VLAN & Trunk Port Network Topology Documentation

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1. Project Title
Configuring VLANs and Trunk Ports with Inter-VLAN Routing and Security

2. Objective
The objective of this project is to implement network segmentation using VLANs, configure trunk ports to enable inter-VLAN communication, and apply essential network security best practices within an enterprise environment. The configuration is implemented using Cisco Packet Tracer for simulation and demonstration.

3. Network Topology Overview
Devices Used:
- Router (R1) – Inter-VLAN routing (Router-on-a-Stick)
- Switch 1 (Layer 3) – VTP Server
- Switch 2 (Layer 2) – VTP Client 1
- Switch 3 (Layer 2) – VTP Client 2
- 6 PCs – 3 PCs per VLAN

VLAN Assignments:

VLAN ID	Department	Subnet	Devices
10	Admin	192.168.10.0/24	Admin 1, 2, 3
20	Guest	192.168.20.0/24	Guest 1, 2, 3

4. Configuration Summary
Switch Configuration:
- VTP domain configured with Switch 1 as VTP Server
- Switches 2 and 3 set as VTP Clients
- VLANs 10 and 20 created and propagated via VTP
- Access ports assigned to their respective VLANs

- Trunk port (G0/0/3) configured for inter-switch/router communication

Router Configuration (R1):
- Router-on-a-Stick configuration using encapsulation dot1Q on subinterfaces
- Each VLAN has its own gateway IP on the router

PC Configuration:
- Static IPs assigned to each PC within their VLAN subnet
- Gateway set to the respective router subinterface

5. Security Implementation

Security Measure	Purpose
Port Security	Limits access to one MAC per port
Disabled Unused Ports	Prevents unauthorized physical access
Trunk Port Hardening	Prevents VLAN hopping attacks

6. Trunk Port Configuration

```
interface G0/0/3
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport trunk allowed vlan 10,20
 switchport nonegotiate
```

7. Inter-VLAN Routing (Router-on-a-Stick)

```
interface GigabitEthernet0/0.10
 encapsulation dot1Q 10
 ip address 192.168.10.1 255.255.255.0

interface GigabitEthernet0/0.20
 encapsulation dot1Q 20
 ip address 192.168.20.1 255.255.255.0
```

9. Testing and Validation

Connectivity:
- All PCs can successfully ping their default gateway.
- Devices in different VLANs can communicate through the router.

Security Checks:
- Unused ports were shut down.
- MAC address restrictions were enforced.
- Trunk ports restricted to only VLANs 10 and 20.

10. Conclusion

The network was successfully segmented using VLANs for better traffic management and security. Inter-VLAN routing was achieved using the Router-on-a-Stick method. Security policies such as port security, trunk hardening, and shutdown of unused ports were implemented to secure the network from unauthorized access and VLAN hopping attacks.