DHCP SERVERS

Dynamic Host Configuration Protocol (DHCP) is a network protocol that automatically assigns TCP/IP information to client machines. Each DHCP client connects to the centrally located DHCP server, which returns that client's network configuration (including the IP address, gateway, and DNS servers).

1. WHY USE DHCP?

DHCP is useful for automatic configuration of client network interfaces. When configuring the client system, the administrator chooses DHCP instead of specifying an IP address, netmask, gateway, or DNS servers. The client retrieves this information from the DHCP server. DHCP is also useful if an administrator wants to change the IP addresses of a large number of systems. Instead of reconfiguring all the systems, he can just edit one DHCP configuration file on the server for the new set of IP addresses. If the DNS servers for an organization changes, the changes are made on the DHCP server, not on the DHCP clients. When the administrator restarts the network or reboots the clients, the changes will go into effect.

If an organization has a functional DHCP server properly connected to a network, laptops and other mobile computer users can move these devices from office to office.

2.CONFIGURING A DHCP SERVER

2.1.The dhcp package contains an ISC DHCP server. First, install the package as root:

Yum (or dnf) install dhcp

Installing the dhcp package creates a file, /etc/dhcp/dhcpd.conf, which is merely an empty configuration file:

DHCP Server Configuration file.

see /usr/share/doc/dhcp*/dhcpd.conf.sample

see dhcpd.conf(5) man page

The sample configuration file can be found at /usr/share/doc/dhcp-version/dhcpd.conf.sample.

You should use this file to help you configure /etc/dhcp/dhcpd.conf, which is explained in detail below.

DHCP also uses the file /var/lib/dhcpd/dhcpd.leases to store the client lease database.

2.CONFIGURATION FILE

The first step in configuring a DHCP server is to create the configuration file that stores the network information for the clients. Use this file to declare options and global options for client systems.

The configuration file can contain extra tabs or blank lines for easier formatting. Keywords are case-insensitive and lines beginning with a hash sign (#) are considered comments.

There are two types of statements in the configuration file:

Parameters : State how to perform a task, whether to perform a task, or what network configuration options to send to the client.

Declarations : Describe the topology of the network, describe the clients, provide addresses for the clients, or apply a group of parameters to a group of declarations.

The parameters that start with the keyword option are referred to as options. These options control DHCP options; whereas, parameters configure values that are not optional or control how the DHCP server behaves.

Parameters (including options) declared before a section enclosed in curly brackets ({ }) are considered global parameters. Global parameters apply to all the sections below it.

Restart the DHCP daemon for the changes to take effect

If the configuration file is changed, the changes do not take effect until the DHCP daemon is restarted. To do so, type the following at a shell prompt as root:

systemctl restart dhcpd.service

USE THE OMSHELL COMMAND

Instead of changing a DHCP configuration file and restarting the service each time, using the omshell command provides an interactive way to connect to, query, and change the configuration of a DHCP server. By using omshell, all changes can be made while the server is running. For more information on omshell, refer to the omshell man page.

In Example, “Subnet declaration”, the routers, subnet-mask, domain-search, domain-name-servers, and time-offset options are used for any host statements declared below it.

Additionally, a subnet can be declared, a subnet declaration must be included for every subnet in the network. If it is not, the DHCP server fails to start.
In this example 1, there are global options for every DHCP client in the subnet and a range declared. Clients are assigned an IP address within the range.

EXAMPLE 1. SUBNET DECLARATION

```
subnet 192.168.1.0 netmask 255.255.255.0 {
    option routers                  192.168.1.254;
    option subnet-mask              255.255.255.0;
    option domain-search            "example.com";
    option domain-name-servers      192.168.1.1;
    option time-offset              -18000;     # Eastern Standard Time
        range 192.168.1.10 192.168.1.100;
}
```

To configure a DHCP server that leases a dynamic IP address to a system within a subnet, modify Example, “Range parameter” with your values. It declares a default lease time, maximum

lease time, and network configuration values for the clients. This example 2 assigns IP addresses in the range 192.168.1.10 and 192.168.1.100 to client systems.

Example 2. Range parameter

```
default-lease-time 600;
max-lease-time 7200;
option subnet-mask 255.255.255.0;
option broadcast-address 192.168.1.255;
option routers 192.168.1.254;
option domain-name-servers 192.168.1.1, 192.168.1.2;
option domain-search "example.com";
subnet 192.168.1.0 netmask 255.255.255.0 {
  range 192.168.1.10 192.168.1.100;
}
```

To assign an IP address to a client based on the MAC address of the network interface card, use the hardware ethernet parameter within a host declaration. As demonstrated in Example3, “Static IP address using DHCP”, the host apex declaration specifies that the network interface card with the MAC address 00:A0:78:8E:9E:AA always receives the IP address 192.168.1.4.

Note that the optional parameter host-name can also be used to assign a host name to the client.

Example 3. Static IP address using DHCP

```
host apex {
  option host-name "apex.example.com";
  hardware ethernet 00:A0:78:8E:9E:AA;
  fixed-address 192.168.1.4;
}
```

All subnets that share the same physical network should be declared within a shared-network declaration as shown in Example 4, “Shared-network declaration”. Parameters within the shared-network, but outside the enclosed subnet declarations, are considered to be global parameters. The name of the shared-network must be a descriptive title for the network, such as using the title 'test-lab' to describe all the subnets in a test lab environment.

Example 4. Shared-network declaration

```
shared-network name {
   option domain-search             "test.redhat.com";
   option domain-name-servers      ns1.redhat.com, ns2.redhat.com;
```

```
    option routers                  192.168.0.254;
    more parameters for EXAMPLE shared-network
    subnet 192.168.1.0 netmask 255.255.252.0 {
      parameters for subnet
      range 192.168.1.1 192.168.1.254;
    }
    subnet 192.168.2.0 netmask 255.255.252.0 {
      parameters for subnet
      range 192.168.2.1 192.168.2.254;
    }
}
```

As demonstrated in Example 5, “Group declaration”, the group declaration is used to apply global parameters to a group of declarations. For example, shared networks, subnets, and hosts can be grouped.

Example 5. Group declaration

```
group {
  option routers                  192.168.1.254;
  option subnet-mask              255.255.255.0;
  option domain-search            "example.com";
  option domain-name-servers      192.168.1.1;
  option time-offset              -18000;     # Eastern Standard Time
  host apex {
    option host-name "apex.example.com";
    hardware ethernet 00:A0:78:8E:9E:AA;
    fixed-address 192.168.1.4;
  }
  host raleigh {
    option host-name "raleigh.example.com";
    hardware ethernet 00:A1:DD:74:C3:F2;
    fixed-address 192.168.1.6;
```

}

}

USING THE SAMPLE CONFIGURATION FILE

The sample configuration file provided can be used as a starting point and custom configuration options can be added to it. To copy it to the proper location, use the following command:

cp /usr/share/doc/dhcp-version-number/dhcpd.conf.sample /etc/dhcp/dhcpd.conf

... where version-number is the DHCP version number.

LEASE DATABASE

On the DHCP server, the file /var/lib/dhcpd/dhcpd.leases stores the DHCP client lease database.

Do not change this file. DHCP lease information for each recently assigned IP address is automatically stored in the lease database. The information includes the length of the lease, to whom the IP address has been assigned, the start and end dates for the lease, and the MAC address of the network interface card that was used to retrieve the lease.

All times in the lease database are in Coordinated Universal Time (UTC), not local time.

The lease database is recreated from time to time so that it is not too large. First, all known leases are saved in a temporary lease database. The dhcpd.leases file is renamed dhcpd.leases~ and the temporary lease database is written to dhcpd.leases.

The DHCP daemon could be killed or the system could crash after the lease database has been renamed to the backup file but before the new file has been written. If this happens, the dhcpd.leases file does not exist, but it is required to start the service. Do not create a new lease file. If you do, all old leases are lost which causes many problems. The correct solution is to rename the dhcpd.leases~ backup file to dhcpd.leases and then start the daemon.

4. STARTING AND STOPPING THE SERVER

STARTING THE DHCP SERVER FOR THE FIRST TIME

When the DHCP server is started for the first time, it fails unless the dhcpd.leases file exists. Use the command touch /var/lib/dhcpd/dhcpd.leases to create the file if it does not exist.

If the same server is also running BIND as a DNS server, this step is not necessary, as starting the named service automatically checks for a dhcpd.leases file.

To start the DHCP service, use the following command:

systemctl start dhcpd.service

To stop the DHCP server, type:

systemctl stop dhcpd.service

By default, the DHCP service does not start at boot time. To configure the daemon to start automatically at boot time, run:

systemctl enable dhcpd.service

If more than one network interface is attached to the system, but the DHCP server should only be started on one of the interfaces, configure the DHCP server to start only on that device.
In /etc/sysconfig/dhcpd, add the name of the interface to the list of DHCPDARGS:

```
# Command line options here

DHCPDARGS=eth0
```

This is useful for a firewall machine with two network cards. One network card can be configured as a DHCP client to retrieve an IP address to the Internet. The other network card can be used as a DHCP server for the internal network behind the firewall. Specifying only the network card connected to the internal network makes the system more secure because users can not connect to the daemon via the Internet.

Other command line options that can be specified in /etc/sysconfig/dhcpd include:

-p portnum — Specifies the UDP port number on which dhcpd should listen. The default is port 67. The DHCP server transmits responses to the DHCP clients at a port number one greater than the UDP port specified. For example, if the default port 67 is used, the server listens on port 67 for requests and responses to the client on port 68. If a port is specified here and the DHCP relay agent is used, the same port on which the DHCP relay agent should listen must be specified. Refer to Section 11.2.4, “DHCP Relay Agent” for details.

-f — Runs the daemon as a foreground process. This is mostly used for debugging.

-d — Logs the DHCP server daemon to the standard error descriptor. This is mostly used for debugging. If this is not specified, the log is written to /var/log/messages.

-cf filename — Specifies the location of the configuration file. The default location is /etc/dhcp/dhcpd.conf.

-lf filename — Specifies the location of the lease database file. If a lease database file already exists, it is very important that the same file be used every time the DHCP server is started. It is strongly recommended that this option only be used for debugging purposes on non-production machines. The default location is /var/lib/dhcpd/dhcpd.leases.

-q — Do not print the entire copyright message when starting the daemon.