Case Study: College Campus Network

Team Members:

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Problem Statement:
Design a network with multiple routers, switches and machines. The networks should be wired and wireless should implement one of RIP or OSPF and should use DHCP and static as routing protocols

Introduction:
The scope of this project is to create a better network for the College Campus that will allow them flexibility in the following categories:

1. Security
2. Network scalability
3. Email and FTP using
4. Own server
5. Data backup

There is no VPN for the college to provide separation from the public network

Scope and Utility:
Scope

- The project is primarily intended for small organizations, which include startups & other organizations, and small to medium-sized schools.
- The project has been made keeping in mind both cost and efficiency.
- Lastly, the project can be used both as a blank slate, and for upgrading
- a pre-existing network.

Utility

- We firmly believe that the template provided by this design is applicable for any network – provided it is not large enough

Tools and technologies used:

- The main tool used is Cisco Packet Tracer, provided free of charge for educational and academic purposes by Cisco Inc.

Highlights:

1. DHCP
2. DNS

3. WEB
4. VLANs
5. Email

Objective of the Network:
The network is designed to achieve several specific academic/operational objectives:
1. Secure Service:
The main objective of this network is to provide secure administrative computing service to the State Office and two districts. It is designed to be functionally and physically isolated from access by people not employed by the Maryland public education system so as to minimize the risk of unauthorized use.
2. **Integration and Update:** Presently there are many LANs in the Maryland public education system, but much of the equipment is out of date, and many of the LANs are incompatible with each other, and not connected in a systemwide network. This proposal describes a WAN that integrates and updates these LANs to support productive collaboration across the system.
3. **Versatile Information Processing:** The network will enable users to retrieve, process, and store ASCII and nonASCII text, still graphics, audio, and video from any connected computer.
4. **Collaboration**: The network will combine the power and capabilities of diverse equipment across the state to provide a collaborative medium that helps users combine their skills regardless of their physical location. A network for this educational community will enable people to share information and ideas easily so they can work more efficiently and productively.
5. **Scalability**: The design is scalable so that more district offices can be added as funding becomes available without having to redo the installed network.

Intended Users: The primary users of the network at the College staff, administrator and Students

Design Assumptions:
This design assumes the following:
1. The Institute Education Network has a firewall that protects all information coming and going from the network.
2. Internet service is provided by the Institute Education Network - Tata and BSNL

Network Design:

A. Network Topology

a. **Technical Requirements:** The building will consist of faculty and administrative offices,classrooms, library and technology labs. The administrator offices will need to be on a separate secure network due to the sensitive personal and financial information they are required to access to perform their duties. A Local Area Network (LAN) will be created for this new building and connect to Main Building's secure Wide Area network (WAN). Since user satisfaction is the primary purpose of an IT network and the network design, creating a network that meets and exceeds the users expectations is the primary goal

b. **Proposed Technology**:The proposal includes a physical and logical star wired and wireless topology as they are the most commonly used topology for a Local Area Network (LAN) today. A physical star topology uses a centralized

connecting device such as a server or a switch for a wired network and a wireless access point (WAP) for a wireless network to send data directly to the intended device. With a star topology, all network connections are located in a single place, which reduces redundancy and makes it easier to troubleshoot and reconfigure devices. Wireless access points act as a bridge between wireless devices such as laptops, tablets and smart phones, and the wired network. On a star topology, nodes can be removed and added to the network easily making it much easier to reduce or expand a network. Using a star topology will also allow the campus to integrate a client-server network. Although a bus topology is cost effective, it wasn't considered for this networking project because it is outdated and utilized for smaller networks. With only one cable connecting the devices together, there is a greater probability for data collision and data loss with a bus topology. A ring topology was not considered since the network will be an ethernet based LAN, which is the most popular networking architecture offering high performance but low maintenance and cost.Multi-layer switching combines layer 2, 3 and 4 switching technologies and provides high-speed scalability with low latency. Multi-layer switching can move traffic at wire speed and also provide layer 3 routing. We have used blade servers, sometimes referred to as a high-density server, is a compact device containing a computer used **to manage and distribute data in a collection of computers and systems, called a network**. Its role is to act as a conduit between computers, programs, applications and systems

B. Cables and Connectors

Ethernet supports unshielded twisted pair (UTP) cables with RJ45 connectors and happens to be the most common transmission medium for LAN. For this network, Cat6a will be utilized for the connection of computers and printers and other client devices as it supports gigabit ethernet and provides moderate protection against electromagnetic interference (EMI).

To avoid EMI, the UTP cables must be kept away from fluorescent light fixtures, air conditioners, generators, motors, radio transmitters and transformers. Although shielded twisted pair (STP) is another option that could prevent external interference and has the benefit of being able to support higher transmission rates over longer distances, it is not necessary in a computer lab on a college campus. The cost of STP is almost three times more than UTP, so STP should only be used in environments with a lot of EMI, such as in outdoor applications or factories. For a college campus, Cat7 should be utilized for connecting the networking and internetworking devices since it is the most durable and resistant of the ethernet cables and supports 10GB ethernet. The Cat7 provides an alternative to fiber optic cabling as they are similar in performance. The equipment cost is also less than fiber optic and copper cabling is not fragile. Fiber optic cabling will be utilized to connect the WAN ethernet to the ISP

References:

- PPT's
- Videos

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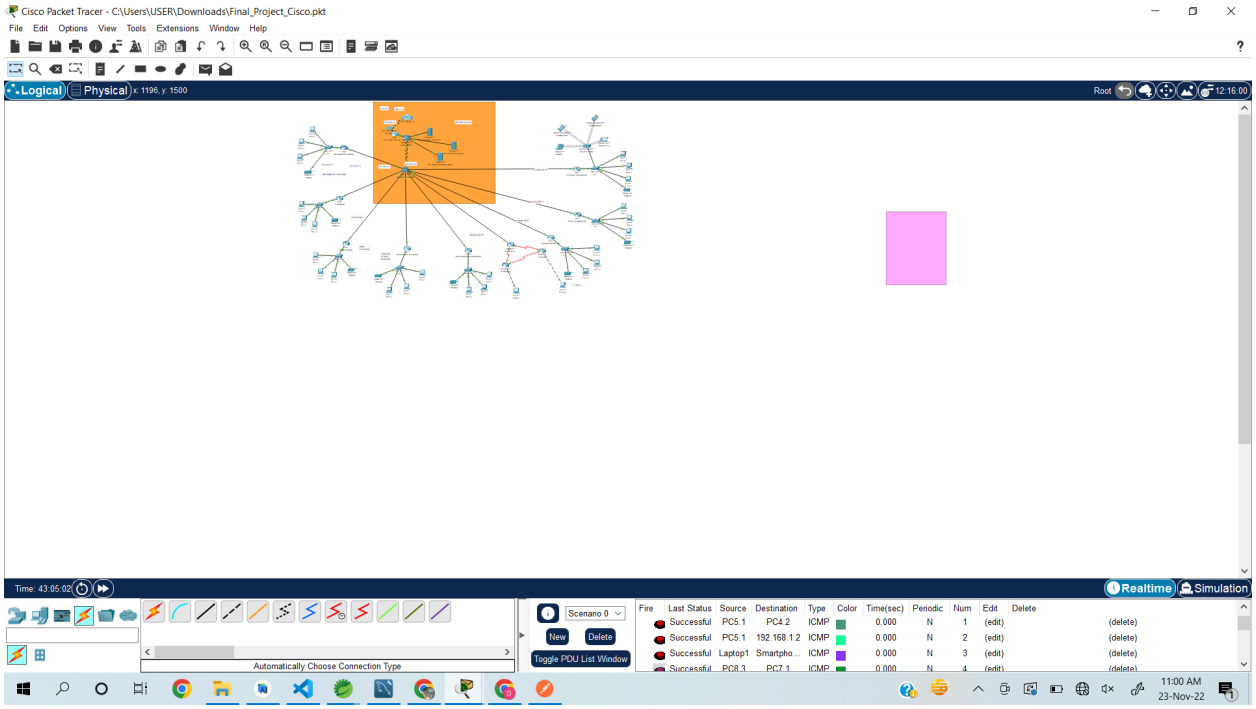
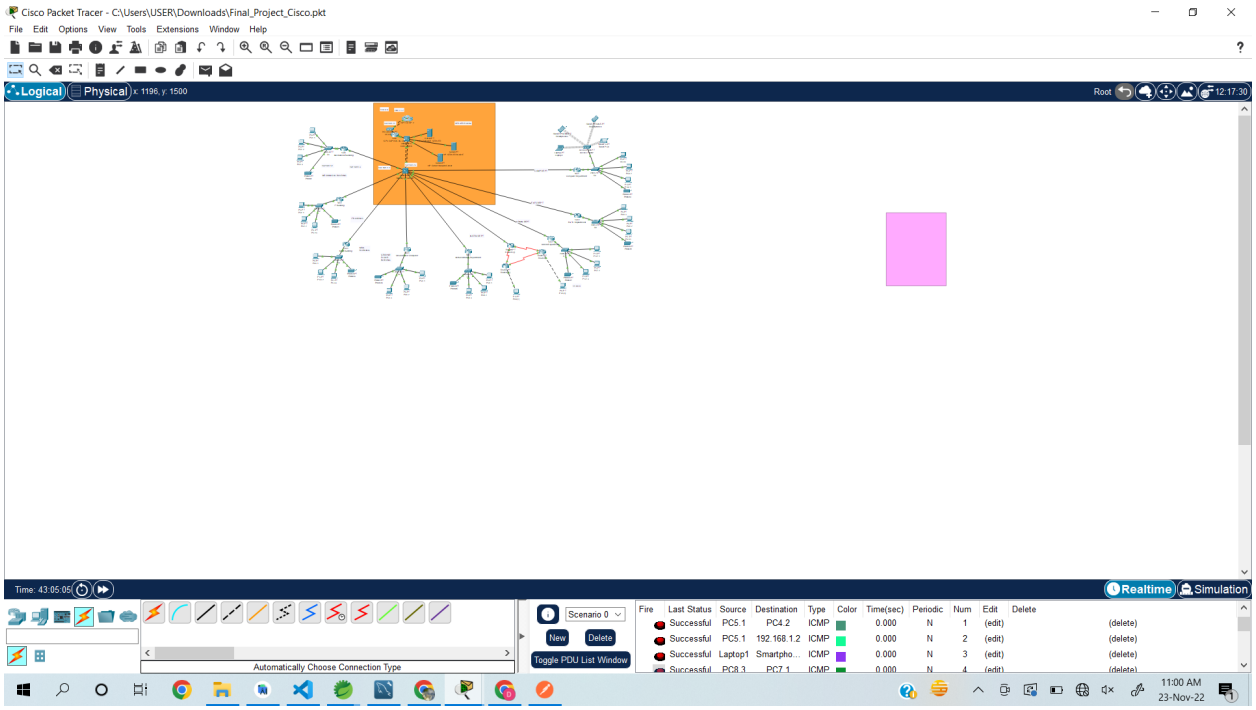
Screenshot:





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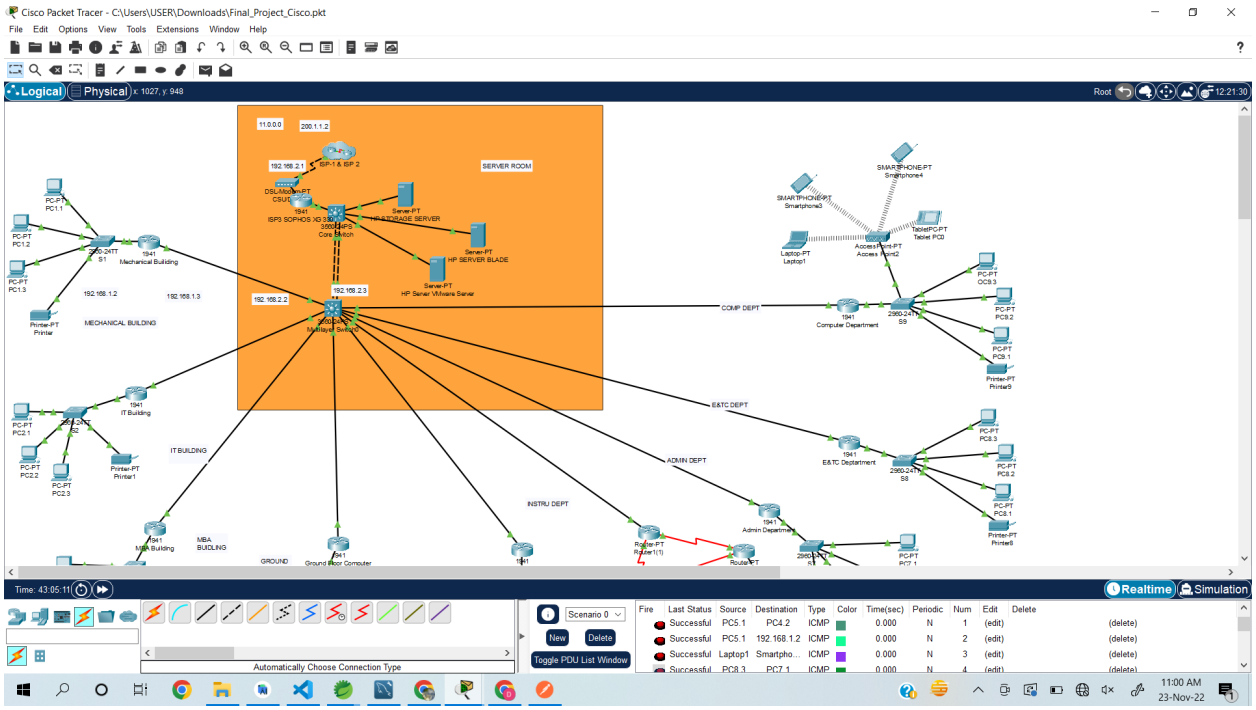

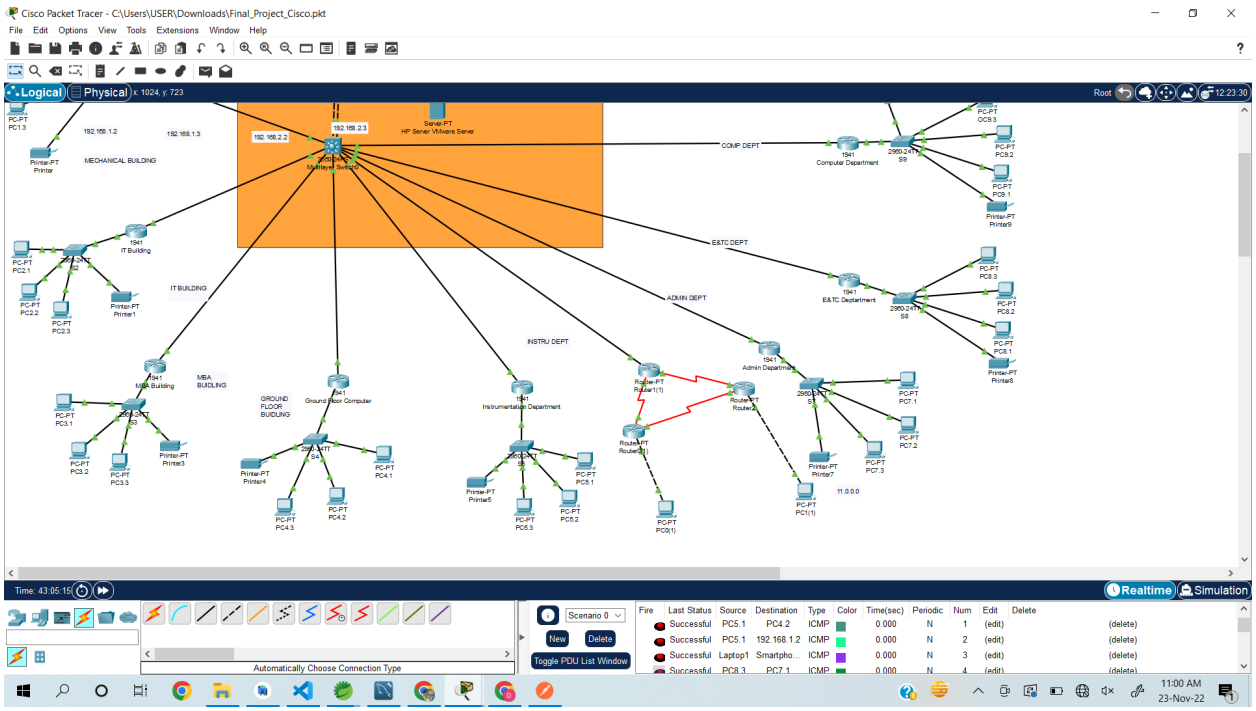

Conclusion:

We have designed a campus network using various networks with multiple routers, switches and machines. The network has wired and wireless connections. It uses DHCP and static as it's routing protocols and OSPF is implemented in the .pkt file.