# Dynamic Host Configuration Protocol

Instructions

Set up a DHCP server on R4 (eth2) such that it leases IP addresses from the 10.10.11.X/28 subnet to the Ubuntu VM. Calculate the network, broadcast, and useable range of IP addresses for your address range. Select the first useable IP address as the static address for the R4 interface (remember that we cannot use the network and broadcast). The remaining addresses will go into the pool that the DHCP server will lease and manage.

Before starting this lab, please read RFC 2131.

Note: Please make any necessary changes to the */etc/network/interfaces* file of Ubuntu before you proceed. The file should already have an existing entry for DHCP which includes:

```
iface eth0 inet dhcp
```
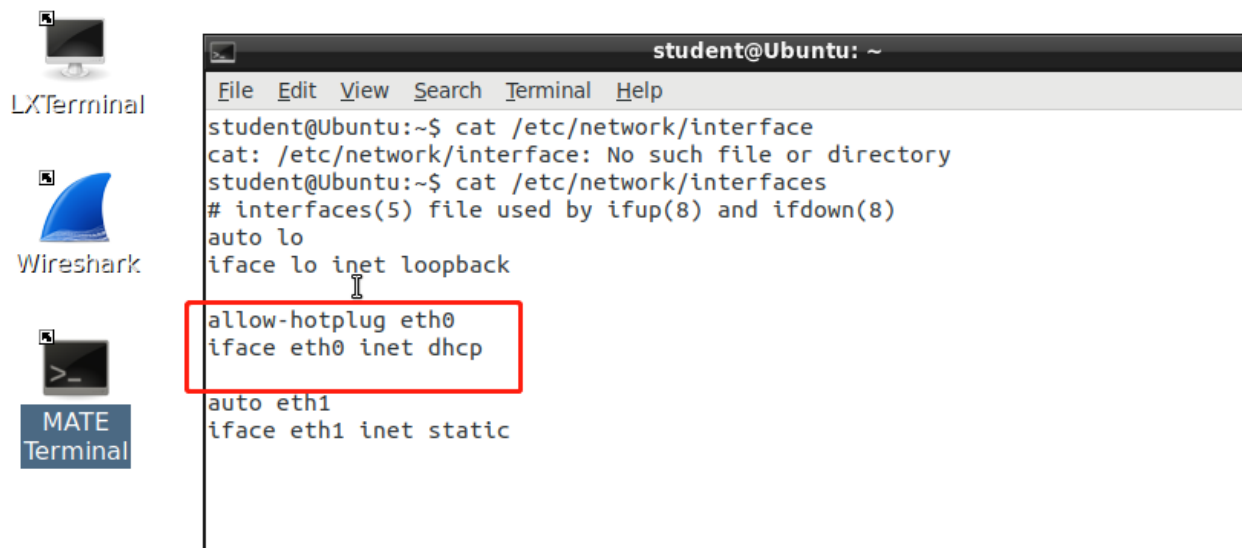
Part 1: Configuring DHCP

The first step is to configure the dhcpd.conf (DHCP daemon configuration) file in router R4. This file is present in the */etc/dhcp* directory. You can make edits to this file using any text editor.

Consult the example configuration options in the dhcpd.conf file to configure your DHCP server on R4. Make sure to set default-lease-time to 300.

Note that you do not need to provide configurations for the option domain-name or domain name-servers.

```
root@CN-R4:/home/student# cat /etc/dhcp/dhcpd.conf
#
# Sample configuration file for ISC dhcpd for Debian
#
# Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
# configuration file instead of this file.
#
#

# The ddns-updates-style parameter controls whether or not the server will
# attempt to do a DNS update when a lease is confirmed. We default to the
# behavior of the version 2 packages ('none', since DHCP v2 didn't
# have support for DDNS.)
ddns-update-style none;

subnet 10.10.11.16 netmask 255.255.255.240{
   range 10.10.11.18 10.10.11.30;
   option broadcast-address 10.10.11.31;
   default-lease-time 300;

}
```

Part 2: Server Interface

Check the */etc/default/isc-dhcp-server* file on R4. This file has to be changed so the DHCP server knows which interface it should listen on for serving IP addresses.

```
root@CN-R4:/home/student# nano /etc/default/isc-dhcp-server
root@CN-R4:/home/student# cat /etc/default/isc-dhcp-server
# 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=""
root@CN-R4:/home/student#
```

Part 3: Verifying DHCP and Wireshark

We will verify that Ubuntu has obtained an IP address.

1. Shutdown R4 and Ubuntu.
2. Power on Ubuntu and run Wireshark via the terminal: *sudo wireshark* 3. Monitor incoming traffic on the appropriate interface.
4. Now power on R4 and view Wireshark traffic on Ubuntu.
5. Use the following filter to show DHCP messages: `udp.port == 67` 6. Take a screenshot showing all captured DHCP messages.

Before R4 turn on , only DHCPDISCOVER packets, because the Ubuntu system is broadcasting DHCPDISCOVER for asking itself for an IP address.

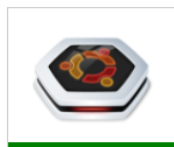R1   R2   R3   R4

Ubuntu   Kali

onsole/vnc_auto.html?token=8a2c3628-d778-48d3-91f8-67e0bd99f834

Connected (encrypted) to: QEMU (1824_20_11)
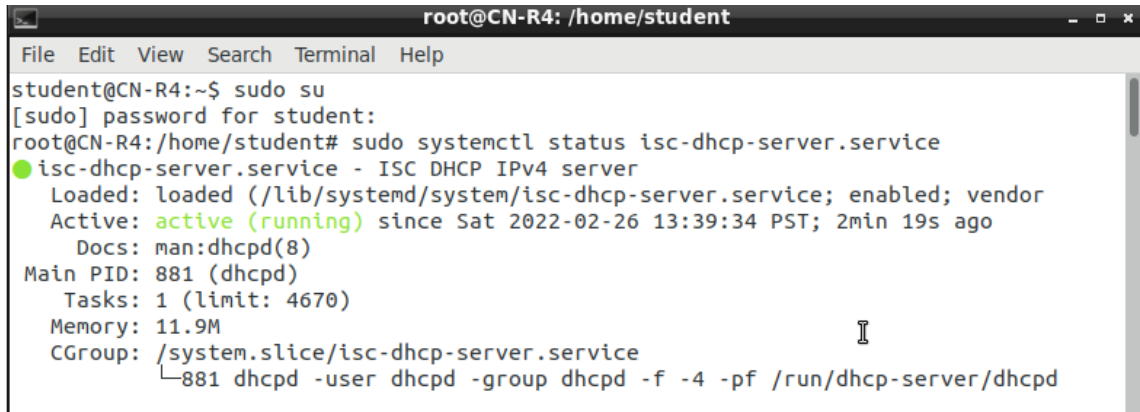
*eth0

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

udp.port == 67

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
3	10.245823457	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
4	18.479322335	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
7	28.206016056	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
8	41.348228466	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
45	56.017340826	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transacti
47	57.019344681	10.10.11.17	10.10.11.18	DHCP	342	DHCP Offer - Transacti
48	57.019818959	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transacti
49	57.034465480	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transacti

Note: Verify that the DHCP server is running properly on R4 by using the following command:

```
sudo systemctl status isc-dhcp-server.service
```

Submissions

[20 points] The leases file on R4 found in */var/lib/dhcp/dhcpd.leases*

```
root@CN-R4: /home/student                                            _ □

File  Edit  View  Search  Terminal  Help
# 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;

server-duid "\000\001\000\001)\255Z\226\000\000\000\000\000\013";

lease 10.10.11.18 {
  starts 6 2022/02/26 21:39:46;
  ends 6 2022/02/26 21:44:46;
  cltt 6 2022/02/26 21:39:46;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 00:00:00:00:00:0c;
  client-hostname "Ubuntu";
}
lease 10.10.11.18 {
  starts 6 2022/02/26 21:42:01;
  ends 6 2022/02/26 21:47:01;
  cltt 6 2022/02/26 21:42:01;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 00:00:00:00:00:0c;
  client-hostname "Ubuntu";
}
root@CN-R4:/home/student# █
```
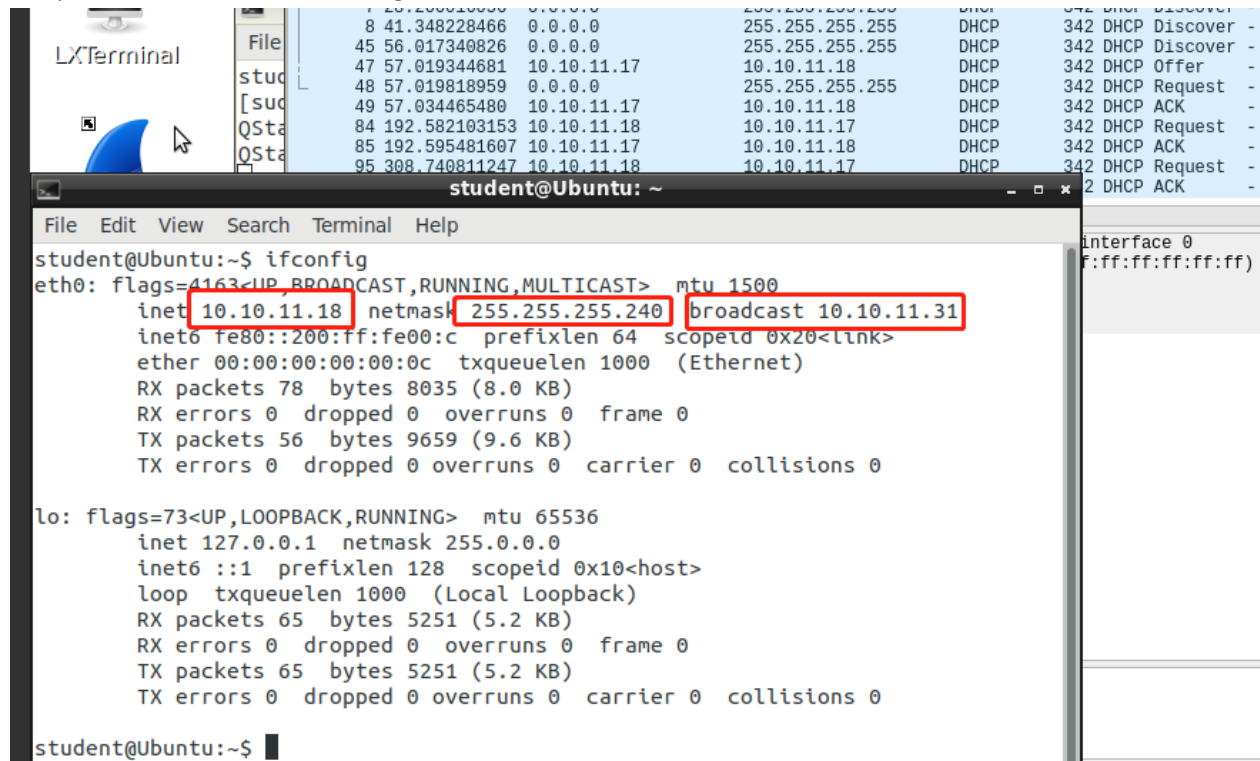
[20 points] Your configuration for the DHCP server.

```
root@CN-R4:/home/student# cat /etc/dhcp/dhcpd.conf
#
# Sample configuration file for ISC dhcpd for Debian
#
# Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
# configuration file instead of this file.
#
#

# The ddns-updates-style parameter controls whether or not the server will
# attempt to do a DNS update when a lease is confirmed. We default to the
# behavior of the version 2 packages ('none', since DHCP v2 didn't
# have support for DDNS.)
ddns-update-style none;

subnet 10.10.11.16 netmask 255.255.255.240{
   range 10.10.11.18 10.10.11.30;
   option broadcast-address 10.10.11.31;
   default-lease-time 300;


}
```

[20 points] Screenshot of ifconfig on Ubuntu.

```
                          8 41.348228466  0.0.0.0            255.255.255.255      DHCP    342 DHCP Discover -
                         45 56.017340826  0.0.0.0            255.255.255.255      DHCP    342 DHCP Discover -
                         47 57.019344681  10.10.11.17        10.10.11.18          DHCP    342 DHCP Offer    -
                         48 57.019818959  0.0.0.0            255.255.255.255      DHCP    342 DHCP Request  -
                         49 57.034465480  10.10.11.17        10.10.11.18          DHCP    342 DHCP ACK       -
                         84 192.582103153 10.10.11.18        10.10.11.17          DHCP    342 DHCP Request  -
                         85 192.595481607 10.10.11.17        10.10.11.18          DHCP    342 DHCP ACK       -
                         95 308.740811247 10.10.11.18        10.10.11.17          DHCP    342 DHCP Request  -
```
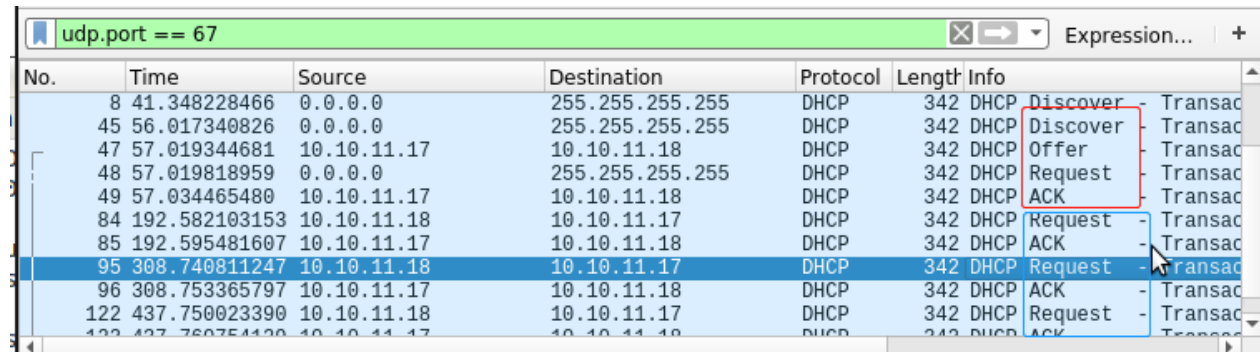
student@Ubuntu: ~

File   Edit   View   Search   Terminal   Help

```
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 78  bytes 8035 (8.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 56  bytes 9659 (9.6 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 65  bytes 5251 (5.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 65  bytes 5251 (5.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

student@Ubuntu:~$
```

[20 points] Screenshot showing Ubuntu pinging R4.

```
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=0.506 ms
64 bytes from 10.10.11.17: icmp_seq=2 ttl=64 time=0.463 ms
64 bytes from 10.10.11.17: icmp_seq=3 ttl=64 time=0.421 ms
64 bytes from 10.10.11.17: icmp_seq=4 ttl=64 time=0.457 ms
64 bytes from 10.10.11.17: icmp_seq=5 ttl=64 time=0.574 ms
64 bytes from 10.10.11.17: icmp_seq=6 ttl=64 time=0.387 ms
64 bytes from 10.10.11.17: icmp_seq=7 ttl=64 time=0.482 ms
64 bytes from 10.10.11.17: icmp_seq=8 ttl=64 time=0.538 ms
^C
--- 10.10.11.17 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 182ms
rtt min/avg/max/mdev = 0.387/0.478/0.574/0.060 ms
student@Ubuntu:~$
```

[20 points] Screenshot showing Wireshark DHCP messages (4 Types).

No.	Time	Source	Destination	Protocol	Length	Info
8	41.348228466	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transac
45	56.017340826	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transac
47	57.019344681	10.10.11.17	10.10.11.18	DHCP	342	DHCP Offer - Transac
48	57.019818959	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transac
49	57.034465480	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transac
84	192.582103153	10.10.11.18	10.10.11.17	DHCP	342	DHCP Request - Transac
85	192.595481607	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transac
95	308.740811247	10.10.11.18	10.10.11.17	DHCP	342	DHCP Request - Transac
96	308.753365797	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transac
122	437.750023390	10.10.11.18	10.10.11.17	DHCP	342	DHCP Request - Transac
123	437.760754120	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transac

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