

# DHCP Server Lab

## Part 1: Configuring DHCP

The first step is to configure the **dhcpcd.conf** (DHCP daemon configuration) file in router R4. This file is present in the **/etc/dhcp** directory.

```
subnet 10.10.11.16 netmask 255.255.255.240{
    range 10.10.11.18 10.10.11.30;
    option subnet-mask 255.255.255.240;
    option broadcast-address 10.10.11.31;
    default-lease-time 300;
}
student@CN-R4:/etc/dhcp$
```

## Part 2: Server Interface

We need to 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.

A terminal window titled 'student@CN-R4: ~' showing the command 'cat /etc/default/isc-dhcp-server' and its output. The output is a configuration file for the DHCP server with various defaults and options.

```
student@CN-R4:~$ cat /etc/default/isc-dhcp-server
# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

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

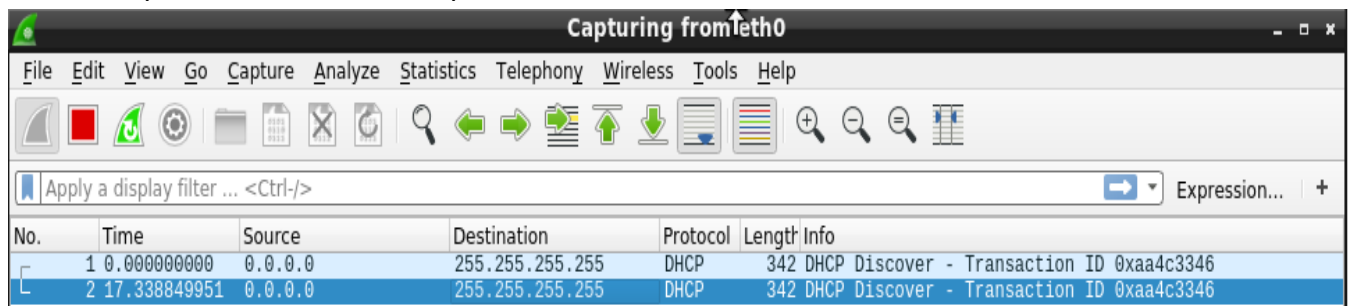
# Path to dhcpcd's PID file (default: /var/run/dhcpd.pid).
#DHCPDv4_PID=/var/run/dhcpd.pid
#DHCPDv6_PID=/var/run/dhcpd6.pid

# 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=""
student@CN-R4:~$
```

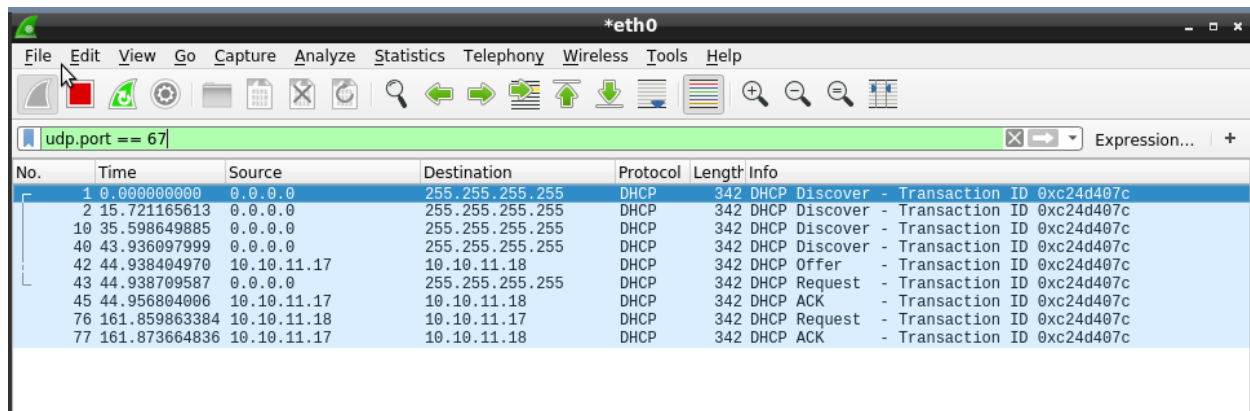
## Part 3: Verifying DHCP and Wireshark

Wireshark packets before R4 was powered on

A screenshot of the Wireshark network protocol analyzer. The title bar says 'Capturing from eth0'. The packet list shows two DHCP Discover packets. The packet details pane shows the structure of a DHCP Discover packet.

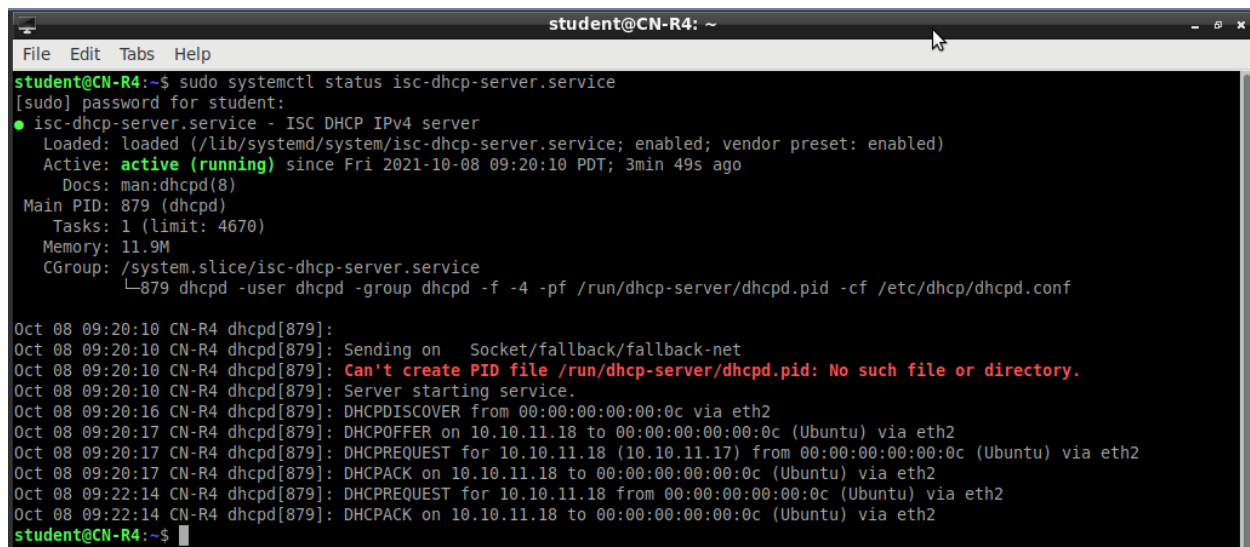
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa4c3346
2	17.338849951	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xaa4c3346

All captured 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 0xc24d407c
2	15.721165613	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
10	35.598649885	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
40	43.936097999	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
42	44.938404970	10.10.11.17	10.10.11.18	DHCP	342	DHCP Offer - Transaction ID 0xc24d407c
43	44.938709587	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0xc24d407c
45	44.956804006	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transaction ID 0xc24d407c
76	161.859863384	10.10.11.18	10.10.11.17	DHCP	342	DHCP Request - Transaction ID 0xc24d407c
77	161.873664836	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transaction ID 0xc24d407c

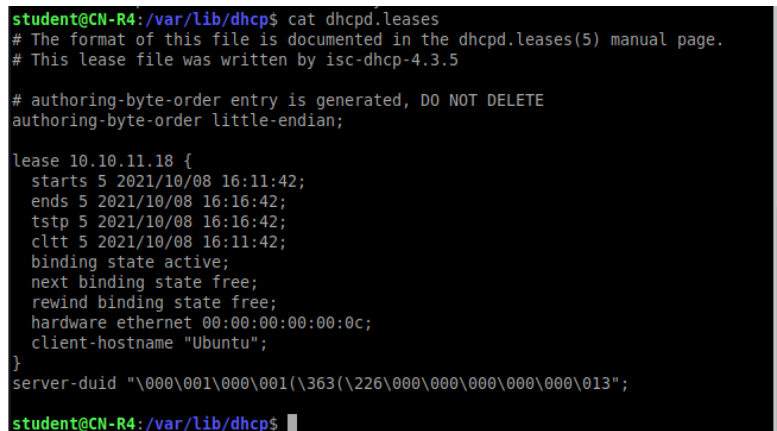
Verification that the DHCP server is running properly on R4 by using the following command:  
**sudo systemctl status isc-dhcp-server.service**



```
student@CN-R4: ~  
File Edit Tabs Help  
student@CN-R4:~$ sudo systemctl status isc-dhcp-server.service  
[sudo] password for student:  
● 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 Fri 2021-10-08 09:20:10 PDT; 3min 49s ago  
     Docs: man:dhcpd(8)  
  Main PID: 879 (dhcpd)  
    Tasks: 1 (limit: 4670)  
   Memory: 11.9M  
    CGroup: /system.slice/isc-dhcp-server.service  
            └─879 dhcpd -user dhcpd -group dhcpd -f -4 -pf /run/dhcp-server/dhcpd.pid -cf /etc/dhcp/dhcpd.conf  
  
Oct 08 09:20:10 CN-R4 dhcpd[879]:  
Oct 08 09:20:10 CN-R4 dhcpd[879]: Sending on Socket/fallback/fallback-net  
Oct 08 09:20:10 CN-R4 dhcpd[879]: Can't create PID file /run/dhcp-server/dhcpd.pid: No such file or directory.  
Oct 08 09:20:10 CN-R4 dhcpd[879]: Server starting service.  
Oct 08 09:20:16 CN-R4 dhcpd[879]: DHCPDISCOVER from 00:00:00:00:00:0c via eth2  
Oct 08 09:20:17 CN-R4 dhcpd[879]: DHCPDISCOVER on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2  
Oct 08 09:20:17 CN-R4 dhcpd[879]: DHCPREQUEST for 10.10.11.18 (10.10.11.17) from 00:00:00:00:00:0c (Ubuntu) via eth2  
Oct 08 09:20:17 CN-R4 dhcpd[879]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2  
Oct 08 09:22:14 CN-R4 dhcpd[879]: DHCPREQUEST for 10.10.11.18 from 00:00:00:00:00:0c (Ubuntu) via eth2  
Oct 08 09:22:14 CN-R4 dhcpd[879]: DHCPACK on 10.10.11.18 to 00:00:00:00:00:0c (Ubuntu) via eth2  
student@CN-R4:~$
```

## Screenshots

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

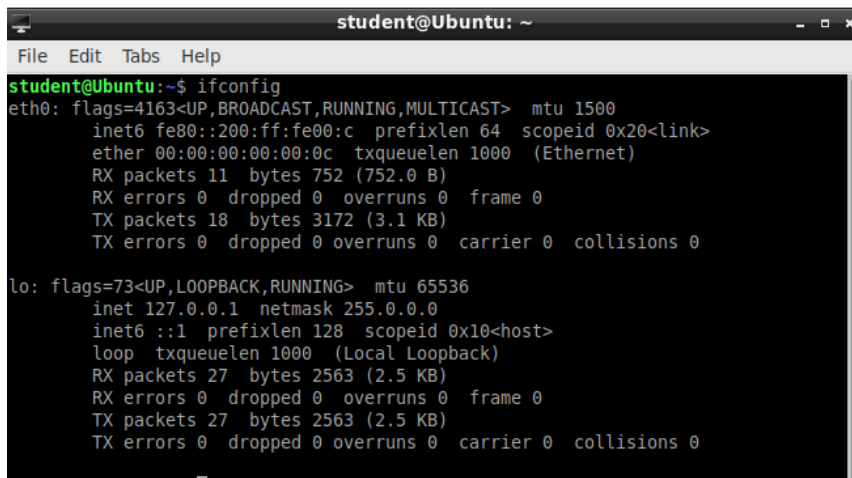


```
student@CN-R4:/var/lib/dhcp$ cat dhcpd.leases  
# The format of this file is documented in the dhcpd.leases(5) manual page.  
# This lease file was written by isc-dhcp-4.3.5  
  
# authoring-byte-order entry is generated, DO NOT DELETE  
authoring-byte-order little-endian;  
  
lease 10.10.11.18 {  
    starts 5 2021/10/08 16:11:42;  
    ends 5 2021/10/08 16:16:42;  
    tstp 5 2021/10/08 16:16:42;  
    cltt 5 2021/10/08 16:11:42;  
    binding state active;  
    next binding state free;  
    rewind binding state free;  
    hardware ethernet 00:00:00:00:00:0c;  
    client-hostname "Ubuntu";  
}  
server-duid "0000001\000\001\363\226\000\000\000\000\000\013";  
student@CN-R4:/var/lib/dhcp$
```

2. Your configuration for the DHCP server.

```
subnet 10.10.11.16 netmask 255.255.255.240{
    range 10.10.11.18 10.10.11.30;
    option subnet-mask 255.255.255.240;
    option broadcast-address 10.10.11.31;
    default-lease-time 300;
}
student@CN-R4:/etc/dhcp$
```

3. Screenshot of ifconfig on Ubuntu.

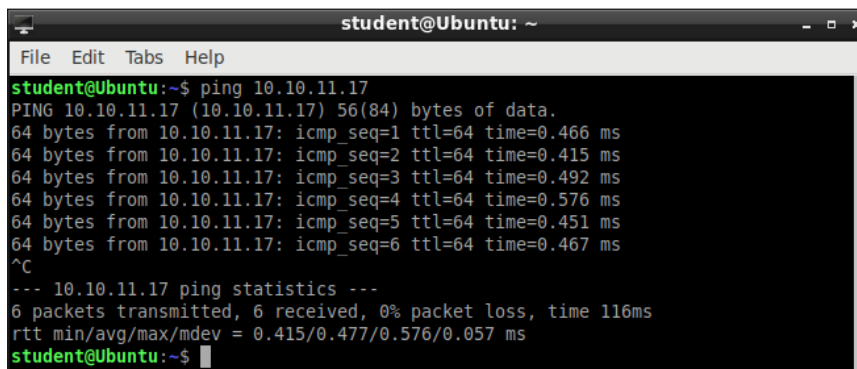


The screenshot shows the output of the `ifconfig` command in a terminal window titled `student@Ubuntu: ~`. The output displays details for the `eth0` and `lo` interfaces.

```
student@Ubuntu:~$ ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::200:ff:fe00:c prefixlen 64 scopeid 0x20<link>
    ether 00:00:00:00:00:0c txqueuelen 1000 (Ethernet)
    RX packets 11 bytes 752 (752.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 18 bytes 3172 (3.1 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 27 bytes 2563 (2.5 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 27 bytes 2563 (2.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

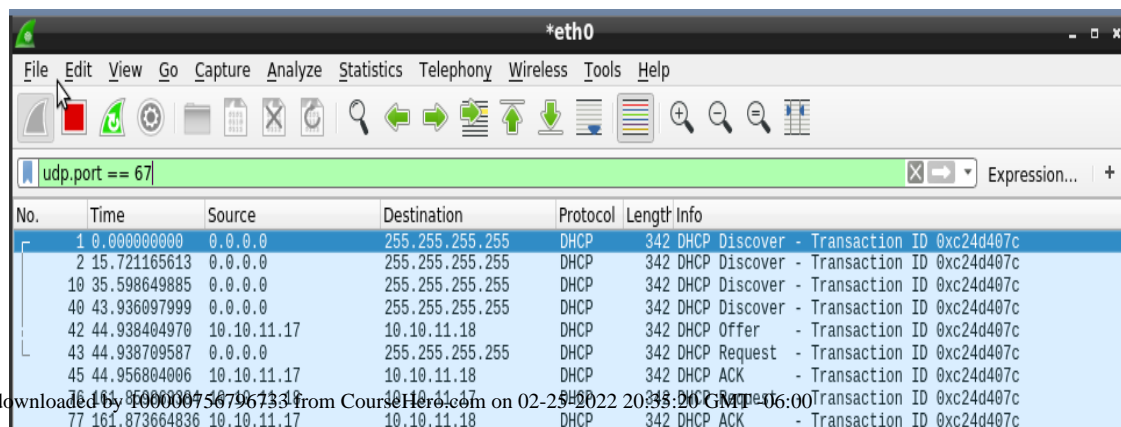
4. Screenshot showing Ubuntu ping R4



The screenshot shows the output of the `ping` command in a terminal window titled `student@Ubuntu: ~`. The command is `ping 10.10.11.17`, and the output shows successful pings with varying times.

```
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=0.466 ms
64 bytes from 10.10.11.17: icmp_seq=2 ttl=64 time=0.415 ms
64 bytes from 10.10.11.17: icmp_seq=3 ttl=64 time=0.492 ms
64 bytes from 10.10.11.17: icmp_seq=4 ttl=64 time=0.576 ms
64 bytes from 10.10.11.17: icmp_seq=5 ttl=64 time=0.451 ms
64 bytes from 10.10.11.17: icmp_seq=6 ttl=64 time=0.467 ms
^C
--- 10.10.11.17 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 116ms
rtt min/avg/max/mdev = 0.415/0.477/0.576/0.057 ms
student@Ubuntu:~$
```

5. Screenshot showing Wireshark DHCP messages (4 Types).



The screenshot shows the Wireshark network protocol analyzer interface. The filter is set to `udp.port == 67`. The packet list shows several DHCP messages, including Discover, Offer, Request, and ACK, all with Transaction ID `0xc24d407c`.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
2	15.721165	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
10	35.598649	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
40	43.936097	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xc24d407c
42	44.938409	10.10.11.17	10.10.11.18	DHCP	342	DHCP Offer - Transaction ID 0xc24d407c
43	44.938709	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0xc24d407c
45	44.956804	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transaction ID 0xc24d407c
77	161.873664	10.10.11.17	10.10.11.18	DHCP	342	DHCP ACK - Transaction ID 0xc24d407c