

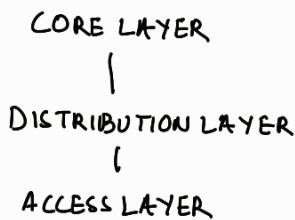
# CNC Project 1: University Network Design & Implementation

## Overview

Here, we are attempting to design a campus-wide university network, with technologies like:

- \* VLAN Segmentation
- \* Inter-VLAN Routing
- \* Servers (DHCP, DNS, Web, Mail, FTP)
- \* OSPF routing
- \* NAT for internet
- \* STP + EtherChannel
- \* ACL security.

## 3-Tier Hierarchical Model



## Routing Technologies

- \* Inter-VLAN Routing
  - Implemented using SVIs on Core switch
  - Allows communication between VLANs
- \* OSPF (Open Shortest Path First)
  - Dynamic routing protocol
  - Area 0 (backbone)
  - Faster convergence than RIP
- \* NAT (PAT)
  - Converts private IPs to Public IP
  - Allows Internet access
  - Implemented on Edge Routers.

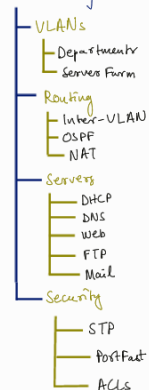
## STP & Redundancy

- \* STP (Spanning tree Protocol)
  - Prevents Layer-2 loops
  - Core switch configured as Root Bridge
  - Backup links kept in blocking state
- \* PortFast
  - Reduces connection delay.

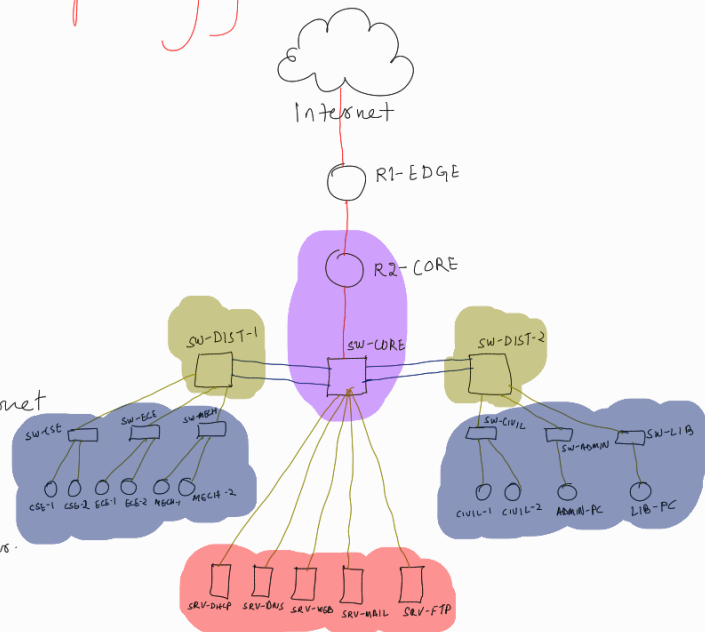
## \* ACLs (Access Control List)

- Students → Admin ✗
- Students → Servers ✗
- Admin → All VLANs ✓

## University Network



## Topology



## Devices:

- \* Edge Routers (R1)
  - Connects campus network to Internet
  - Performs NAT/PAT
  - Acts as Internet Gateway
- \* Core Router (R2)
  - Connects core switch to edge routers.
  - Runs OSPF
  - Handles backbone routing
- \* Core Switch (Layer 3)
  - Performs Inter-VLAN routing
  - Hosts SVIs
  - Acts as network backbone
- \* Distribution Switches
  - Connects access switches to core
  - Load balancing
  - STP redundancy
- \* Access Switches
  - Connects PCs and end devices
  - VLAN access ports
  - PortFast enabled
- \* Servers
  - Provide centralized services
  - Located in Server VLAN (70)

## Subnet Table

VLAN ID	VLAN Name	Network Address	Default Gateway	Broadcast Address
10	CSE	192.168.10.0	192.168.10.1	192.168.10.255
20	ECE	192.168.20.0	192.168.20.1	192.168.20.255
30	MECH	192.168.30.0	192.168.30.1	192.168.30.255
40	CIVIL	192.168.40.0	192.168.40.1	192.168.40.255
50	ADMIN	192.168.50.0	192.168.50.1	192.168.50.255
60	LIB	192.168.60.0	192.168.60.1	192.168.60.255
70	SERVER	192.168.70.0	192.168.70.1	192.168.70.255

## Servers IP Allocation

Server	IP Address	VLAN
SRV-DHCP	192.168.70.2	70
SRV-DNS	192.168.70.3	70
SRV-WEB	192.168.70.4	70
SRV-MAIL	192.168.70.5	70
SRV-FTP	192.168.70.6	70

## Server Configuration

- \* DHCP Servers
  - Assigns IP addresses dynamic
  - Uses DHCP Relay (ip helper-address)
  - One pool per VLAN
- \* DNS Server
  - Resolves hostnames to IP addresses
  - Domain used: univ.com
- \* Web server
  - Hosts University Intranet
  - Accessible via web.univ.com
- \* FTP Servers
  - Centralized file sharing
  - User-based authentication
- \* Mail Servers
  - SMTP + POP3
  - Internal email communication
  - Users: admin@univ.com, student@univ.com

## DNS Records:

No.	Name	Type	Detail
0	dhcp.univ.com	A Record	192.168.70.2
1	dns.univ.com	A Record	192.168.70.3
2	ftp.univ.com	A Record	192.168.70.6
3	mail.univ.com	A Record	192.168.70.5
4	web.univ.com	A Record	192.168.70.4

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