Design and Implement a Small Office Network

# In Our Office🡪the requirements during implementation are:-

# One [router](https://gurutechnetworks.otombenard.com/assetsProject/project2) and one [switch](https://gurutechnetworks.otombenard.com/assetsProject/project2) to be used.

# 4 Teams (Admin, HR,Accounts and IT ).

# Each department is required to be in different VIANS.

# Each Team (department) is required to have a wireless network for the users.

# Host devices in the network are required to obtain IPv4 address automatically.

# Devices in all the departments are required to communicate with each other.

## 

# Network Requirements: -Number of Users -Types of Devices - Internet Connectivity Needs

|  |  |  |  |
| --- | --- | --- | --- |
| User | User-Devices | Network-Devices | Peripheral-Devices |
| AdminTeam: 3 users | PCs:4 | Router: 1 | Network Printer: 4 |
| HRTeam: 3 users | Laptops: 4 | Switch: 1 |  |
| ITTeam: 3 users | Smartphones : 3 | Access Points: 4 |  |
| AccountsTeam:4 | Tablets : 2 |  |  |

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## Topology Diagram: A computer screen shot of a computer network Description automatically generated

## IP Addressing Scheme

The IP addressing scheme for the departments is as follows:  
- Base Network: 192.168.1.0/24  
  
🡪AdminTeam (VLAN 10):  
 - Network Address: 192.168.1.0/26  
 - Usable IP Range: 192.168.1.1 - 192.168.1.62  
 - Broadcast Address: 192.168.1.63  
  
🡪HRTeam (VLAN 20):  
 - Network Address: 192.168.1.64/26  
 - Usable IP Range: 192.168.1.65 - 192.168.1.126  
 - Broadcast Address: 192.168.1.127  
  
🡪AccountsTeam (VLAN 30):  
 - Network Address: 192.168.1.128/26  
 - Usable IP Range: 192.168.1.129 - 192.168.1.190  
 - Broadcast Address: 192.168.1.191  
  
🡪ITTeam (VLAN 40):  
 - Network Address: 192.168.1.129/26  
 - Usable IP Range: 192.168.1.192 - 192.168.1.223  
 - Broadcast Address: 192.168.1.224

For simplicity, we will use the **192.168.1.0/24** network (a common private IP range). Here’s how the IPs will be allocated:

1. **Router**:
   * LAN IP: **192.168.1.1** (default gateway for all devices)
2. **Switch**:
   * Not required to have an IP for basic functionality.
3. **PCs**:
   * Assign static IPs = **192.168.1.2**.  
      = **192.168.1.67**.  
      = **192.168.1.131**.  
      = **192.168.1.194**.
4. **Printers**:
   * Assign IPs **192.168.1.3** , **192.168.1.65 , 192.168.1.129 , 192.168.1.93** .
5. **Wireless Access Point (WAP)**:
6. **Subnet Mask**: All devices will use **255.255.255.0**.
7. **Default Gateway**: **192.168.1.**

## Device List

The following Cisco devices will be used in the network:  
🡪Router: Cisco 1811  
🡪Switch: Cisco 2950  
🡪Wireless Access Point: AP-PT  
  
  
  
  
  
  
  
**Network Overview:**

**🡪VLAN 10 (Admin Team):**

**D**evices include PCs, a laptop, a smartphone, printers, and an access point.

**IP range:** 192.168.1.0/26 (subnet mask 255.255.255.192).

**🡪VLAN 20 (HR Team):**

**D**evices include a PC, laptop, smartphone, printers, and an access point**.**

**IP range:** 192.168.1.64/26 (subnet mask 255.255.255.192).

**🡪VLAN 30 (Accounts Team):**

**D**evices include PCs, a tablet, laptops, smartphones, printers, and an access point.

**IP range:** 192.168.1.128/26 (subnet mask 255.255.255.192).

**🡪VLAN 40 (IT Team):**

**D**evices include PCs, a tablet, laptops, printers, and an access point.

**IP range:** 192.168.1.192/26 (subnet mask 255.255.255.192).

**Devices Setup:**

**🡪Central Switch (Cisco 2960):** All VLANs are connected to this core switch.

**🡪Router (2911 Router):** The router handles the internet connection and routing between VLANs.

**🡪Access Points (APs):** Each VLAN has its dedicated wireless access point for device connectivity.

**🡪WiFi Configuration:**

Each team has its specific WiFi SSID (Admin, HR, Accounts, IT), with passwords such as:

**Admin WiFi:** admin@123

**HR WiFi:** hrteam@123

**Accounts WiFi:** account@123

**IT WiFi:** itteam@123

**🡪 Printer and Smartphone Access:** Each VLAN has dedicated printers and smartphones.

**The network uses Class C private IP addressing and VLANs to segment traffic, improve security, and manage bandwidth efficiently. Each VLAN corresponds to a different department, ensuring isolation between teams.**

**Inter-VLAN Routing Configuration**

* Inter-VLAN routing is implemented using a router-on-a-stick setup, where each VLAN is assigned a sub-interface on the router’s LAN port.

**DHCP Configuration**

* Each VLAN has a dedicated DHCP pool on the router to ensure devices automatically obtain IP addresses.

**Connectivity Verification and Troubleshooting Network Connectivity Testing:-**

1. **Ping Test:**
   * **Verifies IP connectivity between VLANs and ensures devices are reachable.**
   * **Example command (from VLAN 10 PC to VLAN 20 PC):**

**ping 192.168.1.65**

1. **Traceroute Test:**
   * **Verifies the routing path taken between two devices.**
   * **Example command (from VLAN 10 PC to VLAN 30 PC):**

**traceroute 192.168.1.129**

**Sample Test Results**

* **Ping Results:**
  + **Ping from Admin PC (192.168.1.2) to HR PC (192.168.1.67): Success**
  + **Ping from IT PC (192.168.1.194) to Accounts PC (192.168.1.131): Success**
* **Traceroute Results:**
  + **Traceroute from Admin PC to Accounts PC shows packets passing through the router’s 192.168.1.1 interface.**

**Troubleshooting Report**

**Issue 1:**

* **Problem: Devices in different VLANs cannot communicate.**
* **Solution:**
  + **Verified that inter-VLAN routing was enabled on the router.**
  + **Ensured that the trunk port between the router and switch was properly configured.**

**Issue 2:**

* **Problem: Devices are not receiving IP addresses via DHCP.**
* **Solution:**
  + **Confirmed the DHCP pools were correctly configured.**
  + **Checked that router interfaces were active and connected to the correct VLANs.**