

# DYNAMIC HOST CONFIGURATION PROTOCOL

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## Abstract

This guide will develop the procedure that will allow you to practice the knowledge acquired in the theoretical class of server management. The topic to be developed is **DHCP**.

## 1 Introduction

The purpose of the Dynamic Host Configuration Protocol (DHCP) is to assign network settings centrally (from a server) rather than configuring them locally on every workstation. A host configured to use DHCP does not have control over its own static address. It is enabled to configure itself completely and automatically according to directions from the server. If you use the NetworkManager on the client side, you do not need to configure the client. This is useful if you have changing environments and only one interface active at a time. Never use NetworkManager on a machine that runs a DHCP server.[1].

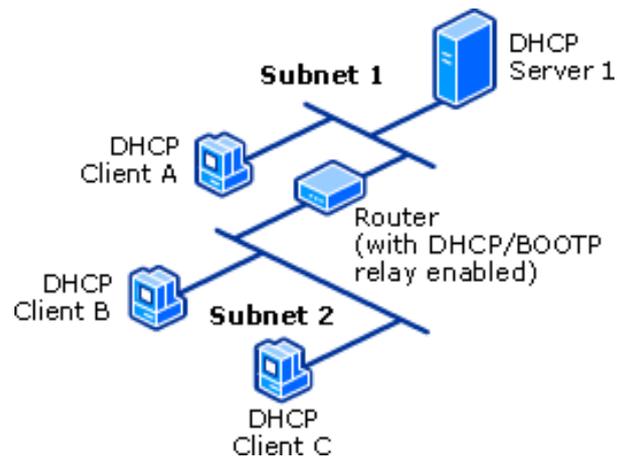


Figure 1: DHCP Server.

## 2 DHCP lease process

A DHCP-enabled client obtains a grant for an IP address from a DHCP server. This concept is like a lease for a certain time, once the contract expires there is a period of grace in which the DHCP server waits for a new renewal of the contract. This protects the lease of clients in case the client and the server are in different time zones, the internal clocks of the client and server computers. They are not synchronized, or the client is out of the network when the lease expires.

DHCP servers and DHCP clients communicate through a series of DHCP messages. To obtain a grant, the DHCP client initiates a conversation with a DHCP server using a series of these DHCP messages.

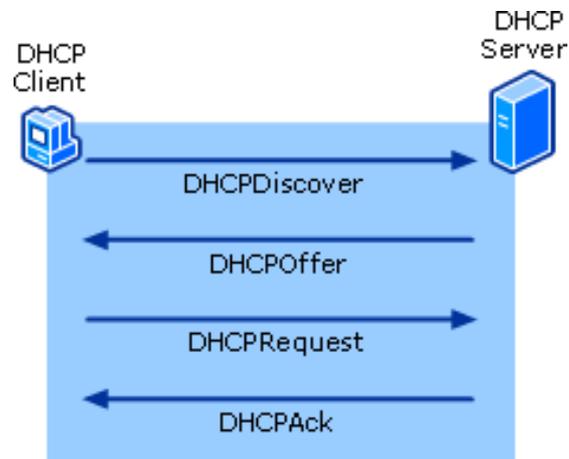


Figure 2: DHCP lease process.

- **DHCPDiscover:** Transmission by a DHCP client when you try to connect to the network for the first time. The DHCPDiscover message requests IP address information from a DHCP server.
- **DHCPOffer:** It is broadcast for each DHCP server that receives the DHCPDiscover message from the client and has an IP address configuration to offer the client. The DHCPOffer message contains an unpublished IP address and additional TCP / IP configuration information, such as the subnet mask and the default gateway. More than one DHCP server can respond with a DHCPOffer message. The client accepts the best offer, which for a Windows DHCP client is the first DHCPOffer message it receives.
- **DHCPRequest:** Transmitted by a DHCP client after selecting a DHCPOffer. The DHCPRequest message contains the IP address of the DHCPOffer that you selected. If the customer is renewing or re-linking to a previous lease, this package can be unicast directly to the server.
- **DHCPAck:** Transmitted by a DHCP server to a DHCP client recognizing the DHCPRequest message. At this time, the server also forwards any

option. Upon receiving the DHCPAck, the customer can use the leased IP address to participate in the TCP / IP network and complete the system startup. This message is usually transmitted, because the DHCP client does not officially have an IP address that it can use at this time. If the DHCPAck responds to a DHCPInform, then the message is unicast directly to the host that sent the DHCPInform message.

- **DHCPNack:** Transmission by a DHCP server to a DHCP client that denies the client's DHCPRequest message. This can occur if the requested address is incorrect because the client moved to a new subnet or because the DHCP client lease has expired and can not be renewed.
- **DHCPDecline:** Transmit from a DHCP client to a DHCP server, informing the server that the offered IP address is rejected because it seems to be in use by another computer.
- **DHCPRelease:** Sent by a DHCP client to a DHCP server, waiving an IP address and canceling the remaining lease. This is unicast to the server that provided the lease.
- **DHCPInform:** Sent from a DHCP client to a DHCP server, requesting only additional local configuration parameters; The client already has an IP address configured.

### 3 DHCP service

A DHCP server supplies not only the IP address and the netmask, but also the host name, domain name, gateway, and name server addresses for the client to use. In addition to that, DHCP allows several parameters to be configured in a centralized way, for example, a time server from which clients may poll the current time or even a print server. **RFC 2132** [2]

## 4 Development of Practice

The development of the practice will take place in the distribution of Open Suse Leap 15, it is clear that this practice can be extended to other distributions taking into account their respective changes.

### 4.1 Necessary logical equipment.

we must install the dhcp server, if it is already installed then we must update it, also we must install the graphical configuration mode with yast, to do this we write the following commands in the console.

Execute the following to install the protocol:

```
zypper install dhcp
```

Execute the following to install the service:

```
zypper install dhcp-server
```

Execute the following to configuration in graphic mode with yast :

```
zypper install yast2-dhcp-server
```

## 4.2 Start service and add the service to the system boot.

dhcp is a service that must be started once it has been configured. And it must be stopped when some new configuration is going to be done, to do this execute the following commands.

Execute the following to start the service for the first time:

```
systemctl start dhcpd
```

Execute the following to restart the service:

```
systemctl restart dhcpd
```

Execute the following to stop the service:

```
systemctl stop dhcpd
```

## 4.3 Necessary modifications in the firewall.

Clients in all subnets need to be able to communicate with the server. To define the interfaces that the DHCP server should listen to, adjust the firewall accordingly, for this we execute the following commands.

Execute the following to configure the firewall:

```
firewall-cmd --zone=public --permanent --add-service=dhcp
```

Run the following to reload the firewall:

```
firewall-cmd --reload
```

#### 4.4 Files and configuration directories.

- **/etc/dhcpd.conf:** in this file the network parameters that the dhcp server should follow are configured.
- **/etc/sysconfig/dhcpd:** file is used to pass arguments to the dhcpd daemon at boot time.

**While the file is being modified, stop the service.**

Modify this file as shown below:

```
DHCPD_INTERFACE="eth0"
```

Locate Listen a slightly different configuration for an internal subnet:

```
# A slightly different configuration for an internal subnet.
subnet 10.5.5.0 netmask 255.255.255.224 {
  range 10.5.5.26 10.5.5.30;
  option domain-name-servers 10.5.5.116;
  option domain-name "internal.example.org";
  option routers 10.5.5.1;
  option broadcast-address 10.5.5.31;
  default-lease-time 600;
  max-lease-time 7200;
}
```

- The line `option domain-name` defines the default domain of your network.
- With the entry `option domain-name-servers`, specify up to three values for the DNS servers used to resolve IP addresses into host names and vice versa. Ideally, configure a name server on your machine or somewhere else in your network before setting up DHCP. That name server should also define a host name for each dynamic address and vice versa. To learn how to configure your own name server.
- The line `option broadcast-address` defines the broadcast address the requesting client should use.
- With `option routers`, set where the server should send data packets that cannot be delivered to a host on the local network (according to the source and target host address and the subnet mask provided). Usually, especially in smaller networks, this router is identical to the Internet gateway. `option subnet-mask`, specify the netmask assigned to clients. `first` one defines how many seconds an IP address is leased to a requesting client

by default (default-lease-time) before it should apply for renewal. section also includes a statement of the maximum period for which a machine may keep an IP address assigned by the DHCP server without applying for renewal (max-lease-time).

locate the following and modify it according to your needs

```
#Fixed IPAddresses can aslo be specified for hosts. these addresses
#should no also be listed as being available for dynamic assignment
#Hosts for which fixed IP addresses have been specified can boot using
#BOOTP or DHCP. Hosts for whichno fixed address is specified can only
#be booted whith DHCP,unless there is an address range on the subnet
#to whicha BOOTP client is connected whichhas the dynamic-bootp flag
#set.
host fantasia{
hardware ethernet 08:00:07:26:c0:a5;
fixed-address 10.5.5.11
}
```

To identify a client configured with a static address, dhcpd uses the hardware address (which is a global unique fixed numeric code consisting of six pairs of octets) for the identification of all network devices (for example, 00: 30: 6E: 08: EC: 80). If the respective lines, as shown above, the DHCP daemon always assigns the same data set to the corresponding client. The name of the respective client (host HOSTNAME, here fantasy) is entered in the first line and the MAC address in the second.

#### 4.4.1 Some Useful Commands.

**ip link show:** shows the ip of the network card

## 5 Exercise

Install and configure a DHCP server, as shown throughout the development of the practice, mount a network and try it, also configure another server using yast.

## References

- [1] DHCP/openSUSE Leap 15.0", *doc.opensuse.org* 2018
- [2] How-does-DHCP-work/quora", *www.quora.com* 2018