**Network Design Project Report**

**1. Introduction**

This report documents the configuration and design of a small enterprise LAN utilizing inter-VLAN routing with a Cisco router and switch. The network is segmented into three VLANs to separate broadcast domains and improve security and manageability. The following sections provide an overview of the network design, device configurations, VLAN distribution, and the routing scheme.

**2. Network Topology Overview**

**Devices Used:**

* **Router:** Cisco 2911 (Router0)
* **Switch:** Cisco (Switch0)

**VLANs:**

* **VLAN 10:** Data Department
* **VLAN 20:** Accounting Department
* **VLAN 30:** Management Department

**Connection Overview:**

* The switch's port Fa0/1 is configured as a trunk and connects to the router's GigabitEthernet0/0.
* User devices are connected to the respective VLAN access ports on the switch.

**3. VLAN Design**

**VLAN Assignment on Switch:**

|  |  |  |
| --- | --- | --- |
| VLAN | Ports Assigned | Department |
| 10 | Fa0/2 - Fa0/4 | Data |
| 20 | Fa0/5 - Fa0/7 | Accounting |
| 30 | Fa0/8 - Fa0/10 | Management |

* Access ports are clearly assigned to each VLAN, isolating traffic between departments.
* Trunk port (Fa0/1) carries all VLANs between the switch and router.

**4. IP Addressing Scheme**

* **VLAN 10:**
  + Subnet: 192.168.1.0/26 (Subnet Mask: 255.255.255.192)
  + Router Sub-interface: 192.168.1.1
* **VLAN 20:**
  + Subnet: 192.168.1.64/26 (Subnet Mask: 255.255.255.192)
  + Router Sub-interface: 192.168.1.65
* **VLAN 30:**
  + Subnet: 192.168.1.128/26 (Subnet Mask: 255.255.255.192)
  + Router Sub-interface: 192.168.1.129

**5. Router Configuration (Router-on-a-Stick)**

The router uses its GigabitEthernet0/0 interface with sub-interfaces for each VLAN:

* **Encapsulation dot1Q** allows the router to differentiate traffic for each VLAN carried over the trunk.
* Each sub-interface is assigned the corresponding gateway IP for its VLAN.

**Relevant Configuration:**

interface GigabitEthernet0/0.10  
 encapsulation dot1Q 10  
 ip address 192.168.1.1 255.255.255.192  
  
interface GigabitEthernet0/0.20  
 encapsulation dot1Q 20  
 ip address 192.168.1.65 255.255.255.192  
  
interface GigabitEthernet0/0.30  
 encapsulation dot1Q 30  
 ip address 192.168.1.129 255.255.255.192

**6. Switch Configuration**

* **Trunk Port:** Fa0/1 is set as a trunk to allow VLAN traffic between switch and router.
* **Access Ports:** Other FastEthernet ports are set to specific VLANs to segregate department traffic.

**Sample Configuration:**

interface FastEthernet0/1  
 switchport mode trunk  
  
interface FastEthernet0/2  
 switchport access vlan 10  
 switchport mode access  
  
interface FastEthernet0/5  
 switchport access vlan 20  
 switchport mode access  
  
interface FastEthernet0/8  
 switchport access vlan 30  
 switchport mode access

**7. Spanning Tree Protocol**

* **PVST (Per VLAN Spanning Tree)** is enabled by default, ensuring loop-free and redundantly connected Layer 2 networks.

**8. Security and Management**

* No IP address or configuration on default VLAN1 (“no ip address,” “shutdown”) to ensure it is not used for management traffic.
* Basic login configuration for console and VTY (telnet/SSH) lines.

**9. Summary / Conclusion**

This network design implements a logical and secure segmentation of network resources using VLANs, enhancing traffic management and security. Inter-VLAN routing is accomplished efficiently through a router-on-a-stick configuration. The switch is configured with clear access and trunk ports to direct traffic as designed.

**Key Achievements:**

* Proper isolation and segmentation between departments.
* Efficient inter-VLAN communication via router sub-interfaces.
* Scalable and secure LAN infrastructure.