## Problem Statement: Routing Protocol Demonstration for Multi-Office Network

## **Background:**

You are the lead network engineer at a medium-sized organization expanding its operations across multiple office locations. Efficient inter-office communication and seamless data transfer require a robust routing protocol setup between separate local networks. To demonstrate and validate these capabilities, the organization needs a simulated network using Cisco Packet Tracer, showcasing both RIP version 1 and RIP version 2 in action.

## **Scenario:**

The organization is operating from three branches, each with its dedicated LAN and connected router. These offices need to communicate securely with each other for file sharing, VoIP, and collaborative work. To enable dynamic path selection and effortless expansion, RIP (Routing Information Protocol) will be used as the interior gateway protocol. The demo network topology includes three routers, switches, and host PCs, with both RIP v1 and v2 configurations for educational and operational comparison.

## **Network Requirements:**

1. Inter-Office Routing:
   * Each router must be configured to route traffic between local PCs and remote offices via dynamic routing.
   * Use RIP v1 and RIP v2 on respective routers to illustrate protocol differences and compatibility.
2. LAN Segmentation:
   * Each office has a unique IP subnet, connected to a local switch and hosts (PCs).
   * All offices must be able to communicate with one another (end-to-end ping).
3. Routing Protocol Features:
   * Demonstrate RIP v1’s classful routing and lack of subnet support.
   * Demonstrate RIP v2’s classless routing and support for subnetting.
   * Configure RIP v2 with authentication (optional, for deeper understanding).
4. Connectivity Validation:
   * Ensure full connectivity between all LAN segments after configuring RIP.
   * Verify route propagation and convergence via routing tables.
5. Testing and Analysis:
   * Compare network behavior under both RIP versions (route advertisements, subnet support, convergence).
   * Provide evidence of successful communication (ping tests) between PCs across the topology.

## **Task:**

Using the provided Cisco Packet Tracer topology, perform the following steps:

1. Configure Routers for Dynamic Routing:
   * Assign appropriate IP addresses to each router interface as per the topology.
   * Configure RIP v1 on Router0 and Router1, RIP v2 on Router2.
   * Enable RIP across relevant networks, ensuring proper distribution.
2. Set Up Local Area Networks:
   * Assign IP addresses to PCs, switches, and router interfaces per subnet specifications.
   * Test internal LAN connectivity.
3. Implement Routing Protocols:
   * Configure RIP v1 with default settings.
   * Configure RIP v2, ensuring support for variable-length subnet masks (VLSM).
   * If required, add RIP v2 authentication.
4. Connectivity Verification:
   * Use ping and traceroute from each PC to verify inter-office communication.
   * Document routing tables before and after enabling RIP to show protocol effect.
5. Demonstrate Key Differences:
   * Identify and record protocol differences in network behavior, routing tables, and communications between hosts on different subnets.

## **Expected Outcome:**

By completion, the demonstration network should show fully dynamic routing with RIP v1 and v2, allowing all PCs to communicate across offices. Routing tables must reflect correct path propagation, evidencing protocol properties (classful for RIP v1, classless for RIP v2). The organization will use this demo to evaluate protocol suitability for their growing network and educate staff on dynamic routing best practices.