

Lab Number 5

Aim: Basic Router Configuration with DHCP

Theory:

A router is a critical networking device that routes data packets between different networks, directing traffic across the internet. Configuring a router involves setting up key parameters to ensure it can connect to the internet and communicate with other devices on the local network.

A vital feature of routers is the Dynamic Host Configuration Protocol (DHCP), which automates the assignment of IP addresses and network settings (such as the subnet mask, default gateway, and DNS servers) to devices within the network.

Here's a summary of the core theory and steps involved in setting up a router with DHCP:

1. Accessing the Router's Configuration Interface

- **Connecting to the router:** Typically, connect either via an Ethernet cable or wirelessly.
- **Opening a web browser:** Enter the router's IP address (commonly 192.168.0.1 or 192.168.1.1) into the browser's address bar.
- **Logging in:** Input the router's credentials (usually found on a label on the router or in its manual).

2. Basic Router Configuration

- **WAN (Wide Area Network) Configuration:** This is where the router connects to the internet. If your ISP provides dynamic IP addresses, you can enable the router's DHCP client to automatically obtain an IP address from the ISP.
- **LAN (Local Area Network) Configuration:** This handles the internal network, where the router assigns IP addresses to connected devices. You can set the router's internal IP address (e.g., 192.168.1.1) here.

3. Configuring DHCP

- **Enabling the DHCP Server:** This allows the router to assign IP addresses to devices on the LAN.
- **IP Address Pool:** Define the range of IP addresses that the DHCP server can assign to devices, such as from 192.168.1.100 to 192.168.1.200.
- **Lease Time:** Set the duration for which a device can use an assigned IP before renewing (typically 24 hours).
- **Subnet Mask:** Usually 255.255.255.0, which defines the range of IP addresses in the network.
- **Default Gateway:** This is generally the router's IP address (e.g., 192.168.1.1), which devices use to access external networks.
- **DNS Servers:** You can specify DNS servers (e.g., Google's DNS: 8.8.8.8 and 8.8.4.4) or let the router assign them automatically.

4. Securing the Router

- **Change default login credentials:** To secure the router's configuration, set a new username and password.
- **Wireless Security (if applicable):** For wireless networks, enable encryption (e.g., WPA3 or WPA2) to prevent unauthorized access.

5. Testing the Configuration

- After setting up DHCP, connect devices to the network, and they should automatically receive IP addresses.
- Use the ipconfig command (Windows) or ifconfig (Linux/Mac) on a connected device to confirm that an IP address has been assigned from the DHCP pool.

6. Optional Configuration

- **Static IP Assignments:** Reserve specific IP addresses for certain devices (like servers or printers) using their MAC addresses.
- **Port Forwarding:** If you need to allow external access to certain applications (such as game servers), set up port forwarding to direct incoming traffic from the internet to the relevant internal device.

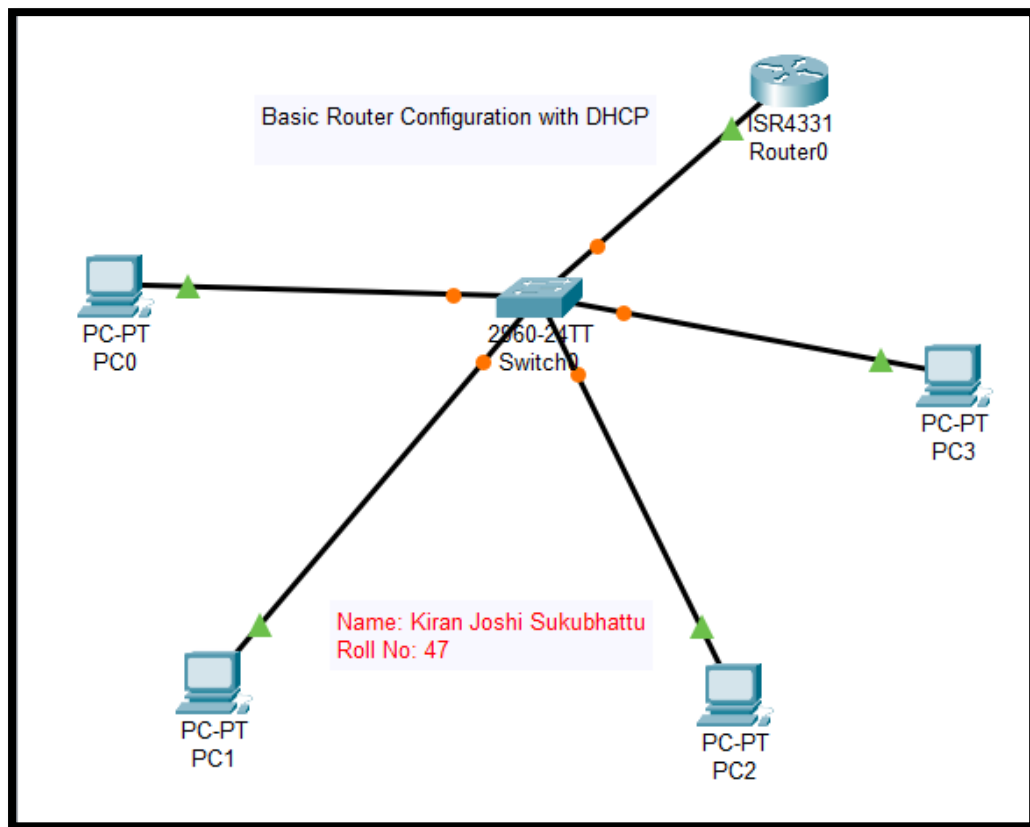
Example of a Basic Router DHCP Configuration

1. LAN Settings:

- IP Address: 192.168.1.1
- Subnet Mask: 255.255.255.0

2. DHCP Settings:

- DHCP Server: Enabled
- IP Pool Range: 192.168.1.100 to 192.168.1.200
- Lease Time: 24 hours
- Default Gateway: 192.168.1.1
- DNS Servers: Automatically from ISP or custom (e.g., 8.8.8.8)



PC2

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static

IPv4 Address 192.168.1.4

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::2D0:BCFF:FE18:2E0E

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

```
Router#show running-config
Building configuration...

Current configuration : 810 bytes
!
version 16.6.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
enable secret 5 $l$mERr$fyvjxpArVrJoOVijRSPA00
!
!
!
ip dhcp pool lan
  network 192.168.1.0 255.255.255.0
  default-router 192.168.1.1
!
!
!
ip cef
no ipv6 cef
!
!
!
!
!
!
!
!
```

```

!
!
!
spanning-tree mode pvst
!
!
!
!
!
!
interface GigabitEthernet0/0/0
ip address 192.168.1.1 255.255.255.0
duplex auto
speed auto
!
interface GigabitEthernet0/0/1
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/0/2
no ip address
duplex auto
speed auto
shutdown
!
interface Vlan1
no ip address
shutdown
!
ip classless
!
ip flow-export version 9
!
!
!
!
!
!
!
line con 0
password 1234
login
!
line aux 0
!
line vty 0 4
login
!
!
!
end

```

Conclusion:

This guide outlines the basic yet essential steps involved in configuring a router with DHCP. By setting up DHCP, DNS, and proper security protocols, the router ensures efficient device management, automatic IP assignment, and secure communication across the network. These configurations optimize network performance and allow for streamlined, hassle-free connectivity.

Discussion:

By enabling DHCP, the router automates the otherwise complex task of assigning IP addresses, simplifying network management. DNS ensures that devices can access the internet through familiar domain names, while security features like changing login credentials and enabling encryption safeguard the network from unauthorized access. Overall, this lab demonstrates how these elements work together to create a secure, efficient, and scalable network environment.