

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.