DHCP
(DYNAMIC HOST CONFIGURATION PROTOCOL)

What is DHCP:

It's basically a protocol using which our computers gets an IP address dynamically rather than assigning each computer a static IP address.

Why can't we just use static IP addressing?

Reason is simple a human cannot assign 1000 pc IP address without an IP addressing conflict.

DHCP process

DHCP has 4 steps called as DORA nothing but Discover, Offer, Request, Acknowledge.
DHCP is client server model which uses UDP port number 68 for client and UDP 67 for server.

Even a router can be configured as a DHCP server by giving it a pool of ip address and lease time (what's this i will discuss later in this section)
Let dig into the process of getting a fresh IP address for a computer connected to a DHCP server or a DHCP enabled router.

D- Discover: Initially when a computer comes up it will send a Discover message to all the device via its interface, it's a broadcast message as it don't know where the DHCP server lies following are the information contained.

I am using 12.1.1.1 as my DHCP server IP or My router IP.
Both client and server uses UDP ports.
Source IP: 0.0.0.0
Source Port number: 68
Destination IP: 255.255.255.255
Destination Port: 67
*Note: DHCP server hears using port number 68.

O- Offer:

Once the DHCP server receives the Discover message in UDP port number 68, it checks its database for free IP's and gives out an IP address via broadcast.

Source IP: 12.1.1.1
Source Port number: 67
Destination IP: 255.255.255.255
Destination Port: 678

R-Request:

The PC receives the IP address and says ok fine i will get the IP address please give.

Source IP: 0.0.0.0
Source Port number: 68
Destination IP: 255.255.255.255
Destination Port: 67

A-Acknowledgement:

At last as the PC accepts the offer the DHCP server will send an acknowledgment message with the Requested IP address.

Source IP: 12.1.1.1
Source Port number: 67
Destination IP: 255.255.255.255
Destination Port: 68

All of the above step is only for allocating fresh IP to a computer or any other client device, now what about that Lease time.

Lease time is the time period for with the computer don't need to renew its IP address its there just to use the unused IP in the DHCP and also this is the reason why a dynamic IP keeps on changing.
Following are the screenshot for packet capture

**Allocating New IP:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Time</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Length</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.01608</td>
<td>0.0.0.6</td>
<td>0.0.0.6</td>
<td>DHCP</td>
<td>551</td>
<td>DHCP Discover – Transaction ID 0x1f84</td>
</tr>
<tr>
<td>11</td>
<td>0.00959</td>
<td>12.1.1.2</td>
<td>12.1.1.2</td>
<td>DHCP</td>
<td>201</td>
<td>DHCP Offer – Transaction ID 0x1f84</td>
</tr>
<tr>
<td>12</td>
<td>0.00582</td>
<td>0.0.0.6</td>
<td>0.0.0.6</td>
<td>DHCP</td>
<td>551</td>
<td>DHCP Request – Transaction ID 0x1f84</td>
</tr>
<tr>
<td>13</td>
<td>0.00413</td>
<td>12.1.1.1</td>
<td>255.255.255.255</td>
<td>DHCP</td>
<td>201</td>
<td>DHCP ACK – Transaction ID 0x1f84</td>
</tr>
</tbody>
</table>

**Renewing of IP:**

It has only 2 process
Request and Acknowledge also its an unicast packet.

<table>
<thead>
<tr>
<th>No.</th>
<th>Time</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Length</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.00016</td>
<td>12.1.1.2</td>
<td>12.1.1.2</td>
<td>DHCP</td>
<td>201</td>
<td>DHCP Request – Transaction ID 0x1f84</td>
</tr>
<tr>
<td>26</td>
<td>0.00004</td>
<td>12.1.1.1</td>
<td>12.1.1.1</td>
<td>DHCP</td>
<td>201</td>
<td>DHCP ACK – Transaction ID 0x1f84</td>
</tr>
</tbody>
</table>

**Doubt:**

1) Why should the Client sending Request in broadcast even though the Offer which it received from Server in Offer process, the PC might have got the server's IP address.

**Reason:**

Multiple DHCP servers could be catering to a DHCP client. Sending a request as a broadcast is an indication to the other DHCP servers that a DHCP server has been selected by the client. The client includes the IP address of the the DHCP server it wants to use in the "DHCP server identifier" field. This way only the selected DHCP server commits to leasing the IP address and the rest of the available DHCP servers discard the assignment.

Here's a capture showing the DHCP server selected by the client in the DHCP server identifier field.
In this packet capture you can see under Bootp flags it uses Broadcast and also it uses DHCP Server Identifier to specify from which server its going to receive the IP address’.

Summary:
DHCP allocating fresh IP always use Broadcast with DORA process
DHCP when renewing IP always use Unicast with RA process
Client uses UDP port number 68
Server uses UDP port number 67
** For any query mail me or catch me at
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