

## **DHCP LAB DESCRIPTION**

This lab demonstrates how **Dynamic Host Configuration Protocol (DHCP)** is used to **automatically assign IP configuration** to end devices in a local area network. Instead of manually configuring IP addresses on each PC, a router is configured to act as a **DHCP server**, simplifying network management and reducing configuration errors.

### **Network Topology Overview**

The network consists of:

- **One Cisco ISR4331 router** acting as both the **default gateway** and **DHCP server**
- **One Cisco 2960 switch** providing Layer 2 connectivity
- **Four end devices (PCs)** connected to the switch

All devices are part of a **single LAN**.

### **Network Addressing Scheme**

- **Network:** 192.168.10.0/24
- **Default Gateway:** 192.168.10.1 (Router interface)
- **DNS Server:** 8.8.8.8

The router interface connected to the switch is statically assigned the gateway IP address, while all PCs obtain their IP settings dynamically.

### **DHCP Scope and Address Allocation**

The router is configured with a DHCP pool that defines how IP addresses are distributed:

- **Excluded IP Range:**  
192.168.10.1 – 192.168.10.10  
(Reserved for the router, servers, or future static devices)
- **DHCP Pool Range:**  
192.168.10.11 – 192.168.10.254

When a PC is set to obtain its IP address automatically, it receives:

- An IP address from the DHCP pool
- Subnet mask
- Default gateway

- DNS server address

### **DHCP Operation Explanation**

When a PC is powered on or connected to the network, the following DHCP process occurs:

1. **Discover** – The PC broadcasts a request for an IP address
2. **Offer** – The router responds with an available IP address
3. **Request** – The PC requests the offered address
4. **Acknowledge** – The router confirms and leases the address

This process ensures that each PC receives a **unique and valid IP configuration**.

### **Protocols Used**

- **DHCP** – automatic IP address assignment
- **IPv4** – logical addressing
- **ICMP** – connectivity testing using ping
- **Ethernet** – LAN communication

### **Key Commands Used**

#### **Router Configuration**

- ip address – assign IP address to router interface
- ip dhcp excluded-address – reserve IP addresses
- ip dhcp pool – create DHCP pool
- network – define DHCP network
- default-router – specify gateway
- dns-server – define DNS server
- no shutdown – enable interfaces

#### **Verification Commands**

- show ip dhcp binding
- show ip dhcp pool
- ipconfig /all (on PCs)

- ping

### **Traffic Flow and Verification**

Once DHCP is configured:

- All PCs automatically receive IP addresses from the router
- PCs can successfully ping the default gateway
- PCs can communicate with each other within the LAN

This confirms that DHCP is functioning correctly.