

# Final Assignment: Multi-Office Network Design

## Scenario:

You are tasked with designing a network for a company that has three offices: **Headquarters (HQ)**, **Branch Office 1**, and **Branch Office 2**. The company requires efficient communication between offices, secure VLAN segmentation, and dynamic routing for optimal traffic flow.

## Requirements:

### 1. Office Layout:

- HQ: Located in City A.
- Branch Office 1: Located in City B.
- Branch Office 2: Located in City C.

### 2. Devices:

- Each office has the following devices:
  - Layer 2 Switches: To connect PCs and provide VLAN segmentation.
  - Layer 3 switches: To connect PCs and provide VLAN segmentation.
  - Routers: To connect offices and enable inter-office communication.
  - PCs: End-user devices in each office.
  - Any Device that will help complete your task

### 3. VLANs:

- Create the following VLANs:
  - VLAN 10: Management (for switches and routers)
  - VLAN 20: Sales
  - VLAN 30: Marketing
  - VLAN 40: IT
  - VLAN 50: Guest (for visitors)

### 4. Trunking:

- Configure trunk links between switches and routers to carry multiple VLANs.
- Use 802.1Q encapsulation for trunking.

### 5. Routing:

- Implement both dynamic and static routing:
  - Static Routing:
    - Set up static routes for default gateways on each router.
    - Ensure proper routing between VLANs.

## **6. Inter-VLAN Communication:**

- Enable communication between VLANs within each office.
- Configure separated interface – connect router with two interfaces to the same switch
- Configure router on a stick – configure sub-interfaces from one router to a switch.

## **7. Security:**

- Secure the network by:
  - Disabling unused ports on switches.
  - Implementing port security (limiting MAC addresses per port).
  - Using strong passwords for device access.

## **8. Documentation:**

- Provide a detailed network diagram showing device placement, VLANs, and routing.
- Include configuration details for each device (interfaces, IP addresses, OSPF settings, etc.).

## **9. BE CREATIVE!**

## **Deliverables:**

### **1. Network Diagram:**

- Visually represent the network layout, including devices, VLANs, and connections.

### **2. Configuration Files:**

- Provide the configuration files for each device (switches and routers).

### **3. Explanation Document:**

- Explain your design choices, including reasons for VLAN segmentation, routing protocols, and security measures.

## **Grading Criteria:**

- Correct implementation of VLANs, Trunking modes, and routing methods and connectivity.
- Successful inter-VLAN communication.
- Proper security measures.
- Clear and concise documentation.
- Deadline punctuality

The deadline for this assignment is 10/07/2025.

Please remember to test your network design thoroughly and choose the appropriate IP address classes wisely to ensure proper functionality.

Good luck with your assignment!

## **לא חובה - עבודת רשות לבית - אין צורך להגיש**

### **Bonus: VoIP VLAN Implementation**

#### **Requirements:**

##### **1. VoIP VLAN:**

- Create a dedicated VLAN for VoIP traffic.
- Assign an appropriate VLAN ID (VLAN 60) for VoIP devices.
- VoIP phones and related equipment (such as VoIP gateways) will be part of this VLAN.

##### **2. Quality of Service (QoS):**

- Implement QoS settings to prioritize VoIP traffic over other data traffic.
- Configure the following QoS parameters:
  - DSCP (Differentiated Services Code Point) values for VoIP packets.
  - Traffic policing to limit non-VoIP traffic during congestion.
  - Traffic shaping to smooth out bursts of VoIP traffic.

##### **3. VLAN Configuration:**

- On the layer 2 switches:
  - Create the VoIP VLAN interface (SVI) with an IP address.
  - Assign switch ports connected to VoIP phones to the VoIP VLAN.
  - Ensure that the VoIP VLAN is allowed on trunk links between switches and routers.

##### **4. Router Configuration:**

- Configure the router interfaces connected to the VoIP VLAN:
  - Assign IP addresses to the router interfaces.
  - Enable routing for the VoIP VLAN.
  - Advertise the VoIP VLAN subnet via OSPFv2.

##### **5. VoIP Phones:**

- Connect VoIP phones to the appropriate switch ports (assigned to the VoIP VLAN).
- Configure VoIP phones with the correct VLAN settings (VLAN ID, voice VLAN, etc.).

##### **6. Testing:**

- Verify VoIP communication:
  - Place test calls between VoIP phones in different offices.
  - Monitor call quality and latency.
  - Ensure that QoS settings are effective.

## **VoIP Deliverables:**

1. **Updated Network Diagram:**
  - Include the VoIP VLAN and its connections to VoIP phones and gateways.
2. **Configuration Files:**
  - Provide the configuration details for switches, routers, and VoIP phones related to the VoIP VLAN.
3. **Explanation Document:**
  - Explain the rationale behind your VoIP design choices.
  - Discuss how QoS ensures reliable VoIP communication.

## **Grading Criteria:**

- Correct implementation of the VoIP VLAN.
- Effective QoS settings for VoIP traffic.
- Successful VoIP communication across offices.
- Clear documentation of VoIP-related configurations.

**Remember to thoroughly test your VoIP setup to ensure seamless communication.**