**Step-by-Step Network Design & Implementation**

**🖧 1. Topology Overview**

**⚙️ Devices:**

* **3x Routers:** Cisco 2911 (R0, R1, R2)
* **1x Multilayer Switch:** Cisco 3650-24PS
* **6x PCs**: 2 per department
* **Fiber Optic Links**: For router interconnections and router-switch uplink

**🔌 2. Topology Layout**

**🛣️ Router-to-Router Transport Networks (Fiber)**

* R0 <--> R1: 10.10.10.0/24
* R1 <--> R2: 20.20.20.0/24
* R2 <--> R0: 30.30.30.0/24

Use GigabitEthernet interfaces (Gig0/0, etc.) with **Fiber optic** connectors.

**🔁 3. Router-to-Switch Connection**

* Connect R0 to the **Multilayer Switch** using **Fiber Optic** (e.g., Gig0/1 on router to Gig1/1 on switch)

**🪪 4. VLAN Configuration on Switch**

bash

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Switch> enable

Switch# configure terminal

Switch(config)# vlan 10

Switch(config-vlan)# name DevOps

Switch(config-vlan)# exit

Switch(config)# vlan 20

Switch(config-vlan)# name Finance

Switch(config-vlan)# exit

Switch(config)# vlan 30

Switch(config-vlan)# name Security

Switch(config-vlan)# exit

**🌐 5. Subinterfaces on Router R0 (Router-on-a-stick)**

bash

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R0> enable

R0# configure terminal

! Subinterface for DevOps

R0(config)# interface Gig0/1.10

R0(config-subif)# encapsulation dot1Q 10

R0(config-subif)# ip address 10.99.10.1 255.255.255.0

R0(config-subif)# exit

! Subinterface for Finance

R0(config)# interface Gig0/1.20

R0(config-subif)# encapsulation dot1Q 20

R0(config-subif)# ip address 10.99.20.1 255.255.255.192

R0(config-subif)# exit

! Subinterface for Security

R0(config)# interface Gig0/1.30

R0(config-subif)# encapsulation dot1Q 30

R0(config-subif)# ip address 10.99.30.1 255.255.255.224

R0(config-subif)# exit

! Trunk the main interface

R0(config)# interface Gig0/1

R0(config-if)# no shutdown

R0(config-if)# exit

**🖥️ 6. PCs Setup**

* **VLAN 10 - DevOps (10.99.10.0/24):**
  + PC1: IP 10.99.10.10, GW 10.99.10.1 (GigabitEthernet)
  + PC2: IP 10.99.10.11, GW 10.99.10.1 (FastEthernet)
* **VLAN 20 - Finance (10.99.20.0/26):**
  + PC3: IP 10.99.20.10, GW 10.99.20.1 (FastEthernet)
  + PC4: IP 10.99.20.11, GW 10.99.20.1 (GigabitEthernet)
* **VLAN 30 - Security (10.99.30.0/27):**
  + PC5: IP 10.99.30.10, GW 10.99.30.1 (GigabitEthernet)
  + PC6: IP 10.99.30.11, GW 10.99.30.1 (FastEthernet)

Use **Multilayer Switch** interface range commands to assign ports to VLANs:

bash

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Switch(config)# interface range fa0/1 - 2

Switch(config-if-range)# switchport mode access

Switch(config-if-range)# switchport access vlan 10

Switch(config-if-range)# exit

...

**🔁 7. Configure RIP on All Routers**

bash

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Router(config)# router rip

Router(config-router)# version 2

Router(config-router)# no auto-summary

Router(config-router)# network 10.0.0.0

Router(config-router)# exit

Do this on all three routers (R0, R1, R2) — assuming all your subnets fall under 10.0.0.0/8.

**📶 8. Test Connectivity**

On each PC:

* Open **Command Prompt**
* Run: ping to test
  + Other PCs
  + Transport subnets
  + Default gateway

**✅ Final Checklist**

| **Feature** | **Configured** |
| --- | --- |
| VLANs and Subinterfaces | ✅ |
| RIP on Routers | ✅ |
| Gigabit vs FastEthernet | ✅ |
| Ping between PCs/Subnets | ✅ |
| Fiber optic transport | ✅ |