VLAN Network Configuration Guide for Packet Tracer

Network Overview

VLANs:

- VLAN 10 - Admin (192.168.10.0/24)
- VLAN 20 - Academics (192.168.20.0/24)
- VLAN 30 - Student Services (192.168.30.0/24)

WAN Link: 192.168.1.0/30 (between Router and L3 Switch) **ISP Link:** 203.0.113.0/30 (simulated internet connection)

Step 1: Add Devices to Packet Tracer

Devices Needed:

1. **1x Router** (2911 or 2901)
2. **1x Layer 3 Switch** (3560-24PS or Multilayer Switch)
3. **3x Layer 2 Switches** (2960-24TT)
4. **6x PCs** (2 per VLAN)
5. **1x Cloud** (to simulate internet - optional)

Physical Connections:

- Router G0/0 → Internet Cloud
- Router G0/1 → L3 Switch G0/1
- L3 Switch F0/1 → L2 Switch1 F0/24 (Admin)
- L3 Switch F0/2 → L2 Switch2 F0/24 (Academics)
- L3 Switch F0/3 → L2 Switch3 F0/24 (Student Services)
- Connect 2 PCs to each L2 Switch (use F0/1, F0/2)

Step 2: Configure Layer 3 Switch (Core Switch)

Enable IP Routing

```
enable
configure terminal
hostname CoreSwitch
ip routing
```

Create VLANs

```
vlan 10
name Admin
exit

vlan 20
name Academics
exit

vlan 30
name Student-Services
exit
```

Configure Trunk Ports to Layer 2 Switches

```
interface range fastEthernet 0/1-3
switchport trunk encapsulation dot1q
switchport mode trunk
switchport trunk allowed vlan 10,20,30
no shutdown
exit
```

Configure VLAN Interfaces (SVIs) for Inter-VLAN Routing

```
interface vlan 10
ip address 192.168.10.1 255.255.255.0
description Admin-Gateway
no shutdown
exit

interface vlan 20
ip address 192.168.20.1 255.255.255.0
description Academics-Gateway
no shutdown
exit

interface vlan 30
ip address 192.168.30.1 255.255.255.0
description Student-Services-Gateway
no shutdown
exit
```

Configure Routed Port to Router

```
interface gigabitEthernet 0/1
no switchport
ip address 192.168.1.2 255.255.255.252
description Link-to-Router
no shutdown
exit
```

Configure OSPF

```
router ospf 1
router-id 1.1.1.1
network 192.168.10.0 0.0.0.255 area 0
network 192.168.20.0 0.0.0.255 area 0
network 192.168.30.0 0.0.0.255 area 0
network 192.168.1.0 0.0.0.3 area 0
exit
```

Add Default Route

```
ip route 0.0.0.0 0.0.0.0 192.168.1.1
```

Save Configuration

```
end
write memory
```

Step 3: Configure Layer 2 Switches

Layer 2 Switch 1 (Admin VLAN)

```
enable
configure terminal
hostname AdminSwitch

vlan 10
name Admin
exit

interface fastEthernet 0/24
switchport mode trunk
switchport trunk allowed vlan 10
```

```
no shutdown
exit

interface range fastEthernet 0/1-2
switchport mode access
switchport access vlan 10
no shutdown
exit

end
write memory
```

Layer 2 Switch 2 (Academics VLAN)

```
enable
configure terminal
hostname AcademicsSwitch

vlan 20
name Academics
exit

interface fastEthernet 0/24
switchport mode trunk
switchport trunk allowed vlan 20
no shutdown
exit

interface range fastEthernet 0/1-2
switchport mode access
switchport access vlan 20
no shutdown
exit

end
write memory
```

Layer 2 Switch 3 (Student Services VLAN)

```
enable
configure terminal
hostname StudentServicesSwitch

vlan 30
name Student-Services
exit

```

```
interface fastEthernet 0/24
switchport mode trunk
switchport trunk allowed vlan 30
no shutdown
exit

interface range fastEthernet 0/1-2
switchport mode access
switchport access vlan 30
no shutdown
exit

end
write memory
```

Step 4: Configure Router (ISP Connection)

```
enable
configure terminal
hostname ISP-Router

interface gigabitEthernet 0/0
ip address 203.0.113.1 255.255.255.252
description Internet-Simulation
no shutdown
exit

interface gigabitEthernet 0/1
ip address 192.168.1.1 255.255.255.252
description Link-to-CoreSwitch
no shutdown
exit
```

Configure OSPF on Router

```
router ospf 1
router-id 2.2.2.2
network 192.168.1.0 0.0.0.3 area 0
default-information originate
exit
```

Add Default Route (simulating internet)

```
ip route 0.0.0.0 0.0.0.0 203.0.113.2
```

Configure NAT (for internet access simulation)

```
access-list 1 permit 192.168.0.0 0.0.255.255

ip nat inside source list 1 interface gigabitEthernet 0/0 overload

interface gigabitEthernet 0/1
ip nat inside
exit

interface gigabitEthernet 0/0
ip nat outside
exit

end
write memory
```

Step 5: Configure PCs

Admin VLAN (VLAN 10)

PC1:

- IP Address: 192.168.10.10
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.10.1
- DNS Server: 8.8.8.8

PC2:

- IP Address: 192.168.10.11
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.10.1
- DNS Server: 8.8.8.8

Academics VLAN (VLAN 20)

PC3:

- IP Address: 192.168.20.10
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.20.1
- DNS Server: 8.8.8.8

PC4:

- IP Address: 192.168.20.11
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.20.1
- DNS Server: 8.8.8.8

Student Services VLAN (VLAN 30)

PC5:

- IP Address: 192.168.30.10
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.30.1
- DNS Server: 8.8.8.8

PC6:

- IP Address: 192.168.30.11
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.30.1
- DNS Server: 8.8.8.8

Step 6: Configure Internet Cloud (Optional)

If using a Cloud device:

1. Click on the Cloud
2. Go to Config tab
3. Add connection to Router G0/0
4. Configure as needed for simulation

Alternative: Use a Server with IP 8.8.8.8 connected to Router G0/0 network for testing

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Step 7: Verification Commands

On Layer 3 Switch:

```
show vlan brief
show ip interface brief
show ip route
```

```
show ip ospf neighbor
show ip ospf database
```

On Router:

```
show ip interface brief
show ip route
show ip ospf neighbor
show ip nat translations
```

On Layer 2 Switches:

```
show vlan brief
show interfaces trunk
```

Step 8: Testing Connectivity

Test Inter-VLAN Routing:

1. From PC1 (192.168.10.10), ping:
   - PC3 (192.168.20.10) - Should work
   - PC5 (192.168.30.10) - Should work
2. From PC3 (192.168.20.10), ping:
   - PC1 (192.168.10.10) - Should work
   - PC6 (192.168.30.11) - Should work

Test OSPF and External Connectivity:

1. From any PC, ping:
   - 192.168.1.1 (Router interface) - Should work
   - 203.0.113.1 (Simulated internet) - Should work
   - 8.8.8.8 (if configured) - Should work through NAT

Troubleshooting:

- **No inter-VLAN communication:** Check SVI configuration and trunk ports
- **No OSPF neighbors:** Verify network statements and area configuration
- **No internet access:** Check NAT configuration and default routes
- **VLAN not working:** Verify VLAN creation and port assignments

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Network Summary

VLAN	Name	Subnet	Gateway	PCs
10	Admin	192.168.10.0/24	192.168.10.1	.10, .11
20	Academics	192.168.20.0/24	192.168.20.1	.10, .11
30	Student-Services	192.168.30.0/24	192.168.30.1	.10, .11

WAN Link: 192.168.1.0/30 (L3 Switch: .2, Router: .1) **ISP Simulation:** 203.0.113.0/30

Routing Protocol: OSPF Area 0 **NAT:** Configured on Router for internet simulation

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Key Learning Points

1. **VLANs** segment broadcast domains and improve security
2. **Layer 3 Switch** provides fast inter-VLAN routing using SVIs
3. **OSPF** enables dynamic routing between networks
4. **Trunk links** carry multiple VLANs between switches
5. **NAT** translates private IPs for internet access
6. **Default routes** provide path to external networks

Your network is now configured for inter-VLAN communication with OSPF routing and simulated internet connectivity!