SUPERIOR UNIVERSITY LAHORE

Faculty of Computer Science & IT

Project

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Submitted To:

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Project Overview:

Project highlights the interconnectivity of networking devices communicating among themselves and connecting the hosts among themselves. It describes and shows the real time stimulation of server- client communication. It manages the hosts by various techniques like sub-netting and VLAN avoiding network collisions and congestions and VLSM.

Project Deliverables:

Project delivers the following functionalities:

- Sub-netting
- VLAN
- Routing – RIP
- Network Topologies
- HTTP, FTP, DNS, DHCP, SMTP services.
- LAN Switching

Tools and Techniques:

The tools and techniques used are mentioned as:

Tools used:

Cisco Packet Tracer

Techniques used:

- Router-Server configuration
- RIP Configuration
- Subnetting
- Serial-Cable Configuration
- Terminal Configuration

Project Management Plan

Tasks:

The major tasks are:

- Analysis of major deliverables.
- Documentation and modeling.
- Creating Individual Modules.
- Testing the project.

Information Gathering:

Collection of the hardware modules and software functionalities of various switches, routers, Hubs, Gateways and servers.

- Services like HTTP, FTP, SMTP, DHCP, and DNS.

Dependencies and Constraints:

The Project is only compatible with Cisco packet tracer. It cannot be executed at any other platform.

Risks and Contingencies:

Network connections could easily be hindered by mistake of hand. The project must be used with care.

1. RIP

Introduction

RIP stands for Routing Information Protocol

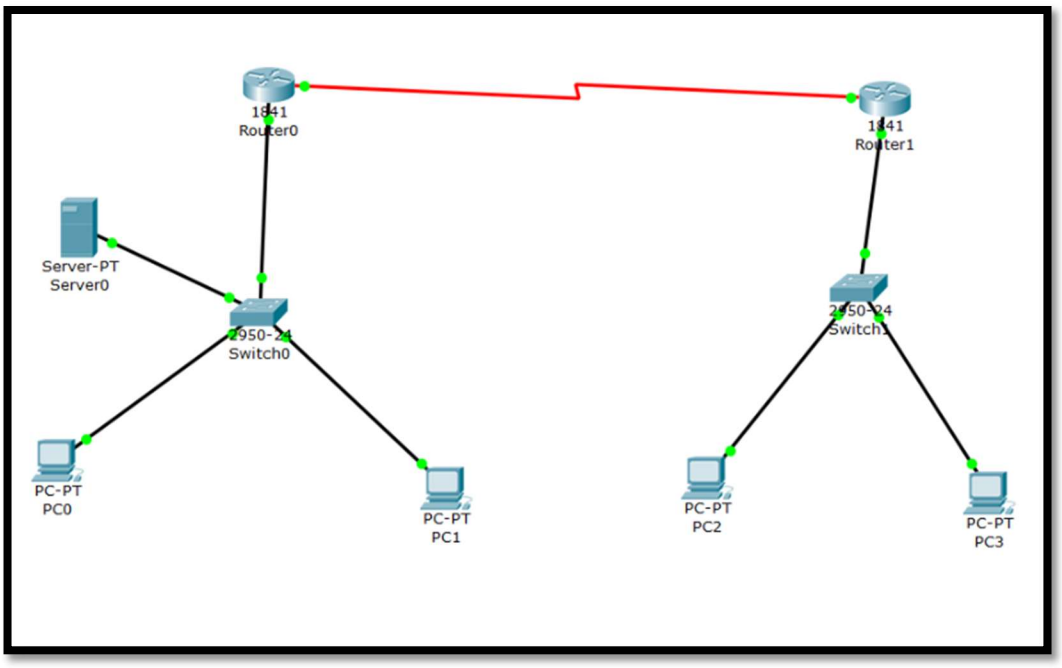
I. RIP is an Intra domain routing protocol
II. Based on distance vector routing.
III. RIP implements distance vector routing directly with some considerations:

Advantages:

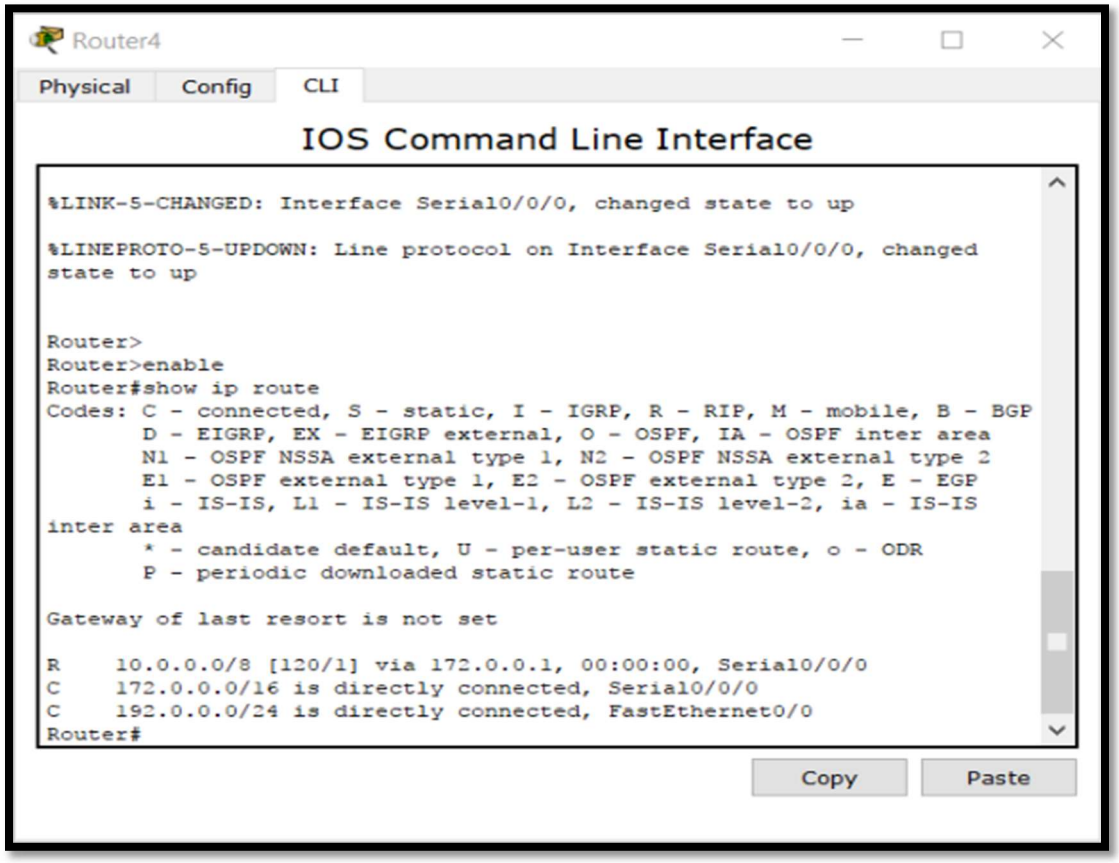
- Very easy to understand and configure.
- Almost guaranteed to be supported by all routers
- Supports load balancing
- Generally loop free

Disadvantages:

- Inefficient(bandwidth intensive)
- Slow convergence in larger network
- Supports only equal cost load balancing
- Limited scalability



In Packet Tracer:



Router Configuration in Packet Tracer:

I. To Enter into router configuration

- Router>Enable
- Router#Configure terminal
- Router(config)#

II. To change name of device

- Router(config)#IHostname R1
- To do interface configuration
- Router(config)#Interface FastEtherne 0/0

III. To set IP address of interface

- Router(config)# ip address 10.0.0.1 255.0.0.0 (For Static)
- Router(config)# ip address dhcp

IV. To open the port

- Router(config)#no shut

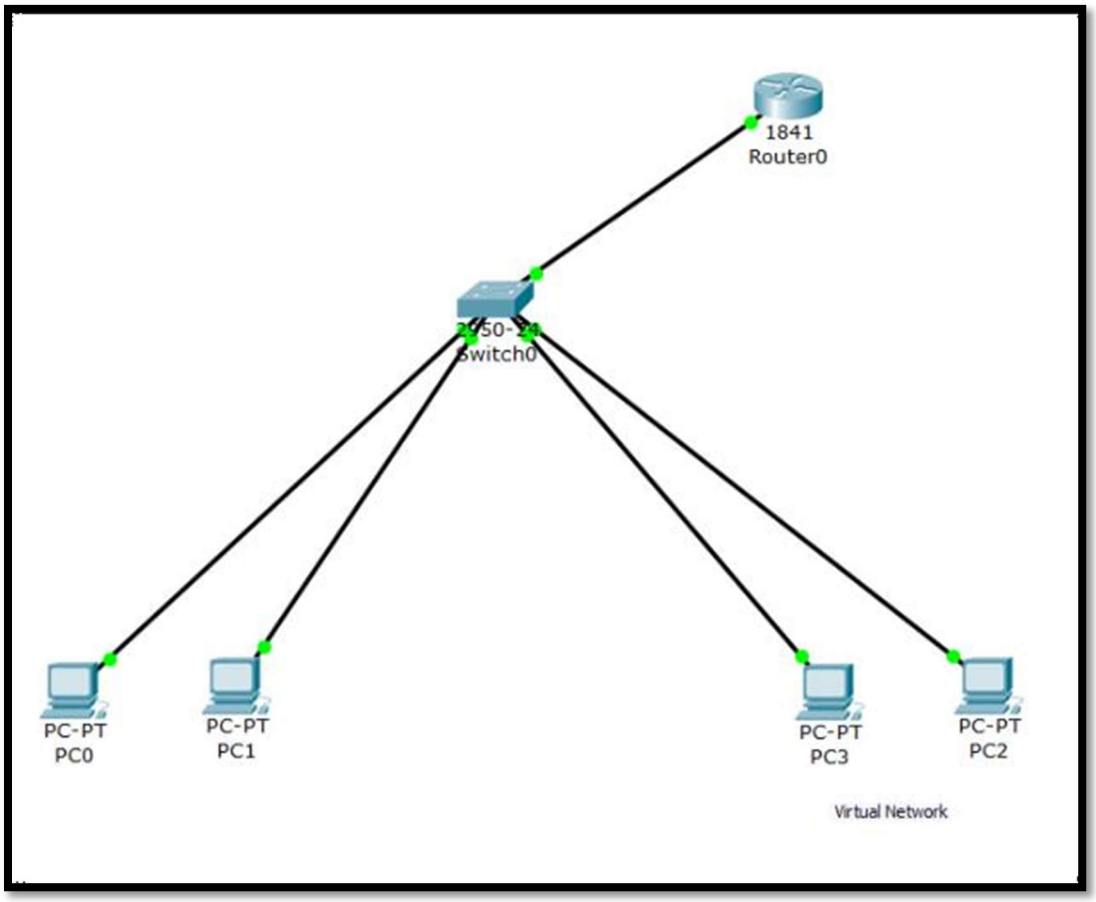
V. To configure the RIP

- Router>enable
- Router#configure terminal
- Router(config)#router rip //To enter the router's RIP configuration
- Router(config-router)#network 1.0.0.0 //To add the network in the RIP
- Router(config-router)#no network 1.0.0.0 //To remove the network from the RIP

1) VLAN

Introduction

A VLAN can be defined as a virtual broadcast domain. Instead of segmenting the broadcast domain with routers at Layer 3, you segment using switches at Layer 2. Each VLAN should be associated with its own IP subnet.



Steps for configuring VLAN in packet tracer:

- Update VLAN database in Switch by creating your own VLAN number.
- VLAN number should be between 1-1005.
- Now in interface change the VLAN drop down to the created VLAN number.
- Change Access to Trunk in interface in switch that is connected to router.
- Update VLAN database in Router also.
- In router CLI
  - Configure terminal
  - Router(config)# Interface FastEthernet0/0.1 (creation of sub - interface)
  - Router(config-subif)#Encapsulation dot1q <VLAN number> (It encapsulate the connection of VLAN through truncation)
  - Router(config-subif)#Ip address <ip> <subnet> (gateway address of VLAN)
  - Exit

2) SUBNETTING

INTRODUCTION

Sub-netting is the strategy used to partition a single physical network into more than one smaller logical sub-networks (subnets). An IP address includes a network segment and a host segment. Subnets are designed by accepting bits from the IP address's host part and using these bits to assign a number of smaller sub-networks inside the original network. Sub-netting allows an organization to add sub- networks without the need to acquire a new network number via Internet service provider (ISP). Sub-netting helps to reduce the network traffic and conceals network complexity. Sub-netting is essential when a single network number has to be allocated over numerous segments of a local area network (LAN).

Subnets were initially designed for solving the shortage of IP addresses over the Internet.

WHAT IS SUB-NETTING?

The process of Sub-netting involves dividing a network up into smaller networks called subnets or sub networks. Each of these subnets has its own specific address. To create these additional networks, we use a subnet mask. The subnet mask simply determines which portion of the IP address belongs to the host. The subnet address is created by dividing the host address into network address and host address. The network address specifies the type of sub network in the network and the host address specifies the host of that subnet. Subnets are under local administration. As such, the outside world sees an organization as a single network and has no detailed knowledge of the organization's internal structure. Sub-netting provides the network administrator with several benefits, including extra flexibility, more efficient use of network address and the capability to contain broadcast traffic. A given network address can be broken up into may sub networks. For example, 172.16.1.0, 172.16.2.0, 172.16.3.0 and

172.16.4.0 are all subnets within network 171.16.0.0.
A subnet address is created by borrowing bits from the host field and designating them as subnet field. The number of bits borrowed varies and is specified by the subnet mask.

HOW TO DO SUBNETTING

Each IP address consists of a subnet mask. All the class types, such as Class A, Class B and Class C include the subnet mask known as the default subnet mask. The subnet mask is intended for determining the type and number of IP addresses required for a given local network. The firewall or router is called the default gateway. The default subnet mask is as follows:

- Class A: 255.0.0.0
- Class B: 255.255.0.0
- Class C: 255.255.255.0

The Sub-netting process allows the administrator to divide a single Class A, Class B, or Class C network number into smaller portions. The subnets can be sub-netted again into sub-subnets.

WHY USE SUBNETTING

Conservation of IP addresses: Imagine having a network of 20 hosts. Using a Class C network will waste a lot of IP addresses (254-20=234). Breaking up large networks into smaller parts would be more efficient and would conserve a great amount of addresses.
Reduced network traffic: The smaller networks created the smaller broadcast domains are formed hence less broadcast traffic on network boundaries.
Simplification: Breaking large networks into smaller ones could simplify fault troubleshooting by isolating network problems down to their specific existence.

HOW TO MAKE SUBNETS ON PACKET TRACER

Part 1: Design an IP Addressing Scheme.
Part 2: Assign IP Addresses to Network Devices and Verify Connectivity.

PART 1: DESIGN AN IP ADDRESSING SCHEME

- **Step 1:** Subnet the 176.124.24.0/24 network into the appropriate number of subnets. In this case we are creating four subnets of this network.
- **Step 2:** Create the subnets
- **Step 3:** Assign the subnets to the network shown in the topology.

- Assign Subnet 0 to the LAN connected to the Fast-Ethernet 0/0 interface of R1: 176.124.24.0/26
- Assign Subnet 1 to the LAN connected to the Ethernet0/0/0 interface of R1: 176.124.24.64/26

- Assign Subnet 2 to the LAN connected to the Ethernet0/0/0 interface of R2: 176.124.24.128/26
- Assign Subnet 3 to the LAN connected to the Fast-Ethernet 0/0 interface of R2: 176.124.24.192/26

Part 2: Assign IP Addresses to Network Devices and Verify Connectivity

Most of the IP addressing is already configured on this network. Implement the following steps to complete the addressing configuration.

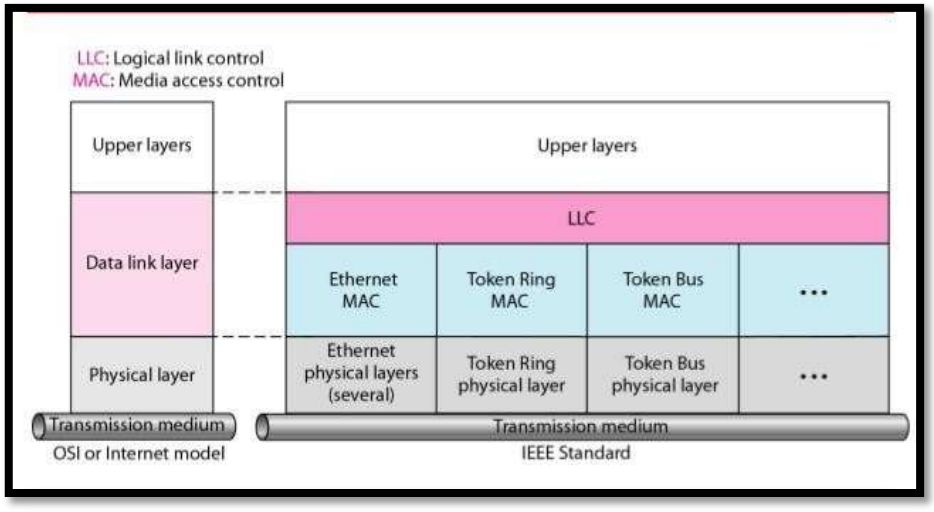
- **Step 1:** Configure IP addressing on R1 LAN interfaces.
- **Step 2:** Configure IP addressing on S3, including the default gateway.
- **Step 3:** Configure IP addressing on PC4, including the default gateway.
- **Step 4:** Verify connectivity.

LAN Switching:

Introduction

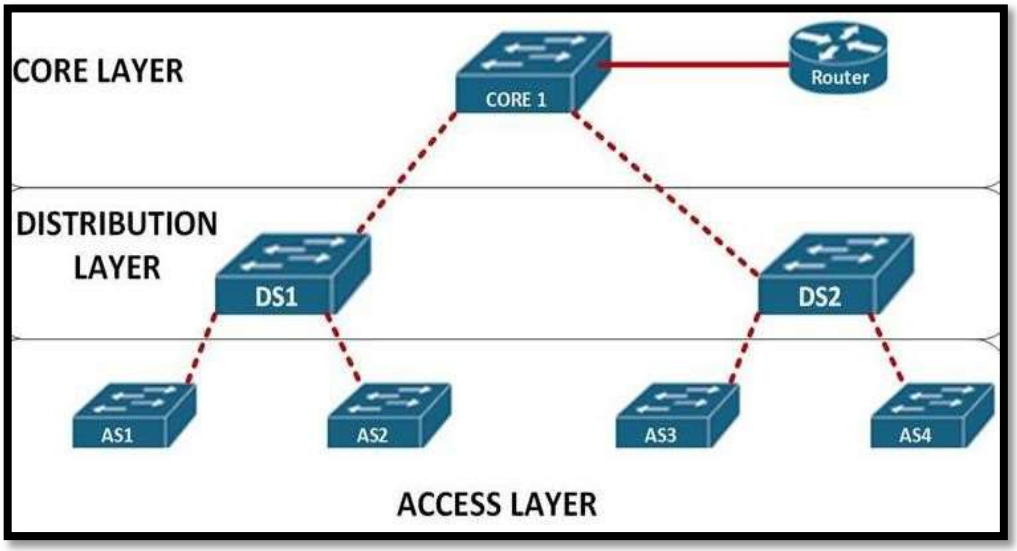
LAN switching is a form of packet switching in which the data packets are transferred from one computer to another over a network. Ethernet switches receive Ethernet frames in one port and then forward (switch) the frames out to one (or more) port. This first major section focuses on how switches make these switching decisions.

IEEE Stands for:



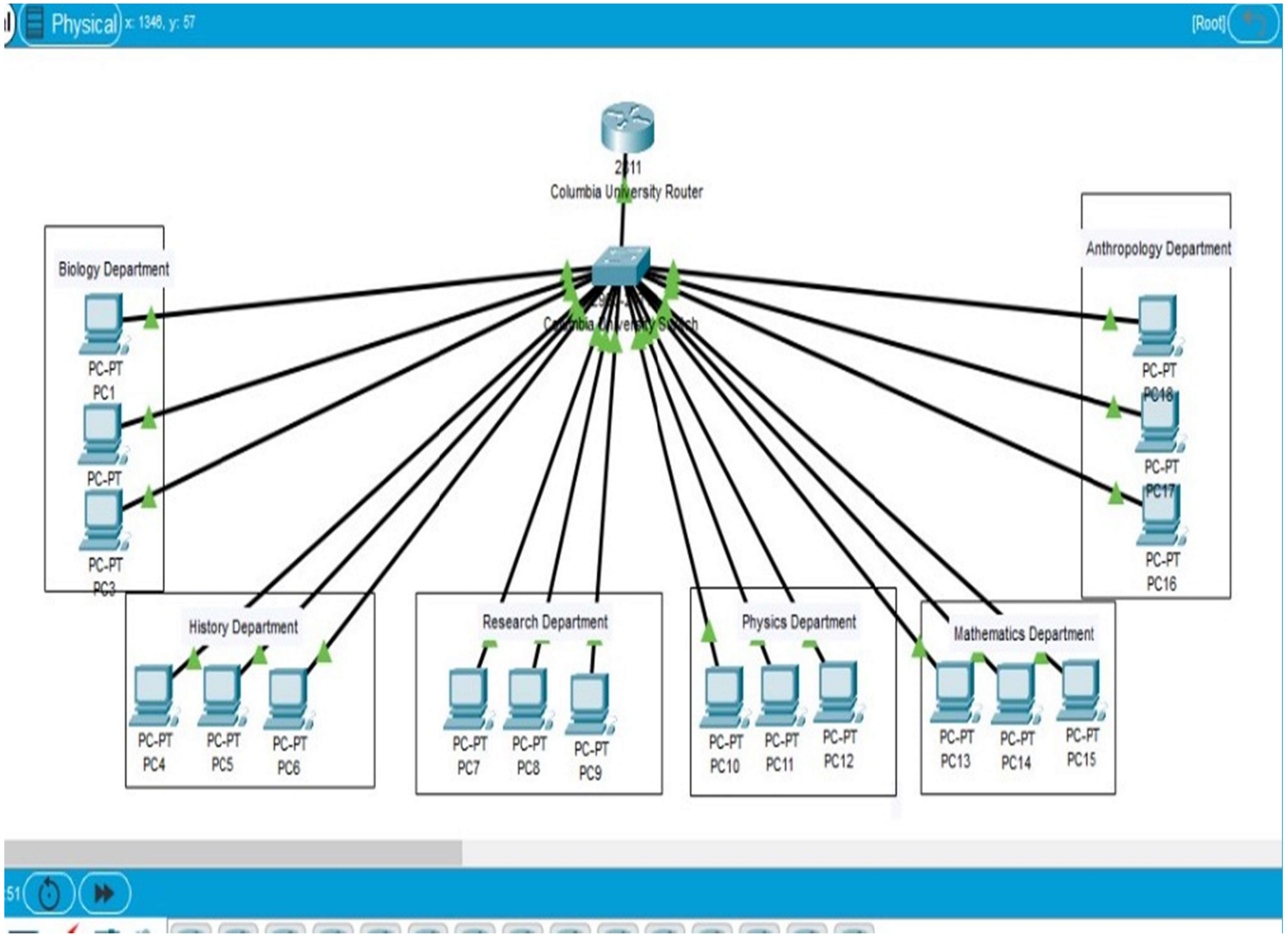
LAN Design Considerations:

- Secure the use of voice, video, data which is transmitted over networks is crucial.
- Following points kept in mind while designing:
- Network segmentation and broadcast traffic management.
- Security.
- Easy configuration and management of the switches.
- Redundancy.



Department	Host	Network	Subnet Mask in dotted decimal notation
Biology Department	1000 Host	125.168.0.100	255.255.252.0
History Department	511 Host	125.168.4.100	255.255.252.0
Research Department	513 Host	125.168.8.100	255.255.252.0
Physics Department	253 Host	125.168.12.100	255..255.255.0
Mathematics Department	127 Host	125.168.13.100	255.255.255.0
Anthropology Department	03 Host	125.168.14.6	255.255.255.248

Final View:


Physical
x: 1346, y: 57
[Root]
2811
Columbia University Router
Biology Department
PC-PT
PC1
PC-PT
PC2
PC-PT
PC3
Anthropology Department
PC-PT
PC18
PC-PT
PC17
PC-PT
PC16
History Department
PC-PT
PC4
PC-PT
PC5
PC-PT
PC6
Research Department
PC-PT
PC7
PC-PT
PC8
PC-PT
PC9
Physics Department
PC-PT
PC10
PC-PT
PC11
PC-PT
PC12
Mathematics Department
PC-PT
PC13
PC-PT
PC14
PC-PT
PC15