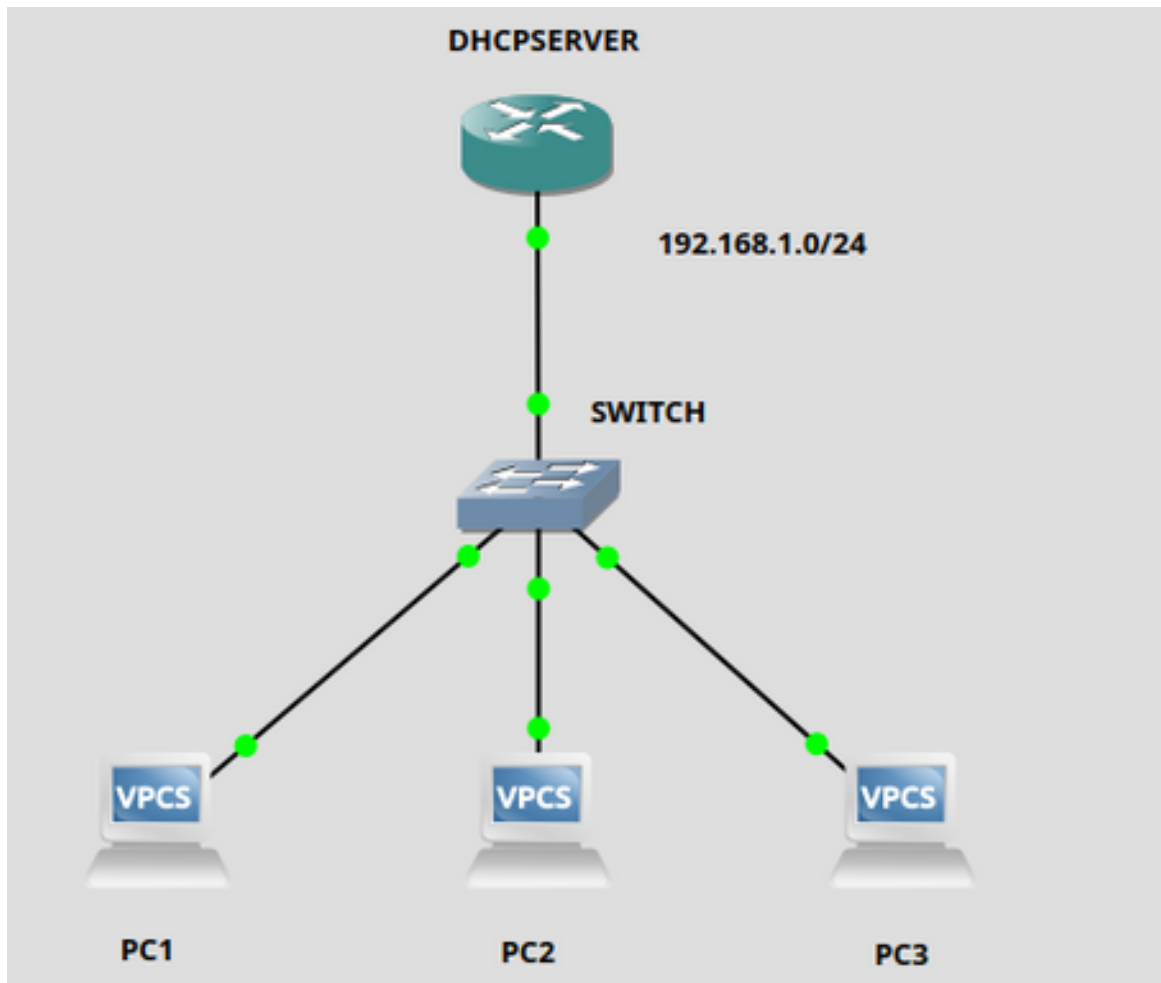**4. DHCP Dynamic IP Addressing Module: Implement a DHCP server for dynamic allocation and release of IP addresses in the network.**

Background Research for the problem statement:

- Gained a solid understanding of how DHCP works.
- Researched the role of the DHCP server in managing and allocating IP addresses to network devices.
- Studied the different configurations such as IP address range, subnet mask, default gateway, etc.
- Understood the concept of Lease Time and how it determines the duration for which an IP address is assigned to a client.
- Client request process, and renewal and release.

Observations:

- **Successful IP Address Allocation:**

  - **Client IP Assignment:**

    Successfully observed the DHCP server dynamically assigning IP addresses to clients upon request.

    Confirmed that clients receive valid and unique IP addresses.

  - **DHCP server configurations:**

```
Current configuration : 949 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname DHCPSERVER
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
memory-size iomem 5
no ip icmp rate-limit unreachable
!
!
ip cef
no ip domain lookup
no ip dhcp use vrf connected
!
ip dhcp pool dhcp
   network 192.168.1.0 255.255.255.0
   default-router 192.168.1.1
```

Below are the observations of how the VPCs are getting unique IP addresses on requesting to DHCP server.

```
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

Welcome to Virtual PC Simulator, version 0.8.3
Dedicated to Daling.
Build time: Sep  9 2023 11:15:00
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Press '?' to get help.

Executing the startup file


PC1> ip dhcp
DDORA IP 192.168.1.3/24 GW 192.168.1.1
```

```
Trying 127.0.0.1...
Connected to 127.0.0.1.
Escape character is '^]'.

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Press '?' to get help.

Executing the startup file


PC2> ip dhcp
DDORA IP 192.168.1.4/24 GW 192.168.1.1
```

- **IP Address Release:**

  - **Release Process:**

  Confirmed that clients release their IP addresses when they are no longer needed.

  Checked that released addresses are returned to the available pool for future assignments.

  - **Lease Time and Renewal:**

  - **Lease Duration:**

  Observed the lease time duration and verified that IP addresses are leased for the specified period.

  Confirmed that clients renew their leases before expiration.