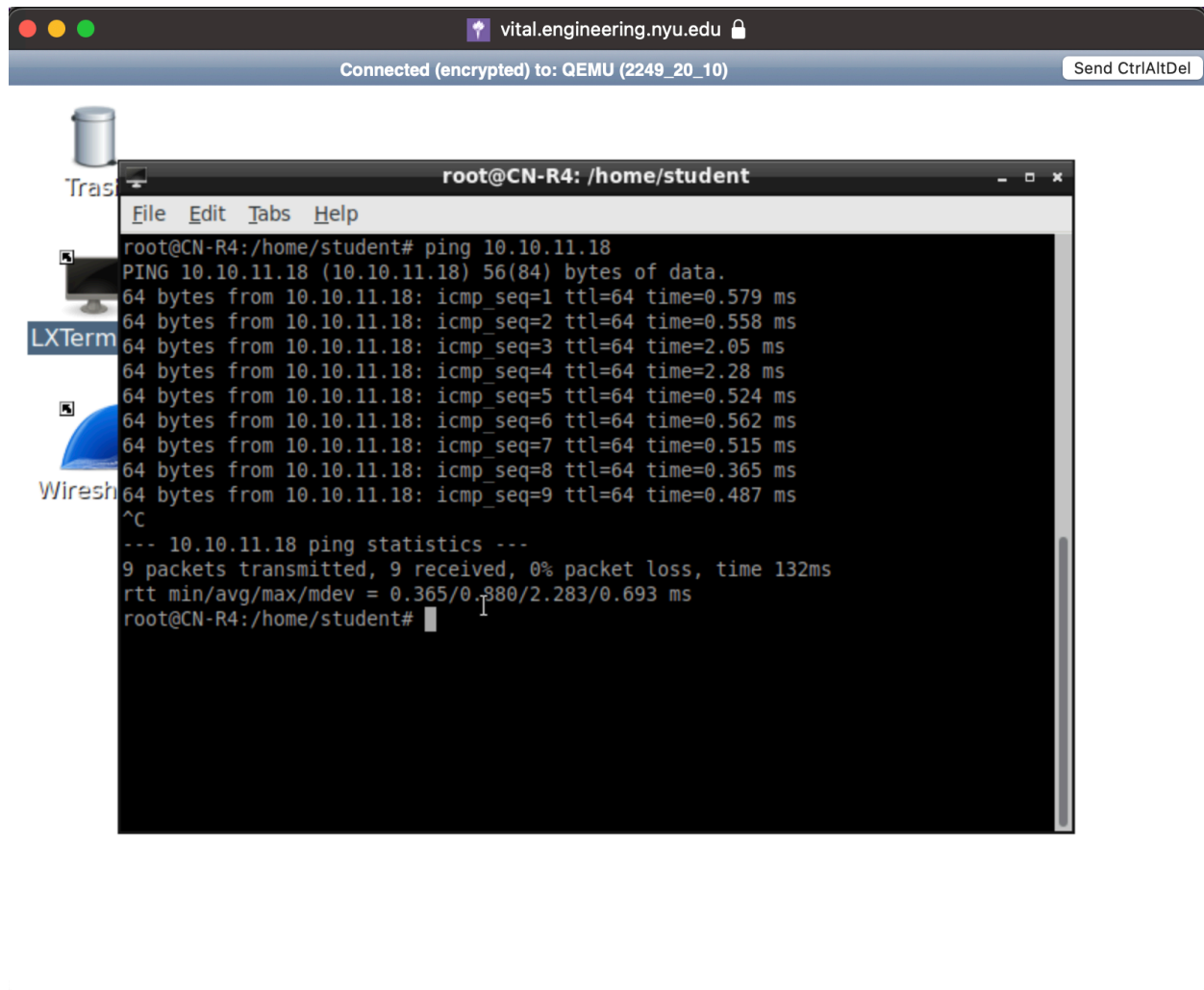


The screenshot shows a terminal window titled "root@CN-R4: /home/student". The user has executed the command "sudo systemctl status isc-dhcp-server.service". The output shows that the service is loaded and active (running). It was started on Thursday, 2023-10-12 at 21:26:10 PDT, 9 minutes ago. The main PID is 885 (dhcpcd). The tasks are 1 (limit: 4670). The memory usage is 11.6M. The CGroup is /system.slice/isc-dhcp-server.service. The service is running as dhcpcd -user dhcpcd -group dhcpcd -f -4 -pf /run/dhcp-server/dhcpcd.pid -cf /etc/dhcp/dhcpcd.conf. The log shows several DHCP transactions on the eth2 interface, including DHCPDISCOVER, DHCPOFFER, DHCPREQUEST, and DHCPACK messages.

```
root@CN-R4:/home/student# sudo systemctl status isc-dhcp-server.service
● isc-dhcp-server.service - ISC DHCP IPv4 server
   Loaded: loaded (/lib/systemd/system/isc-dhcp-server.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2023-10-12 21:26:10 PDT; 9min ago
     Docs: man:dhcpcd(8)
    Main PID: 885 (dhcpcd)
      Tasks: 1 (limit: 4670)
     Memory: 11.6M
    CGroup: /system.slice/isc-dhcp-server.service
            └─885 dhcpcd -user dhcpcd -group dhcpcd -f -4 -pf /run/dhcp-server/dhcpcd.pid -cf /etc/dhcp/dhcpcd.conf

Oct 12 21:26:18 CN-R4 dhcpcd[885]: DHCPDISCOVER from 00:00:00:00:00:0c via eth2
Oct 12 21:26:19 CN-R4 dhcpcd[885]: DHCPOFFER on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:26:19 CN-R4 dhcpcd[885]: DHCPREQUEST for 10.10.11.18 (10.10.11.17) from 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:26:19 CN-R4 dhcpcd[885]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:28:45 CN-R4 dhcpcd[885]: DHCPREQUEST for 10.10.11.18 from 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:28:45 CN-R4 dhcpcd[885]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:30:59 CN-R4 dhcpcd[885]: DHCPREQUEST for 10.10.11.18 from 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:30:59 CN-R4 dhcpcd[885]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:33:30 CN-R4 dhcpcd[885]: DHCPREQUEST for 10.10.11.18 from 00:00:00:00:00:0c (Ubuntu) via eth2
Oct 12 21:33:30 CN-R4 dhcpcd[885]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2
root@CN-R4:/home/student#
```

Pinging Ubuntu from R4 after ubuntu has obtained ip address.



```
root@CN-R4: /home/student
File Edit Tabs Help
root@CN-R4:/home/student# ping 10.10.11.18
PING 10.10.11.18 (10.10.11.18) 56(84) bytes of data.
64 bytes from 10.10.11.18: icmp_seq=1 ttl=64 time=0.579 ms
64 bytes from 10.10.11.18: icmp_seq=2 ttl=64 time=0.558 ms
64 bytes from 10.10.11.18: icmp_seq=3 ttl=64 time=2.05 ms
64 bytes from 10.10.11.18: icmp_seq=4 ttl=64 time=2.28 ms
64 bytes from 10.10.11.18: icmp_seq=5 ttl=64 time=0.524 ms
64 bytes from 10.10.11.18: icmp_seq=6 ttl=64 time=0.562 ms
64 bytes from 10.10.11.18: icmp_seq=7 ttl=64 time=0.515 ms
64 bytes from 10.10.11.18: icmp_seq=8 ttl=64 time=0.365 ms
64 bytes from 10.10.11.18: icmp_seq=9 ttl=64 time=0.487 ms
^C
--- 10.10.11.18 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 132ms
rtt min/avg/max/mdev = 0.365/0.880/2.283/0.693 ms
root@CN-R4:/home/student#
```