

DHCP Server Configuration

DHCP stands for **Dynamic Host Configuration Protocol** which is used to provide IP Address to client Computers Dynamically OR Automatically. The Port Number of DHCP Server is 67 and The Port Number of DHCP Client is 68.

Where should we use DHCP Server?

Suppose we have a small office with three computers with a router. IP Address of the Router is 192.168.1.1 and we have a task to assign IP Address to remaining three computers. In that case we can go and assign IP Address to each and every computer manually. But just Imagine you are working on a large setup with thousands of Client Computers, Multiple Network Printers and so many other networking devices. In such kind of situation it's just impossible to assign IP Addresses manually. In such situation we need Linux DHCP Server. DHCP Server will assign the IP Address to all systems and devices dynamically or automatically.

How DHCP Server Works? OR What is DORA Process?

When a new system connected to Network, As a first step the client computer searches for a DHCP Server in Network and when the client computer unable to found the same as it is currently don't have any IP Address, the system sends a DHCP Discover message to all devices which are connected to network. This process is called as Broadcasting.

When DHCP Server receives the DHCP Discover message from the Client Computer, DHCP Server offers and broadcast's a IP Address (Eg: 192.168.1.3) to all connected devices.

Now when Client Computer receives the IP Address it broadcasts a request on network that it accepts the IP Address.

Then DHCP Server Acknowledge the IP Address that Now Client Computer can use the IP Address. This is how Linux DHCP Server Works. This Whole process is called as DORA (**Discover Offer Request Acknowledgement**).

Like other Services like BIND DNS Server, NFS Server, DHCP is also a Server & client type of Server. So here also we need a Server and a Client to configure DHCP Server.

In this notes, for example DHCP Server & Client details are mentioned below which are used throughout working with lab exercise:

DHCP Server Details:

ServerName: dhcpserver

IPAddress: 192.168.0.100

MAC Address :

DHCP Client Details:

Hostname: Client1

MAC Address:

Important Parameters of Linux DHCP Server

option domain-name : Mention Domain Name **eg** : sanjeevi.net

option domain-name-servers : Mention DNS Servers **eg**: 192.168.0.100, 192.168.0.101 (**Note** : You can also mention the FQDN)

default-lease-time : The Default time in Seconds till the time DHCP Server will assign a IP to Client Computer.

max-lease-time : The Maximum time in Seconds till the time DHCP Server will assign a IP to Client Computer.

subnet : Mention the Subnet IP Address **eg** : 192.168.0.0

netmask : Mention the Subnet Mask **eg** : 255.255.255.0

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range : Mention the IP Range which will dynamically assigned by Linux DHCP Server to Client Computers. **eg** : 192.168.0.2 to 192.168.0.240

option routers : Mention the Gateway IP Address **eg** : 192.168.0.1

option broadcast-address : Mention your Broadcast Address **eg** : 192.168.0.255

hardware ethernet : Mention your MAC Address OR Physical Address **eg** : 00:0C:29:F7:BE:27

option host-name : Your systems Hostname OR Computer Name **eg** : dhcpserver

Follow the Below Steps for Linux DHCP Server Configuration

Step: 1 Prepare your Server before DHCP Server Configuration

Before we start configuration of DHCP Server first we need to prepare our server for that. First Assign a Static IP Address to your Server. Refer the command below.

```
[root@dhcpserver ~]# cat /etc/sysconfig/network-scripts/ifcfg-eth0 # Set Static IP Address
DEVICE=eth0
BOOTPROTO=none
HWADDR=00:0c:29:41:6a:ae
IPV6INIT=yes
NM_CONTROLLED=yes
ONBOOT=yes
TYPE=Ethernet
UUID="2172489a-2137-49f3-8389-6e616d9d6ca1"
IPADDR=192.168.0.100
NETMASK=255.255.255.0
GATEWAY=192.168.0.1
DNS1=192.168.0.100
USERCTL=no
DNS2=192.168.0.101
```

Give a proper Hostname to your Server. Here my Server's Hostname is **dhcpserver**

```
[root@dhcpserver ~]# hostname # Checking Hostname
dhcpserver.elinuxbook.com
```

Step : 2 Install Required Packages

Install required packages and dependencies for Linux DHCP Server.

```
[root@localhost ~]# yum -y install dhcp* # Install Linux DHCP Server Package
```

You can confirm if packages are properly installed or not by using below command

```
[root@localhost ~]# rpm -qa | grep dhcp # Confirm the Installed DHCP Server Package
dhcp-4.1.1-53.P1.el6.centos.x86_64
dhcp-common-4.1.1-53.P1.el6.centos.x86_64
dhcp-devel-4.1.1-53.P1.el6.centos.x86_64
```

After installation let's check, what is the Installation directory of Linux DHCP Server and path of all configuration files. We can do so using below command.

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```
[root@localhost ~]# rpm -ql dhcp    # Check the Path of Installation Directories and Configuration Files
/etc/dhcp    # Installation Directory
/etc/dhcp/dhcpd.conf    # Main Configuration file of DHCP Server
/etc/dhcp/dhcpd6.conf
/etc/ldap/schema/dhcp.schema
/etc/portreserve/dhcpd
/etc/rc.d/init.d/dhcpd
/etc/rc.d/init.d/dhcpd6
/etc/rc.d/init.d/dhcrelay
/etc/rc.d/init.d/dhcrelay6
/etc/sysconfig/dhcpd
/etc/sysconfig/dhcpd6
/etc/sysconfig/dhcrelay
/etc/sysconfig/dhcrelay6
/usr/bin/omshell
/usr/sbin/dhcpd    # Binary Files
/usr/sbin/dhcrelay
/usr/share/doc/dhcp-4.1.1
/usr/share/doc/dhcp-4.1.1/3.0b1-lease-convert
/usr/share/doc/dhcp-4.1.1/IANA-arp-parameters
/usr/share/doc/dhcp-4.1.1/README.ldap
/usr/share/doc/dhcp-4.1.1/api+protocol
/usr/share/doc/dhcp-4.1.1/dhclient-tz-exithook.sh
/usr/share/doc/dhcp-4.1.1/dhcpd-conf-to-ldap
/usr/share/doc/dhcp-4.1.1/dhcpd.conf.sample
/usr/share/doc/dhcp-4.1.1/dhcpd6.conf.sample
/usr/share/doc/dhcp-4.1.1/draft-ietf-dhc-ldap-schema-01.txt
/usr/share/doc/dhcp-4.1.1/ms2isc
/usr/share/doc/dhcp-4.1.1/ms2isc/Registry.perlmodule
/usr/share/doc/dhcp-4.1.1/ms2isc/ms2isc.pl
/usr/share/doc/dhcp-4.1.1/ms2isc/readme.txt
/usr/share/doc/dhcp-4.1.1/sethostname.sh
/usr/share/doc/dhcp-4.1.1/solaris.init
/usr/share/man/man1/omshell.1.gz
/usr/share/man/man5/dhcpd.conf.5.gz
/usr/share/man/man5/dhcpd.leases.5.gz
/usr/share/man/man8/dhcpd.8.gz
/usr/share/man/man8/dhcrelay.8.gz
/var/lib/dhcpd
/var/lib/dhcpd/dhcpd.leases    # Linux DHCP Server Lease File
/var/lib/dhcpd/dhcpd6.leases
```

So the Installation directory of DHCP Server is **/etc/dhcp** and the main configuration file of Linux DHCP Server is **dhcpd.conf**. By default the dhcpd.conf file would look like as shown below. As you can see below there is a message for us that we can copy the sample dhcpd.conf file from **/usr/share/doc/dhcp*** directory.

```
[root@localhost ~]# cat /etc/dhcp/dhcpd.conf
#
# DHCP Server Configuration file.
#   see /usr/share/doc/dhcp*/dhcpd.conf.sample
#   see 'man 5 dhcpd.conf'
#
```

Step : 3 Prepare the Configuration File

So let's go ahead and copy the **dhcpd.conf.sample** file as **dhcpd.conf**. System will ask for Overwrite as we already have dhcpd.conf file at /etc/dhcp path. So just enter **yes** and Press enter to continue the Copy.

```
[root@localhost ~]# cp /usr/share/doc/dhcp-4.1.1/dhcpd.conf.sample /etc/dhcp/dhcpd.conf
cp: overwrite '/etc/dhcp/dhcpd.conf'? yes
```

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Step : 4 Configure the Linux DHCP Server

Now let's go ahead and configure the Linux DHCP Server. Just edit the `/etc/dhcp/dhcpd.conf` file by using your preferred text editor.

Below shown configurations are global variables and will apply to all subnet's we declare on `dhcpd.conf` file. So just edit the configuration file and make changes as per your scenario.

```
option domain-name "elinuxbook.com";
option domain-name-servers 192.168.0.100, 192.168.0.101;

default-lease-time 600;
max-lease-time 7200;

# Use this to enable / disable dynamic dns updates globally.
#ddns-update-style none;

# If this DHCP server is the official DHCP server for the local
# network, the authoritative directive should be uncommented.
authoritative;
```

Then declare a Subnet as per your network Scenario. Here I am taking IP Address starting from 192.168.0 and Subnet as 255.255.255.0

Sample Output:

```
subnet 192.168.0.0 netmask 255.255.255.0 {
    range 192.168.0.5 192.168.0.240;    # IP Address Range
    option domain-name-servers 192.168.0.100, 192.168.0.101;    # DNS Servers
    option domain-name "elinuxbook.com";    # Domain Name
    option routers 192.168.0.1;    # Gateway Address
    option broadcast-address 192.168.0.255;
    default-lease-time 600;
    max-lease-time 7200;
}
```

Where:

Range is for allowed IP Address Range i.e. 192.168.0.5 to 192.168.0.240. DHCP Server will assign IP Address to client computers within this range. And other settings are common like Domain Name, Router Address i.e. Gateway Address, DNS Servers and so on which I already explained above.

After all required changes in `dhcpd.conf` configuration file start the Linux dhcp server service using below command.

```
[root@dhcpserver ~]# /etc/init.d/dhcpd start    # Start the DHCP Server Service
Starting dhcpd:                                [ OK ]
```

Configure DHCP Service to start at system startup.

```
[root@dhcpserver ~]# chkconfig --level 35 dhcpd on    # Start DHCP Service at Startup

[root@dhcpserver ~]# chkconfig --list dhcpd    # Confirm the Startup Configuration
dhcpd      0:off    1:off    2:off    3:on     4:off    5:on     6:off
```

DHCP Client Side Configuration

Configure the Ethernet connection from client side to get IP from DHCP Server. To do so just edit the `ifcfg-ethX` file and set **BOOTPROTO=dhcp** (Highlighted in Red color). Refer the sample output below.

Note : Replace **X** with your Ethernet Connection Number

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```
[root@client1 ~]# nano /etc/sysconfig/network-scripts/ifcfg-eth1 # Configure Ethernet Connection

HWADDR=00:0C:29:F7:BE:27
TYPE=Ethernet
BOOTPROTO=dhcp
DEFROUTE=yes
PEERDNS=yes
PEERROUTES=yes
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
NAME="eth1"
UUID=51af58db-2b74-4b31-9016-2e8682cafcb4
ONBOOT=yes
LAST_CONNECT=1495972689
```

Then restart the Network service using below command

```
[root@dhcpserver ~]# /etc/init.d/network restart # Restart the Network Service
```

Once you restart the Network Service system will get the IP Address from Linux DHCP Server. To confirm the same we can use **ifconfig** command to check the IP Address. Refer the command below.

```
[root@client1 ~]# ifconfig eth1
eth1      Link encap:Ethernet  HWaddr 00:0C:29:F7:BE:27
          inet addr:192.168.0.5  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe77:be27/64  Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:39 errors:0 dropped:0 overruns:0 frame:0
          TX packets:121 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:5184 (5.0 KiB)  TX bytes:7917 (7.7 KiB)
```

Once client get IP Address from DHCP Server you can see all the client information like The assigned IP Address, MAC Address, Client Computer Name in `/var/lib/dhcpd.leases` Server.

Note : IP Address lease information stored in `/var/lib/dhcpd.leases` file. By Default it comes with DHCP Server Package Installation but if it is not there then you have to create it manually otherwise you will unable to start the DHCP Service.

```
[root@dhcpserver ~]# cat /var/lib/dhcpd/dhcpd.leases # Checking the dhcpd.leases file
# The format of this file is documented in the dhcpd.leases(5) manual page.
# This lease file was written by isc-dhcp-4.1.1-P1

server-duid "\000\001\000\001 \275\261\000\014)Aj\256";

lease 192.168.0.5 {
    starts 0 2017/05/28 12:02:32;
    ends 0 2017/05/28 12:12:32;
    cltt 0 2017/05/28 12:02:32;
    binding state active;
    next binding state free;
    hardware ethernet 00:0c:29:f7:be:27;
    client-hostname "client1";
}
```

Advance Features in Linux DHCP Server

One more useful feature you can configure in Linux DHCP Server is you can Reserve IP Address for some user using his MAC Address (Physical Address). Normally DHCP Server leases IP Address to client for some particular time. When you restart the system it is possible that DHCP will assign you a different IP Address.

The benefit of IP Reservation is the IP Address will never change. Suppose you have a network printer, which is configured in so many client systems, in that case if your IP address change frequently then users will unable to use printer. To avoid such situation, you have to reserve an IP Address for that printer in Linux DHCP Server.

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Here I reserved an IP Address for one of my client computer i.e. **client1**. Refer the Sample Output below.

```
### host declaration ###

host client1 {
    option host-name "client1";    # Hostname of the Client Computer
    hardware ethernet 00:0c:29:f7:be:27;    # MAC Address of the Client Computer
    fixed-address 192.168.0.130;    # IP Address You want to assign to that Client
}
```

After required changes just restart the dhcp service to changes take effect.

```
[root@dhcpserver ~]# /etc/init.d/dhcpd restart    # Restart the DHCP Service
Shutting down dhcpd:                             [ OK ]
Starting dhcpd:                                   [ OK ]
```

Then restart the Network Service from DHCP client side and you will get the Reserved IP Address. Refer the Sample Output below.

```
[root@client1 ~]# ifconfig eth1
eth1      Link encap:Ethernet  HWaddr 00:0C:29:F7:BE:27
          inet addr:192.168.0.130  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fef7:be27/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:56 errors:0 dropped:0 overruns:0 frame:0
          TX packets:174 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:8534 (8.3 KiB)  TX bytes:11943 (11.6 KiB)
```

Here it is mentioned my dhcpd.conf configured file for Your Reference.

```
# Configure Global Variables which are common for all Declared Subnets & will applied to all Subnets

option domain-name "elinuxbook.com";
option domain-name-servers 192.168.0.100, 192.168.0.101;
default-lease-time 600;
max-lease-time 7200;
authoritative;
log-facility local7;

# Declare a Subnet with IP Range

subnet 192.168.0.0 netmask 255.255.255.0 {
    range 192.168.0.5 192.168.0.240;
    option domain-name-servers 192.168.0.100, 192.168.0.101;
    option domain-name "elinuxbook.com";
    option routers 192.168.0.1;
    option broadcast-address 192.168.0.255;
    default-lease-time 600;
    max-lease-time 7200;
}

# Host Declaration for IP Address Reservation

host client1 {
    option host-name "client1";
    hardware ethernet 00:0c:29:f7:be:27;
    fixed-address 192.168.0.130;
}
```

😊Good Luck😊