SECURE NETWORK DESIGN FOR INSTITUTION

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INTRODUCTION

The college Network Scenario is about designing a topology of a network (Local Area Network) for institution (KLE Technological University) in which various end devices of different departments are set up so that they can interact and communicate with each other by interchanging data.

With the advancement in IoT devices, the network also proposes a smart classroom and garden setup with end devices such as light, fan, webcam, sprinkler and water level monitor.

OBJECTIVES

1. Enhance network capabilities.
2. Increase flexibility
3. Data centres with good security features and support

MAJOR DESIGN AND FUNCTIONAL AREA

The proposed architecture comprises of IP based switches that remains as Access Point to LAN-based (ethernet) as well as Wi-Fi based connectivity. These switches provide SNMP support. IP based switches are used because:

1. The inter VLAN routing feature is supported on both IP base and IP services, which are basically Layer 3 switches.
2. The IP base feature set includes advanced QOS, rate limiting, and basic static and routing information protocol (RIP) functions.
3. The IP services provides features, which includes advanced hardware-based IP unicast and IP multicast routing.

NETWORK DEVICES

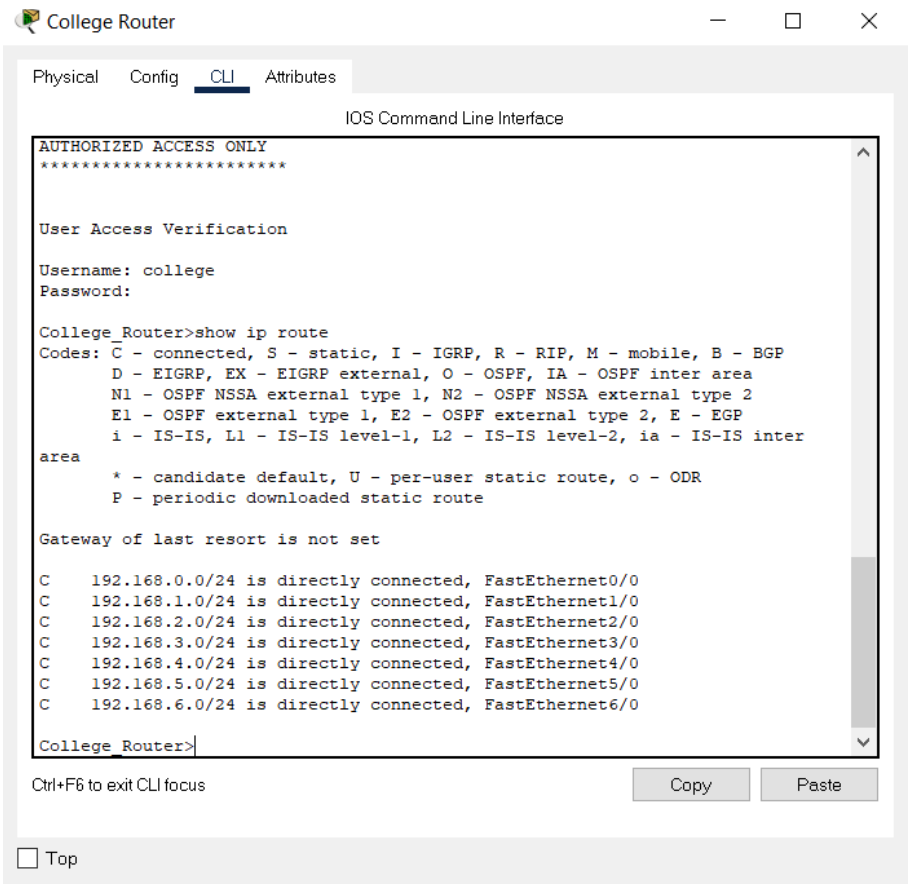
1. The basis of LAN core is Cisco catalyst 2960-X series switches, equipped with Virtual Switching System (VSS), combined with data transmission ports at 10Gbps bandwidth capacity.
2. Switches create a platform for additional services, such as firewall, intrusion prevention system, arrangement of protected VPN channels and acceleration of SSL connections.
3. Cisco unified computing system solution simplifies architecture and significantly reduces number of devices, to connect by wires and supply electricity.

IP ADDRESSING

Department	Address
Infocell	192.168.0.0/24
Administrative Block	192.168.1.0/24
SoCSE	192.168.2.0/24 192.168.3.0/24
Library	192.168.4.0/24
SoECE	192.168.5.0/24 192.168.6.0/24 192.168.8.0/24
Garden	192.168.9.0/24

ROUTING PROTOCOL

Routing Information Protocol is a dynamic routing protocol which uses hop count as a routing metric to find best path between source and destination network. It works on the Application Layer of OSI model.



NETWORK DESIGN

1. Configuring CLI of Routers and Switches

Commands	Action
conf t	Enter global configuration mode
hostname	Set hostname for the switch
enable secret password	Enable secret password for a privilege level
line con 0	Connect switch through medium console port
login local	Authenticate users to vty lines
line vty 0 15	Control inbound Telnet connections of port 0-15
service password-encryption	Encrypt passwords in config file
banner motd #	Configure message for unauthorized user
copy run start	Overwrite previous config file in NVRAM

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2. Configuring Router interfaces with IP Address

Command	Action
int fn/n	Select FastEthernet port on interface n
ip add x.y.t.z a.b.c.d	Assign IP address and subnet mast to the selected port
no shut	Enable the new interface
copy run start	Overwrite previous config file in NVRAM

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3. Configuring switch reader with IP Address

Command	Action
int vlan 1	Act as switch's NOC to send IP packets
ip add x.y.t.z a.b.c.d	Configure IP address and subnet mask under vlan 1
no shut	Enable the interface
ip default-gateway x.y.t.1 a.b.c.d	Default IP gateway address global configuration

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4. IP Configuration of End devices

Configuration	Address
IPv4 Address	192.168.x.y
Subnet Mask	255.255.255.0
Default gateway	192.168.x
DNS Server	192.168.0.5

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5. Configuring Server

E-mail server

Configuration	Action
SMTP and POP3 Service	ON
Domain name	Set kletech.ac.in as e-mail domain
User login details	Register username and password

DNS server

Configuration	Action
DNS service	ON
Name and type of record	Kletech.ac.in
Address	192.168.0.5

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6. Configuring IoT Devices with server

AAA server

Configuration	Action
AAA service	ON
Client registration	Client name, IP, Radius Server type, key
User setup	Username, password

IoT server

Configuration	Action
IoT service	ON
Registration	Username, password

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7. Configuring Wireless connectivity

Wireless Router

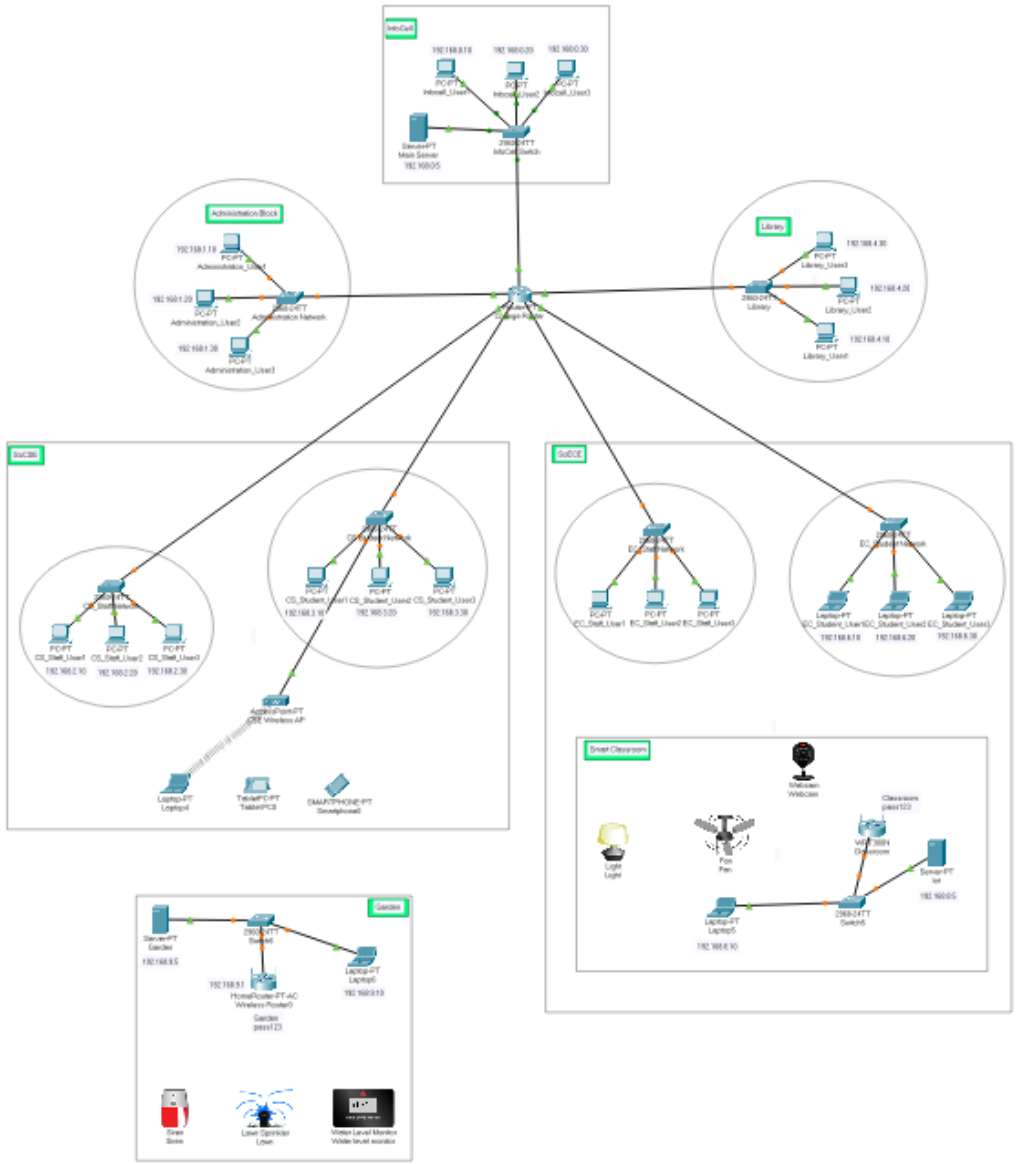
Configuration	Action
Router IP Address	Configure IP Address of router x.y.t.z
Network SSID	Set router's SSID
Wireless security	WPA2 enterprise, AES encrypted, radius server, shared secret key

IoT device

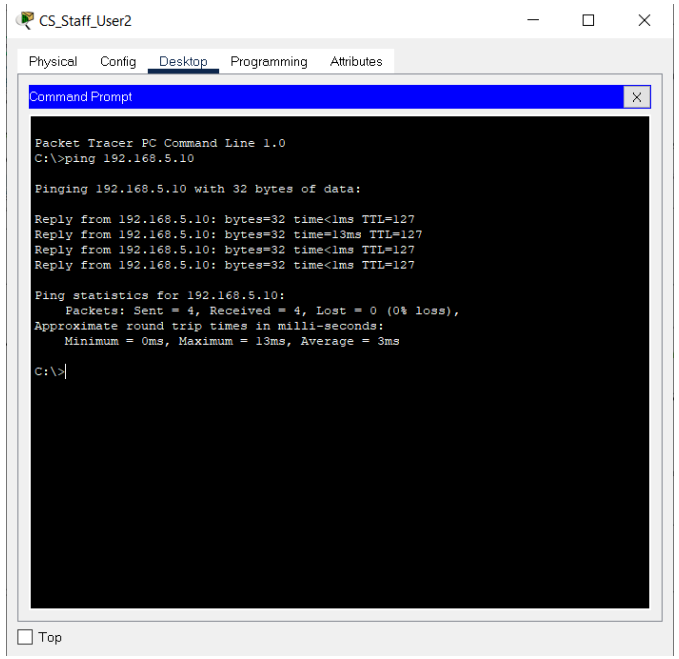
Configuration	Action
Wireless router	Connect to SSID using WPA2 key
IoT server	Connect to server using registered username and password

NETWORK DESIGN

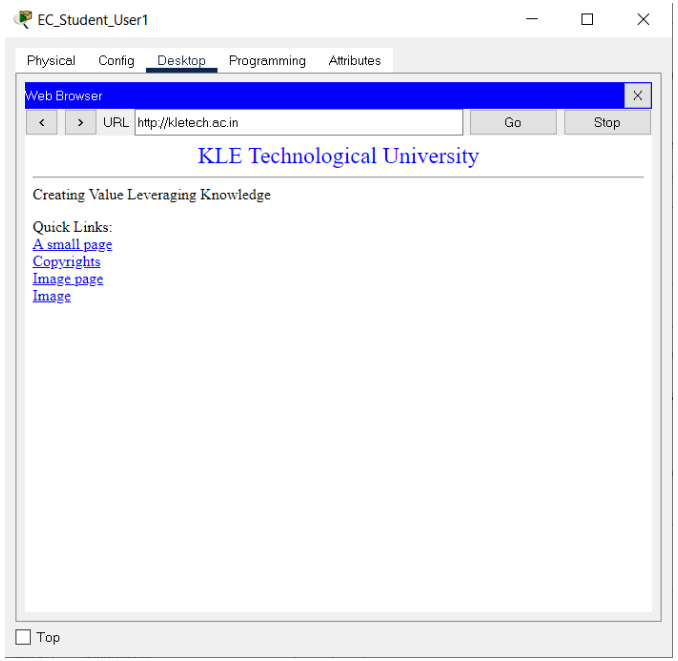
The prototype of the proposed network implemented on cisco packet tracer



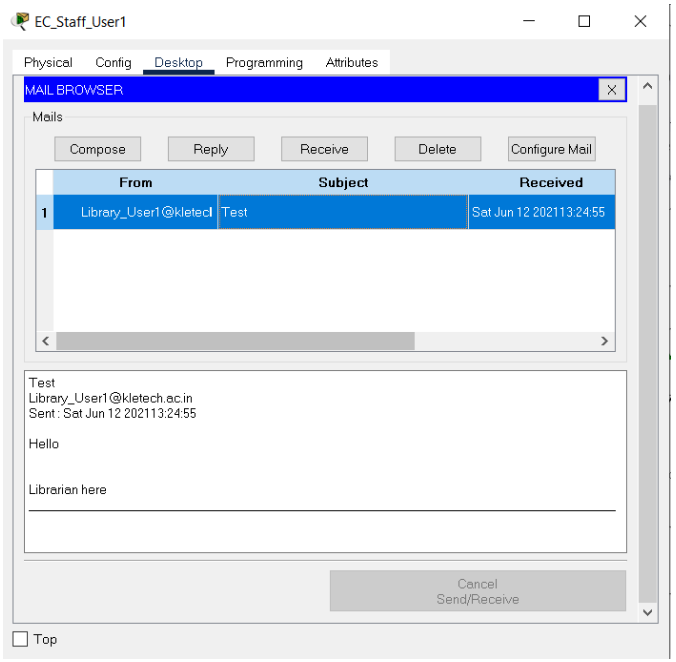
SIMULATION RESULTS



Testing VLAN communications from CSE to ECE



Web hosting with DNS



Email with SMTP and POP3

CONCLUSION

The outcome of the proposed system will be a fail-safe backbone network infrastructure which meets the requirements for readily available access to information and security of the private network, and also ensures optimized productivity when telecommunication services are accessed. The installed equipment allowed to organize high-speed wired and wireless Internet access throughout the whole complex buildings as well as providing transfer of all types of data throughout the single optimized network.