HSRP (HOT STANDBY ROUTER PROTOCOL) DESSCRIPTION

This lab demonstrates the implementation of **Hot Standby Router Protocol (HSRP)** to provide **default gateway redundancy** for hosts in a VLAN-based network. HSRP ensures **high availability** by allowing multiple routers to share a **virtual IP address**, which hosts use as their default gateway.

If the active router fails, the standby router automatically takes over without requiring any changes on the end devices.

Network Topology Overview

The topology consists of:

- **Two routers** configured for HSRP
    - Router1 → **Active Router**
    - Router2 → **Standby Router**
- **One Layer 2 switch** for VLAN connectivity
- **Four PCs**, divided into two VLANs
- **Two VLAN-based LANs**, each with its own virtual gateway

Both routers are connected to the switch, allowing them to participate in HSRP for multiple VLANs.

VLAN and IP Addressing Scheme

VLAN 10 – User Network

Device	**IP Address**
PC1	192.168.10.10
PC2	192.168.10.11
VLAN 10 Network	192.168.10.0/24
HSRP Virtual Gateway	**192.168.10.1**

VLAN 20 – User Network

Device	**IP Address**

PC3	192.168.20.10
PC4	192.168.20.11
VLAN 20 Network	192.168.20.0/24
HSRP Virtual Gateway	**192.168.20.1**

Default Gateway Design (HSRP)

Instead of pointing PCs to a physical router IP, **all PCs use the HSRP virtual IP** as their default gateway:

- VLAN 10 → 192.168.10.1
- VLAN 20 → 192.168.20.1

This allows seamless failover between routers.

HSRP Operation Explanation

Roles

- **Active Router**
    - Forwards traffic for the virtual IP
    - Owns the virtual MAC address
- **Standby Router**
    - Monitors the active router
    - Takes over immediately if the active router fails

HSRP routers exchange **hello messages** to maintain awareness of each other's state.

VLAN Interfacing (Router-on-a-Stick)

Each router uses **subinterfaces** to support multiple VLANs:

- One subinterface per VLAN
- 802.1Q encapsulation used
- HSRP configured independently on each VLAN interface

This allows:

- Logical separation of traffic

- Redundant gateways per VLAN

Traffic Flow Example

Normal Operation

1. PC1 (VLAN 10) sends traffic to its default gateway 192.168.10.1
2. The **active router** receives and forwards the packet
3. The standby router remains idle but ready

Failover Scenario

1. Active router goes offline
2. Standby router detects missing HSRP hellos
3. Standby router becomes **Active**
4. Virtual IP and MAC move instantly
5. PCs continue communication **without interruption**

No reconfiguration is required on the PCs.

Protocols and Technologies Used

- **HSRP** – Gateway redundancy
- **VLANs (802.1Q)** – Network segmentation
- **IPv4** – Logical addressing
- **Ethernet** – Layer 2 communication
- **ICMP** – Connectivity testing

Verification and Testing

To confirm correct operation:

- Ping between PCs in the same VLAN
- Ping across VLANs (if inter-VLAN routing is enabled)
- Shut down the active router interface
- Observe uninterrupted connectivity
- Check HSRP state transitions

Expected result:

- One router shows **Active**
- The other shows **Standby**
- Virtual IP remains reachable