DHCP:

It assigns IP addresses to the device.
Dhcp includes DORA process:

- DISCOVER - client sends discover packet to the server asking for an IP.
- OFFER - server sends offer packet to the client saying this IP is available.
- REQUEST - client sends request packet to the server asking for that particular IP.
- ACKNOWLEDGE - server sends ack packet to client saying this IP is yours for [X]hrs.

If the client requests for a particular IP that is already being used by another system, it sends DECLINE packet - DHCP DECLINE

If the client asks for its old IP after moving to another network, server sends a NAK packet asking the client to restart the DORA process.

To run and capture dhcp packets on wireshark:
Run wireshark in background (wireshark &)
Run dhclient (to start the DORA process)
dhclient -r (to send DHCP RELEASE packet) it kills the old dhcp process.

DHCP LEASE:

It is the temporary IP assigned to a client by the DHCP server for a period of time say Xhrs or 1 day.
/var/lib/dhcp/dhclient.leases

```
lease {
  interface "wlan0";                    # Network interface
  fixed-address 192.168.1.150;          # Assigned IP
  option subnet-mask 255.255.255.0; # Subnet mask:Defines the local network size
  option routers 192.168.1.1;              # Router IP
  option domain-name-servers 8.8.8.8, 8.8.4.4; #DNS servers for domain resolution.
  option dhcp-server-identifier 192.168.1.1;   #IP of the DHCP server that granted
the lease(router)
  renew 4 2025/04/23 12:00:00;    # at 50% of 24-hour lease # 4-thursday(sunday-0)
  rebind 4 2025/04/23 21:00:00;   # at 87.5% of lease
  expire 4 2025/04/23 23:59:59;   # Lease end
}
```

DNS:

Domain Name System translates the domain names into machine-readable IP addresses.

There are two ways of DNS lookups:

1. Domain -> IP
   nslookup (domain-name)
2. IP -> Domain
   nslookup (ip-address)

Example usage:

```
root@27808--IOT--BLR:/home/vvsa# nslookup openwrt.org                #Domain -> IP
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: openwrt.org
Address: 64.226.122.113
Name: openwrt.org
Address: 2a03:b0c0:3:d0::1a51:c001

root@27808--IOT--BLR:/home/vvsa# nslookup 64.226.122.113            #IP -> Domain
113.122.226.64.in-addr.arpa     name = wiki-03.infra.openwrt.org.
```

Authoritative answers can be found from:

dnsmasq:

dnsmasq is a lightweight DNS, TFTP, PXE, router advertisement and DHCP server. It is intended to provide coupled DNS and DHCP service to a LAN.
dnsmasq is a small, efficient tool that acts as:

Service	What it does
DNS server	Resolves domain names to IPs inside a LAN, and forwards external lookups to the internet
DHCP server	Dynamically assigns IP addresses to devices on your LAN
TFTP server	Helps with network booting (especially PXE)
Router Advertisement	Helps IPv6 clients know how to route
PXE server	Boot computers over the network (diskless clients)

Configure dnsmasq parameters:

1. vi /etc/config/dhcp
2. /etc/init.d/dnsmasq restart   #reflect the changes made
3. dhclient -r   #release old client process
4. dhclient   #start a new client process
5. cat /var/lib/dhcp/dhclient.leases   #verify the changes in the lease record

vi /etc/config/dhcp

```
config dhcp 'lan'
        option interface 'lan'
        option force '1'   #ensures dhcp always runs
        option start '100' #the starting IP, dhcp server can assign to any device.
        option limit '50'  #the maximum number of IPs dhcp server can assign.
        option leasetime '12h'
```

Note:

start: 100 -> IP: 192.168.1.100

limit: 50 -> 100+50-1(as we're including the starting IP) -> IP: 192.168.1.149

```
Static dhcp lease
config host
      option mac '00:be:43:7c:ff:d4'    # Device's MAC
      option ip '192.168.1.50'          # IP to reserve
      option name 'my-pc'               #host-name
```

Modifying init scripts:

TASK: Modify vi /etc/init.d/dnsmasq to reflect changes in vi /var/etc/dnsmasq.conf.vlan1_dns

1. Run vi /etc/init.d/dnsmasq
2. Make the below modification

```
if [ "$dhcpv4" != "disabled" ] ; then
        xappend "--dhcp-range=$tags$nettag$START,$END,$NETMASK,$leasetime${options:+ $options}"
        echo "dhcp-lease-time=$leasetime" >> "$CONFIGFILE_TMP"
fi
```

3. Save and exit (esc, :wq!)
4. Run /etc/init.d/dnsmasq restart
5. Open vi /var/etc/dnsmasq.conf.vlan1_dns
6. Check if changes reflected

```
bogus-priv
conf-file=/usr/share/dnsmasq/rfc6761.conf
dhcp-range=set:lan,192.168.1.2,192.168.1.250,255.255.255.0,24h
dhcp-lease-time=24h
no-dhcp-interface=eth0
enable-ra
quiet-ra
```