

DHCP in Linux Net

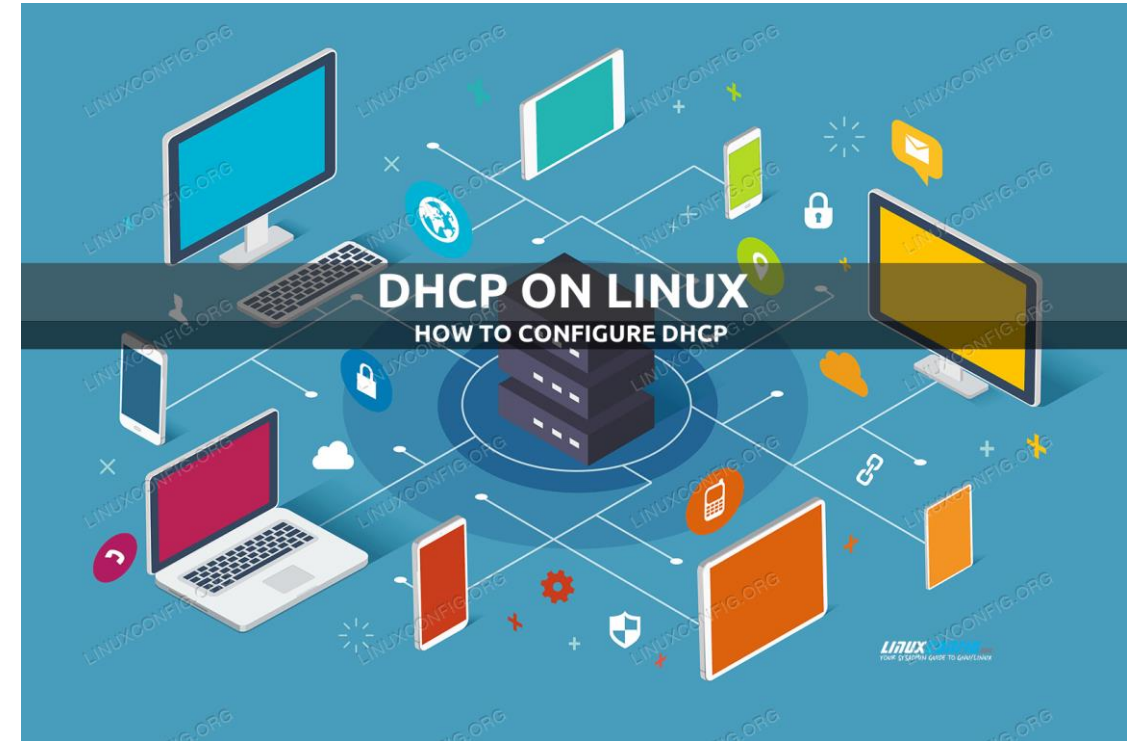
Linux Networking

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DHCP Introduction

- DHCP service enables devices on a network to obtain IP addresses, subnet masks, gateway, and other IP networking parameters **dynamically** from a DHCP server.
- DHCP server is contacted, and address requested - chooses address from a configured range of addresses called a **pool** and “leases” it to the host for a **set period**
- DHCP used for general purpose hosts such as **end user devices**.

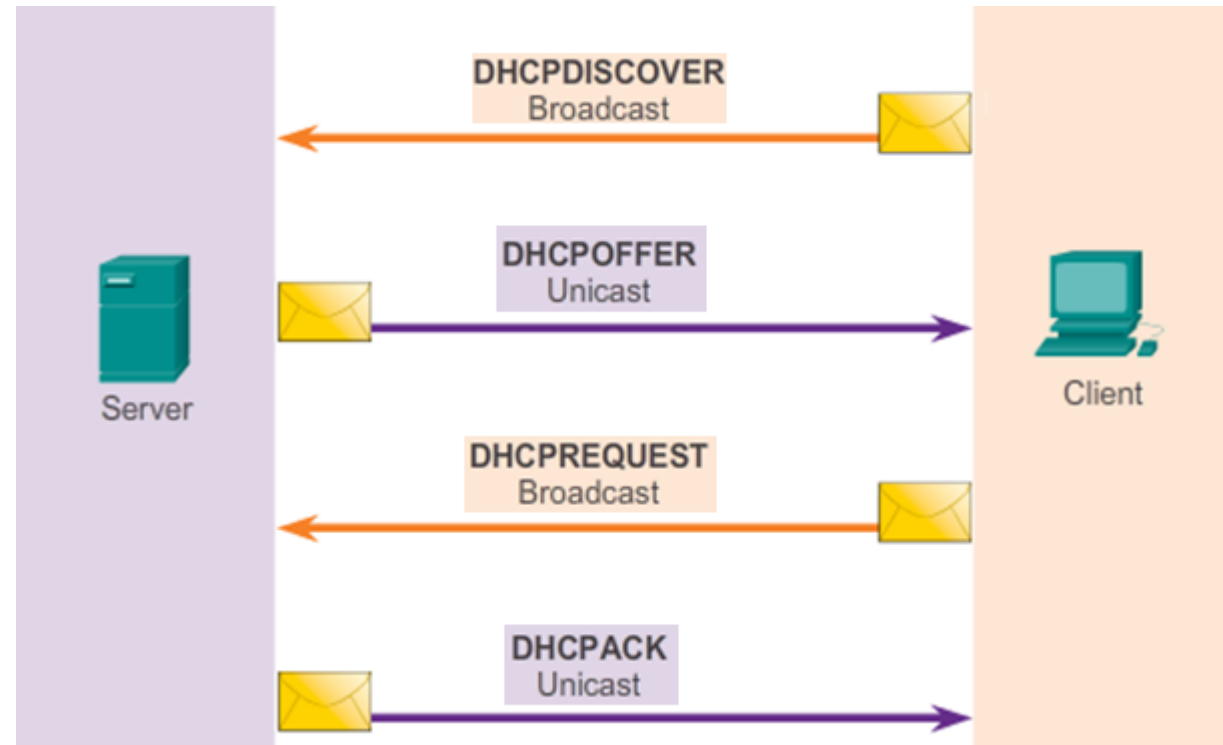


DHCP Operation

DHCPv4 uses three different address allocation methods:

- **Manual Allocation (MAC address)** - This ensures that a particular address is assigned automatically to network card, based on its MAC address.
- **Automatic Allocation** - DHCPv4 automatically assigns a static IPv4 address permanently to a device, selecting it from a pool of available addresses. No lease.
- **Dynamic Allocation** - DHCPv4 dynamically assigns, or leases, an IPv4 address from a pool of addresses for a limited period of time chosen by the server, or until the client no longer needs the address. Most commonly used.

DHCPv4 Lease Origination



Ubuntu DHCP server installation

- The DHCP server Ubuntu makes available is **dhcpcd** (dynamic host configuration protocol daemon), which is easy to install and configure and will be automatically started at system boot.
- At a terminal prompt, enter the following command to install dhcpcd:

```
$ sudo apt install isc-dhcp-server
```

- dhcpcd's messages are being sent to syslog: /var/log/syslog
- To change the default configuration, edit /etc/dhcp/dhcpcd.conf to suit your needs and particular configuration.
- After changing the config files, you must **restart** the dhcpcd service:

```
$ sudo systemctl restart isc-dhcp-server.service
```

dhcpcd.conf overview

- The dhcpcd.conf file essentially consists of a list of statements. Statements fall into two broad categories - **parameters** and **declarations**.
- **Parameter** statements either say how to do something (e.g., how long a lease to offer), whether to do something (e.g., should dhcpcd provide addresses to unknown clients), or what parameters to provide to the client (e.g., use gateway 10.0.1.1).
- **Declarations** are used to describe clients on the network, to provide addresses that can be assigned to clients etc. The most popular declarations are: **subnet, host, group, pool**

Ubuntu DHCP server configuration

```
default-lease-time 600;
max-lease-time 7200;
authoritative;
subnet 192.168.1.0 netmask 255.255.255.0
{
    range 192.168.1.150 192.168.1.200;
    option routers 192.168.1.254;
    option domain-name-servers 192.168.1.1, 192.168.1.2;
    option domain-name "mydomain.example";
}
host Client1
{
    hardware ethernet 00:02:3f:3d:73:b3;
    fixed-address 192.168.1.100;
}
```

- The **max-lease-time** is the maximum lease time that you will get. If you ask for (say) 10000 seconds and the maximum lease time is (say) 7200 seconds, then you will get a lease time of 7200 seconds.
- The **default lease time** is the lease time you will get if you don't request any particular lease time.
- In default configuration uncomment the line **#authoritative**;

Ubuntu DHCP server configuration

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max-lease-time 7200;
authoritative;
subnet 192.168.1.0 netmask 255.255.255.0
{
    range 192.168.1.150 192.168.1.200;
    option routers 192.168.1.254;
    option domain-name-servers 192.168.1.1, 192.168.1.2;
    option domain-name "mydomain.example";
}
host Client1
{
    hardware ethernet 00:02:3f:3d:73:b3;
    fixed-address 192.168.1.100;
}
```

- **Subnet** *<Subnet_addr>* **netmask** *<Net_mask>* describes the subnet from which the ip addresses will be leased.
- The **range** *<first ip-addr>* *<last ip-addr>* defines a range of available addresses. Addresses are allocated sequentially from first to last.
- **option routers** *<ip-addr>* defines a default-gateway address for clients
- **option domain-name-servers** *<ip-addr>* defines a DNS server address for clients
- **option domain-name** "*<domain-name>*" defines a domain name for client's hosts

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    range 192.168.1.150 192.168.1.200;
    option routers 192.168.1.254;
    option domain-name-servers 192.168.1.1, 192.168.1.2;
    option domain-name "mydomain.example";
}
host Client1
{
    hardware ethernet 00:02:3f:3d:73:b3;
    fixed-address 192.168.1.100;
}
```

- **Host** *<Name>* - setting a predefined IP address for a specific host
- **hardware ethernet** *<MAC-address>* - host's MAC-address.
- **fixed-address** *<ip-addr>* a predefined IP address

Sometimes needed to edit **/etc/default/isc-dhcp-server** to specify the interfaces dhcpd should listen to: `INTERFACESv4="enp0s3"`

Some other useful declarations and statements

- The **pool** declaration can be used to specify a pool of addresses that will be treated differently than another pool of addresses, even on the same network segment or subnet.
- The **group** declaration can be used if parameters are to be applied to a group of declarations which are not related strictly on a per-subnet basis.
- The **allow** and **deny** statements can be used to control the response of the DHCP server to various sorts of requests. The **unknown-clients** flag is used to tell dhcpd whether or not to dynamically assign addresses to unknown clients. An unknown client is a client that has no **host** declaration.

DHCP client configuration

- To configure your **Ubuntu** system to use dynamic (DHCP client) address assignment, create a netplan configuration in the file `/etc/netplan/*.yaml`
- To enable DHCP over IPv4, use the `dhcp4` option, in which you can specify both ***true/false*** and ***yes/no***
- Network's configuration files **CentOS** system are in `/etc/sysconfig/network-scripts/`.
- Files names are: `ifcfg-[network_device_name]`, for example: `ifcfg-enp0s3`

```
network:
  version: 2
  renderer: NetworkManager
  ethernets:
    enp0s3:
#      addresses: [10.0.4.2/24]
      dhcp4: true
    enp0s8:
      addresses: [10.0.5.2/24]
```

```
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=dhcp
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6_INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
NAME=enp0s3
```

Ubuntu DHCP server verification

- To review all actual leased IP-addresses:

\$ dhcp-lease-list

```
sergey@Server1:~$ dhcp-lease-list
To get manufacturer names please download http://standards.ieee.org/reg
auth/oui/oui.txt to /usr/local/etc/oui.txt
Reading leases from /var/lib/dhcp/dhcpd.leases
MAC                IP                hostname          valid until       m
anufacturer
=====
=====
08:00:27:9d:ad:3b   10.0.3.10         Client2           2022-01-27 12:37:48 -
NA-
08:00:27:9e:e9:1a   10.0.1.12         Client1           2022-01-27 12:34:48 -
NA-
```

- The history of leased IP-addresses is in
/var/lib/dhcp/dhcpd.leases

```
lease 10.0.1.12 {
  starts 4 2022/01/27 12:14:48;
  ends 4 2022/01/27 12:24:48;
  cltt 4 2022/01/27 12:14:48;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 08:00:27:9e:e9:1a;
  uid "\001\010\000'\236\351\032";
  client-hostname "Client1";
}
lease 10.0.3.10 {
  starts 4 2022/01/27 12:17:48;
  ends 4 2022/01/27 12:27:48;
  cltt 4 2022/01/27 12:17:48;
  binding state active;
  next binding state free;
  rewind binding state free;
  hardware ethernet 08:00:27:9d:ad:3b;
  uid "\001\010\000'\235\255";
  client-hostname "Client2";
}
```

```
lease 10.0.3.11 {
  starts 3 2022/01/26 18:23:36;
  ends 3 2022/01/26 18:33:36;
  tstp 3 2022/01/26 18:33:36;
  cltt 3 2022/01/26 18:23:36;
  binding state free;
  hardware ethernet 08:00:27:9e:e9:1a;
  uid "\001\010\000'\236\351\032";
}
```

A light blue world map is centered on the Atlantic Ocean, showing the continents of North America, South America, Europe, Africa, Asia, and Australia. The map is rendered in a simple, stylized manner with thin lines for coastlines and country borders.

Thank you!