**ENTERPRISE NETWORK DESIGN**

**PROJECT REPORT**

**Group: 2**

**Project Name: HOGWARTS NETWORK**

**DESIGN**

**Date: 4 December 2019**



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Phase 1

1. **Background:**

Hogwarts is a college campus network known with two main campus namely Gryffindor for Arts and Sciences and Slytherin for Engineering and Technology within a distance of 10 miles, one smaller campus in a different city namely Hufflepuff located 100 miles away from the main locations and one remote campus namely Ravenclaw located in India which is 7000 miles away from the main campus. Each building has two floors each. The main aim of the Hogwarts management focuses on providing education with advanced technology in a secure way. Hogwarts offers online courses for off-campus students. It is home for variety of majors such as Arts and Science, Business, Engineering and Forensic Science.

This campus require to grow their characteristics into their specialized condition. For that we have joined main Data Center to oblige college servers and resources. This system has been worked to give scalability, availability and security, cloud services not just takes into account these should be met yet gives the simplicity of framework upgrade, achieves competitive strategic policies and keeps the campus ecologically friendly. This system configuration is contained the absolute best Cisco equipment, to incorporate however not constrained to their routers, switches and firewalls. These items give a significant level of execution, security and simplicity of design to guarantee the campus specialized group stays productive and the system supports the business and specialized needs everything being equal.

You will see inside the accompanying arrangement, detailed reviews of basic areas that have motivated the general structure of this system. To incorporate the variety of client networks, alongside their specialized necessities and requirements. The general system topology or game plan of nearby, wide and remote system frameworks and assets, which was created in view of the Cisco various leveled model. The specialized equipment and programming that is being utilized to give steady system accessibility and execution, alongside the security plans, strategies and system the executives best practices that will be consolidated to help and defend the CPU's data frameworks. Coming up next are some quick certainties that keeps in context the present size of the network we are working with and how the college hopes to extend.

* 6000 Full-Time Students
* 3000 Part-Time Students
* 1000 Full-Time Faculty
* 2,000 Part-Time Faculty
* 2,000 Staff Members

1. **Business Goals**

The main goal of this university is to provide students, faculty and staff with well-equipped workforce. This is possible for the management by collaborating with the local community along with the government. For the achievement of students to stand out and succeed. The campus provides sufficient resources for the achievement of the students.

Results, innovative nature, providing necessary resources are the primary goals of a campus. The following are also considered for the business goals. They are:

* To provide adequate opportunities for faculty and staff
* To increase revenue sources
* Technological operations should be made more advanced.
* To provide excellence in academics of the student and overall development of students.

1. **Technical Goals**

The university has to keep up with the enhancements in the technology since the technology keeps on advancing everyday in all parts of the world. The advantage of the university keeping up with the technology is that it is beneficial for the students for new learning and accessibility. Among all the technology implemented in the university, information technology plays an important role because the information has to be collected, maintained, stored in an efficient manner. The following are some of the important technical goals of an university to provide efficient network management and scalability:

* Network security for students, faculty and staff is the key aspect.
* Network performance should be increased to meet the needs of all both campus and remote users.
* Availability of the network should be 99.99%

1. **Network applications**

Numerous network applications are provided to all the users on a network which are listed below. Students, Faculty and Staff have their own need for accessing to different applications and are restricted to certain apps. For example, student user does not have access to the data center:

1. Web Search
2. File management system
3. Library/Catalog
4. Distance Learning Site
5. Email
6. Virtual Labs
7. Online classes
8. User Communities

It is essential to distinguish relevant client networks inside the campus to comprehend the sorts networks that are available inside every campus, the size and area of those networks, alongside which basic applications that would be utilized. This assists with arranging both LAN and WAN structures to guarantee we are meeting the specialized presentation needs that is required by the college as of now and for what's to come.

|  |  |  |  |
| --- | --- | --- | --- |
| **User Community Name** | **Size of Community (Number of Users)** | **Location of Community** | **Applications used by Community** |
| **Students** | **2250** | **Gryffindor** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search.** |
| **Faculty** | **700** | **Gryffindor (Site 1)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search, Office Facilities.** |
| **Office** | **500** | **Gryffindor (Site 1)** | **Office Facilities, Emails, File Management System.** |
| **Students** | **2250** | **Slytherin (Site 2)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search.** |
| **Faculty** | **700** | **Slytherin (Site 2)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search, Office Facilities.** |
| **Office** | **500** | **Slytherin (Site 2)** | **Office Facilities, Emails, File Management System** |
| **Students** | **2500** | **Huffflepuff (Site 3)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search.** |
| **Faculty** | **700** | **Hufflepuff (Site 3)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search, Office Facilities.** |
| **Office** | **500** | **Hufflepuff (Site 3)** | **Office Facilities, Emails, File Management System** |
| **Management** | | **50** | **Hufflepuff (Site 3)** | **File Management System,**  **Email, Office Facilities** |
| **Finance** | | **20** | **Hufflepuff (Site 3)** | **Office Facilities, Email, File Management System** |
| **Research** | | **100** | **Hufflepuff (Site 3)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search.** |
| **Students** | | **2500** | **Ravenclaw(Site 3)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search.** |
| **Faculty** | | **700** | **Ravenclaw (Site 3)** | **Email,File Management System,Library/Catalogs, Virtual Labs, Web Search, Office Facilities.** |
| **Office** | | **500** | **Ravenclaw (Site 3)** | **Office Facilities.** |

1. **DATA STORE**

In this network, we have used centralized data center that has everything store in it. The data center has two different servers, one primary server, the main server and other is secondary server which is used for backup purpose. Further both these servers are connected to the router via a switch. Additionally, two ISP are used for redundancy and backup purpose is connected to firewall. If in case, router goes down, network can be connected directly to the switch for time being and run service but can’t be done for long time as it is not secure. One Internet cloud is used (main ISP) and it is not connected to router directly as router is a logical device as cloud provide some specific service. For this network, we are using ACL for the data center for providing level of authentication depending on person to person.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Data Store (Windows)** | Location | Application | Used | by | User |
|  |  |  |  | Community | |  |
|  | **Email Server** | VPC | Email | All users except guests | | |
|  | **Web/App Server** | VPC | Web Search | All |  |  |
|  | **College Management** | VPC | College/University | Administration | |  |
|  | **Server** |  | Administration system |  |  |  |
|  | **DNS Server** | VPC | Domain Name Service | All |  |  |
|  | **DHCP Server** | VPC | Dynamic IP addressing | All |  |  |
|  |  |  |  |  |  |  |

1. **Traffic flow**

Traffic flow is a progression of the packet from source PC to a goal. The flow shouldn't be 1:1 mapped it can be anycast or multicast in which there will be single device and numerous goal device. The traffic analysis will give review of the complete traffic flow at that case in the exchange medium. The network administration can get the reports and can roll out required improvements on network by taking the traffic flow on of the primary reference.

|  |
| --- |
|  |

1. **Calculating Bandwidth for each department:**

**Gryffindor: 3000 users**

Bandwidth= {[(267+605+265+467) \*3000] + (187\*100) +(640\*75)} Kbps = 4.652 Gbps

**Ravenclaw: 3000 Users**

Bandwidth= {[(280+320+65) \*2000] + (305\*600) + (397.6\*400)} Kbps = 2.624 Gbps

**Library of Hufflepuff: 1500 Users**

Bandwidth= {[(325+506+707+305) \*1400] + (297.6\*100)} Kbps = 2.55Gbps

**Slytherin (India): 2000 Users**

Bandwidth= {[(305+406+506) \*1500] + (305\*500)} Kbps = 1.93 Gbps

**Phase 2**

1. **LAN Topology Overview**

The LAN topology joins all area of the Cisco Hierarchical model to incorporate the access, distribution and core layers. In the LAN topology review, we have different building. In the right most side we have the Gryffindor building located in West Haven, which has around 2500 users and there are 1024 Mbps switches in this point of view building. The subsequent building is designed underneath the Gryffindor building. The Slytherin building is a solitary floored building with a single switch and multiple clients. Next, we have the Hufflepuff building, it has one multilayer switch and several Cisco 2960 switches for the two floors with around 3000 users.

Next, we have the Data Center building located in New York having a 3560 24PS remote switch, which is home to around all the clients excluding students and labs. With respect to in our topology we have arranged a firewall between the Internet Service Provider (ISP) and the network. Further security usage will be examined later inside this arrangement. All switches inside each virtual LAN are associated with a switch and will be utilized for every office to speak with each other alongside being associated with the web.

1. **WAN Topology Overview**

The WAN topology fuses a similar Cisco hierarchical model having access, appropriation and center layers. We have pursued bus, star and partial mesh topology. This allows to use different devices to connect to others in the network. We have fused EIGRP as the routing protocol. In addition, using the combination of these three topology make it easy to communicate with each other. We have used the concept of frame relay for core layer and connections in this layer are serial DTE. Moreover, routers in core layer are connected through copper-straight to multilayer switches in access layer. This kind of connection is increasingly dependable, takes into consideration simpler future extension and gives quicker association speeds all through the system. To keep up static IP addresses, it was essential for us to buy a devoted line through our ISP.

Accessibility is critical for the campus, with that we have set up a proper service level agreement (SLA) between the ISP and the campus to guarantee they can meet the system accessibility prerequisites. Inside this SLA it is referenced for arrange accessibility to be kept up at 99.99%. This sort of accessibility implies that the college would just experience around 52 minutes of personal time every year. This is reasonable for the college and for the situation that these necessities are not met, the ISP is required to reduce the expenses of administration for the time that those necessities were not fulfilled. We have built up another association with another ISP, with endeavors to give some redundancy and reliably meet the network necessities.

1. **IP Addressing**

Every device on the network must have an IP address so they are reachable over the internet. The university network is divided into Thirty Two subnets to include Hufflepuff (Main Campus), Gryffindor and Ravenclaw (Sub-Campuses), Slytherin (Remote Campus), a Remote subnet for our remote users and Guest subnet for those visiting the campus.

Utilizing Frame Relay we have created a Remote connection to satisfy these networking needs. The Frame Relay strengthens our security by isolating our resources throughout the network. This type of integration provides a variety amount of solutions to the business and technical goals for the University. As mentioned previously, resources are more secure because users who accessing the services within this virtual environment are in a more controlled space. With the necessary routing policies in place resources are kept confidential and available to only those who require it. Frame relay is dynamic and they are maintained by the ISP. This is crucial as the University continues to grow and adapt to technological advances. The University will also benefit from this implementation because Frame Relay provide Cost Efficiency, which helps investing the money in other areas.

Hogwarts uses Class – B IP addressing of enterprise network. We designed our network to accommodate up to 32 subnets (one subnet per department) and each network is going to support 2048 – 2 = 2046 hosts.

**Network Class:** Class B

**Default Mask:** 255.255.0.0

**Subnets available:** 32

**Hosts per subnet:** 2048 – 2 = 2046

**Subnet Used**: 255.255.248.0

**CIDR:** /21

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| --- | --- | --- | --- | --- | --- |
|  |  | **Available** | **IPv4** | |  |
| ***Location/Campus*** | **IPv4 to subnet** | **Addresses** |  | **IP Addresses Ranges in all subnets** |  |
| *Gryffindor @ West Haven* | 172.16.0.0/21 | 2046 per subnet  (32 subnets, 5 bits borrowed) |  | 172.16.0.1 | – |
|  |  |  |  | 172.16.255.254 |  |
| *Slytherin @ India* | 172.17.0.0/21 | 2046 per subnet  (32 subnets, 5 bits borrowed) |  | 172.17.0.1 | – |
|  |  |  |  | 172.17.255.255 |  |
| *Hufflepuff @ New York* | 172.18.0.0/21 | 2046 per subnet  (32 subnets, 5 bits borrowed) |  | 172.18.0.1 | – |
|  |  |  |  | 172.18.255.255 |  |
| *Ravenclaw @ Austin* | 172.19.0.0/21 | 2046 per subnet  (32 subnets, 5 bits borrowed) |  | 172.19.0.1 | – |
|  |  |  |  | 172.19.255.255 |  |

|  |  |  |
| --- | --- | --- |
| **Subnet/VLAN for West Haven (GRYFFINDOR)** | | |
| **Description** | **VLAN ID** | **Network/IP Range** |
| Admin | 100 | 172.16.80.1 – 172.16.87.254 |
| Students | 200 | 172.16.88.1 – 172.16.95.254 |
| Labs | 300 | 172.16.96.1 – 172.16.103.254 |
| Office | 400 | 172.16.104.1 – 172.16.111.254 |

|  |  |  |
| --- | --- | --- |
| **Subnet/VLAN for India ( SLYTHERIN)** | | |
| **Description** | **VLAN ID** | **Network/IP Range** |
| Admin | 100 | 172.17.16.1 – 172.17.23.254 |
| Students | 300 | 172.17.32.1 – 172.17.39.254 |
| Office | 200 | 172.17.24.1 – 172.17.31.254 |
| Labs | 400 | 172.17.40.1 – 172.17.47.254 |

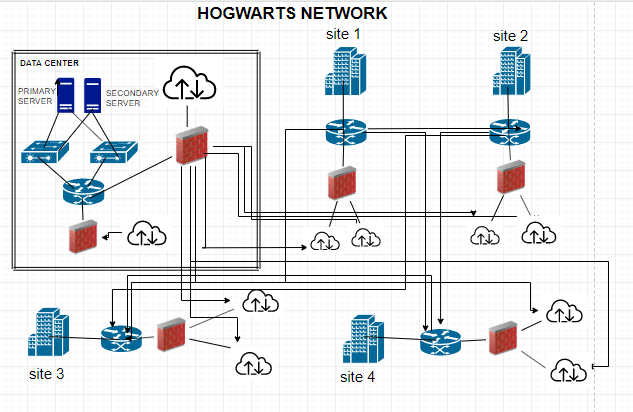
|  |  |  |
| --- | --- | --- |
| **Subnet/VLAN for New York (Head Quarters)** | | |
| **Description** | **VLAN ID** | **Network/IP Range** |
| Admin | 550 | 172.18.56.1 – 172.18.63.254 |
| Students | 510 | 172.18.24.1 – 172.18.31.254 |
| Finance | 520 | 172.18.32.1 – 172.18.39.254 |
| Management | 530 | 172.18.40.1 – 172.18.47.254 |
| Office | 540 | 172.18.48.1 – 172.18.55.254 |
| Library | 560 | 172.18.64.1 – 172.18.71.254 |
| Labs | 500 | 172.18.16.1 – 172.18.23.254 |
| Research | 570 | 172.18.72.1 – 172.18.79.254 |

|  |  |
| --- | --- |
| **IP Address For Cloud Servers in Network 4.2.2.0** | |
| **Description** | **IP Address** |
| TFTP Server | 4.2.2.5 |
| Web Server | 4.2.2.10 |
| Mail Server | 4.2.2.15 |
| FTP Server | 4.2.2.20 |
| DNS Server | 4.2.2.25 |
| Syslog Server | 4.2.2.30 |
| NTP Server | 4.2.2.35 |

|  |  |
| --- | --- |
| **IP Address For Data Storage in Network 8.2.2.0** | |
| **Description** | **IP Address** |
| Primary Storage Server | 8.2.2.10 |
| Secondary Storage Server | 8.2.2.20 |

1. **Logical LAN Design**

The following diagram is the initial logical design of the university LAN. To which a few changes have been made but it stands almost the same. All the sites are designed to support redundancy, cost efficiency, security and performance and they are connected to a center frame relay which will help in connecting the remote sites and establishing a virtual private connection using VPN between the data center location in New York to Vizag, India. Every switch and router will have a backup for redundancy and performance. EIGRP routing protocol is used for connectivity. We have used Hybrid topology which includes Star, Bus and Partial Mesh topology.

****

1. **Security**

The most significant prerequisite for user is for the network to be anything but difficult to utilize and accessible, which is the reason it is significant for the college to have built up and powerful security plans preceding the beginning of planning the system. Security must be as a top priority previously and not and idea in retrospect since ruptures have become increasingly normal and the college is defenseless against an assortment of dangers. There are an assortment of consistence laws and government guidelines that CPU must hold fast to, which is another motivation behind why it is so basic for the college to have the important security controls introduced and arranged to guarantee a productive measure of insurance over data frameworks.

The principle and most shared objective of security is to look after secrecy, uprightness and accessibility. Keeping up classification implies guaranteeing the protection of delicate individual or authoritative information. Honesty is guaranteeing just approved grounds clients approach important data and have the fitting rights and consents. Accessibility implies the system and its assets stays accessible to the individuals who need it.

1. **Security Policy**

**ACL:** Access Control List (ACL) are filters that empower you to control which routing updates or packets are allowed or prevented in or out from claiming a system.

They are explicitly utilized by network overseers to filter traffic and to give additional security to the system. This can be applied to routers (Cisco). ACL give an incredible method to control traffic into and out of your system; this control can be as straightforward as allowing or denying system has or addresses. You can design ACLs for all routed system conventions. The most significant reason to configure ACLs is to give security to your system. In any case, ACLs can likewise be configuring to control network traffic dependent on the TCP port being utilized.

**ACL working:** A router present in the network acts like a packet filter which will decide whether to forward or deny packets as per to filtering rules. As it being a Layer 3 device, a packet-filtering router uses rules to ensure whether to give permission or denial to packet traffic based on source and destination IP addresses, source port and destination port, and the protocol of the packet. These rules are defined using access control lists or ACLs.

Virtual Private Network (VPN):

The virtual private network is used to provide secrecy to the network and also it adds additional security as the private network will be not accessible or known to outsiders. In Hogwarts Network the VPN is used between the main Data Center and Vizag, India (International Location). So, it provides more security.

PASSWORDS:

For security, passwords are one way that can provide security for any network. When sending any packet or receiving any packet password are use both the way for security and every password is encrypted. Password encryption extends the security.

## Syslog:

The Syslog server is used to maintain the logs and this will help us in knowing the traffic of the network. If any intruder enters or exits the network we can get the foot print of the network.

TFTP:

This server is used to store the data and it will help in the time of recovery. The TFTP server have all the important files stored in it.

**Phase 3**

1. **Technologies (LAN)**

Cisco’s Hierarchical three-layer model consists of access, distribution and core layers which has its own importance in configuring LAN and WAN network designs. The use of each layer is as follows:

**Core layer:**

* **Frame Relay:**
* Frame relay is a packet-switching methodology that uses layer-2 technology. It is intended for cost-efficient data transmission for irregular traffic between local area network and between endpoints in wide area networks (WANs).
* The other option would be of leasing lines from the ISP, though it is the most reliable one but still that could be very costly comparatively and it always uses the same path for transmission and has fixed bandwidth.
* On other hand, Frame relay is cost effective compare to leasing lines as ISP will setup a virtual line for communicating and even performance is high, adding ease of management and more number of interface.
* For working Frame relay, all router from all the sites are connected to frame relay for communication to other. There is no physical circuit between sites but there is a virtual circuit. Further, for communication between one site to other, Data link connection identifier (DLCI) number is used which is provided by the ISP. The number of DLCI that a network have is the number of link between the site connected as one DLCI = one virtual line.

A close up of a device

Description automatically generated

* **Routers:**
* A router is a networking device and uses a 3-layer technology. A router is a internetworking device which makes communication possible between 2or more different device present at different geographical location.
* As using the 3-layer technology, it communicates using packet to different device.
* Router works as, it uses routing table for selecting path through which it should send the packet.
* Additionally, Cisco provides the router with more options of customization.

Cisco design the router and it has divided routers in 3-layer, namely,

1. **Access router layer:** This type of routers is mostly used by small organization an are said to be desktop layer router. Moreover, routers in access router layer, are not upgradable and is said to be fixed router.
2. **Distributed router layer:** This type of routers is mostly used by ISP and are said to be ISP layer router. Moreover, routers in distributed router layer, are upgradable and is said to be modular router.
3. **Core router layer:** This type of routers is mostly used by Global ISP are said to be Global layer router. Moreover, routers in core router layer, are upgradable and is said to be modular router.

* For this network, using router at core layer.

**Distribution layer:**

* **Multilayer Switch:**
* Multilayer switches work in layer 2 and 3 which excludes the need of dedicated routers.
* It supports dynamic routing and inter VLAN routing.
* Multilayer switch needs to have IP routing enable.
* Multilayer switches provide many advantages against the traditional router. The primary benefit is that it lesser the number of layer maintaining the same level of redundancy.
* Secondly, it beats traditional router in terms of performance.
* Moreover, traffic is routed internal to switch devices.
* The major difference between the traditional router and multilayer switches are, firstly, multilayer switches routes packet fast then router. Secondly, router uses software to route while multilayer switches route packets on ASCI**.** Lastly, router support various WAN technology while Multilayer switches lack QoS feature and works in LAN. **A close up of a map

  Description automatically generated**

**Access layer:**

* **Switches:**
* Switches operates at layer-2 that is the data link layer and works with physical address (i.e MAC address).
* Switches works with fixed bandwidth and with flooding and unicast.
* As it learns MAC address, it also maintains MAC address table.
* There is different type of Switches available.

1. **Manageable switches:** An IP address can be assigned, and configuration can be made and has a console port.
2. **Unmanageable switches:** An IP address cannot be assigned, and configuration cannot be made and has no console port.

* Cisco have designed a model that divides switches in 3 layers:

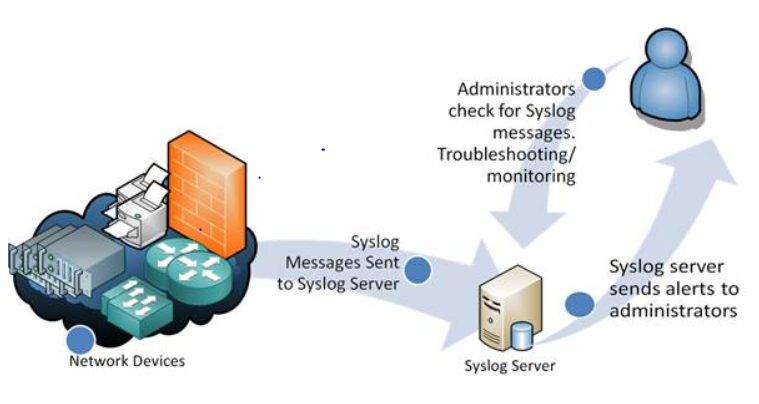
1. **Access layer switches:** This layer switches are directly connected to end user. It only reads and error checks on only 64 bytes of frame and if it finds no error it just forwards it. Its latency is medium. A default switching method is Modified Cut-Through or fragment free.
2. **Distributed layer switches:** A default switching method is store and forward and has the highest error checking rate and even latency is high.
3. **Core layer switches:** A default switching method isCut through and does not do error checking rate and even latency is low.
4. **Network Management**

**Syslog server**

Syslog is a path for network device to send occasion messages to a logging server – normally known as a Syslog server. The Syslog protocol is upheld by a wide scope of device and can be utilized to log various kinds of event. For instance, a router may send messages about user signing on to support sessions, while a web-server may log get to denied events.

Most system equipment, similar to router and switches, can send Syslog messages. That, however \*nix servers likewise can produce Syslog information, as do most firewalls, a few printers, and even web-servers like Apache. Windows-based servers don't bolster Syslog locally, however an enormous number of third party make it simple to gather Windows Event Log or IIS information and forward it to a Syslog server.

Dissimilar to SNMP, Syslog can't be utilized to "poll" device to accumulate data. For instance, SNMP has a complex progressive structure that permits an administration station to approach a gadget for data on things like temperature information or accessible circle space. That is unrealistic with Syslog – it just sends messages to a focal area when explicit event are activated.



**Syslog Servers**: Syslog is efficient way to consolidate from multiple source into singleton site. It uses few components

**A syslog listener**: It receive messages sent over network

**A database**: Large network generate huge data of Syslog data.

Management and filtering software: As a result of the potential for a lot of data, it very well may be cumbersome to discover explicit log entries when required. The arrangement is to utilize a syslog server that both computerizes some portion of the work and makes it simple to filter and view significant log messages.

## Routing Protocol:

EIGRP (Enhanced Interior Gateway Routing Protocol):

Enhanced Interior Gateway Routing Protocol (EIGRP) is an interior gateway protocol suited for many different topologies and media. In a well-designed network, EIGRP scales well and provides extremely quick convergence times with minimal network traffic.

## EIGRP Theory of Operation

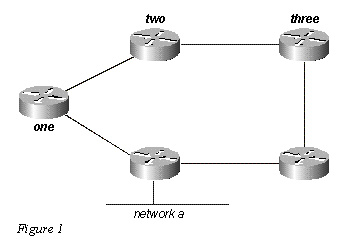
Some of the many advantages of EIGRP are:

* very low usage of network resources during normal operation; only hello packets are transmitted on a stable network
* when a change occurs, only routing table changes are propagated, not the entire routing table; this reduces the load the routing protocol itself places on the network
* rapid convergence times for changes in the network topology (in some situations convergence can be almost instantaneous)

EIGRP is an enhanced distance vector protocol, relying on the Diffused Update Algorithm (DUAL) to calculate the shortest path to a destination within a network.

### Basic Theory

A typical distance vector protocol saves the following information when computing the best path to a destination: the distance (total metric or distance, such as hop count) and the vector (the next hop). For instance, all the routers in the network in Figure 1 are running Routing Information Protocol (RIP). Router Two chooses the path to Network A by examining the hop count through each available path.

[](https://www.cisco.com/c/dam/en/us/support/docs/ip/enhanced-interior-gateway-routing-protocol-eigrp/16406-eigrp-toc-00.gif)

Since the path through Router Three is three hops, and the path through Router One is two hops, Router Two chooses the path through One and discards the information it learned through Three. If the path between Router One and Network A goes down, Router Two loses all connectivity with this destination until it times out the route of its routing table (three update periods, or 90 seconds), and Router Three re-advertises the route (which occurs every 30 seconds in RIP). Not including any hold-down time, it will take between 90 and 120 seconds for Router Two to switch the path from Router One to Router Three.

EIGRP, instead of counting on full periodic updates to re-converge, builds a topology table from each of its neighbor's advertisements (rather than discarding the data), and converges by either looking for a likely loop-free route in the topology table, or, if it knows of no other route, by querying its neighbors. Router Two saves the information it received from both Routers One and Three. It chooses the path through One as its best path (the successor) and the path through Three as a loop-free path (a feasible successor). When the path through Router One becomes unavailable, Router Two examines its topology table and, finding a feasible successor, begins using the path through Three immediately.

Metrics:

EIGRP contains mainly five metrics: minimum bandwidth, delay, load, reliability, and maximum transmission unit (MTU). Of these five metrics, by default, only minimum bandwidth and delay are used to compute best path. Unlike most metrics, minimum bandwidth is set to the minimum bandwidth of the entire path, and it does not reflect how many hops or low bandwidth links are in the path. Delay is a cumulative value which increases by the delay value of each segment in the path.

Phase 4

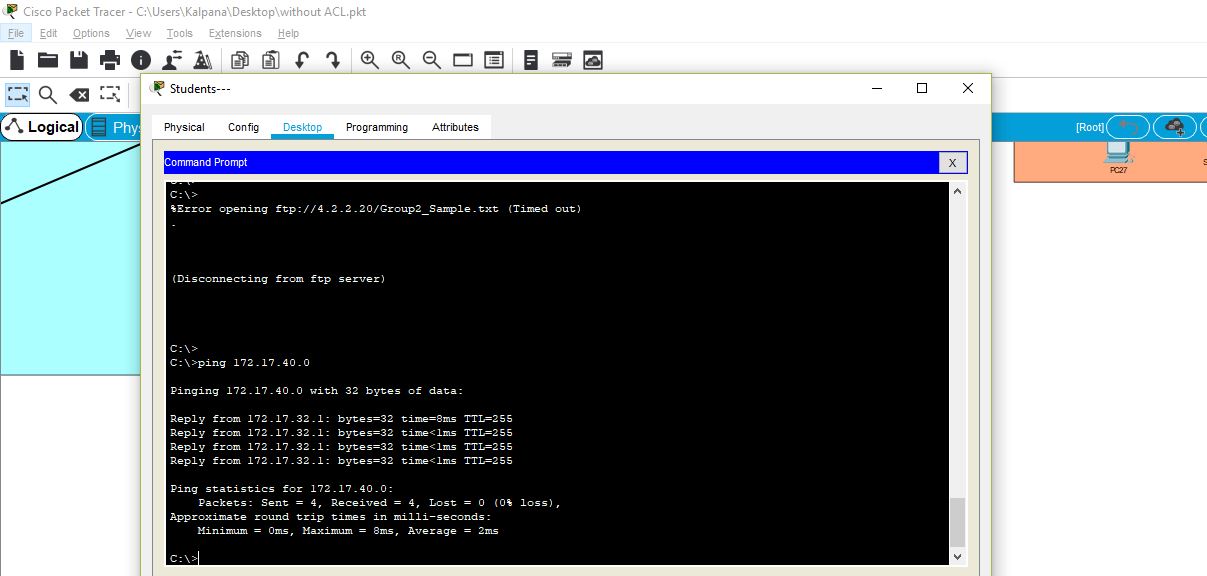
1. **Network Testing**

Testing is done to check whether the campus network is done in an anticipated manner. It can be done in numerous ways. During testing we look up for the proper functionality of the proposed business and technical goals for the university. LAN and WAN validation as well as network connectivity are also an important part of the testing. The tests include ……………………….

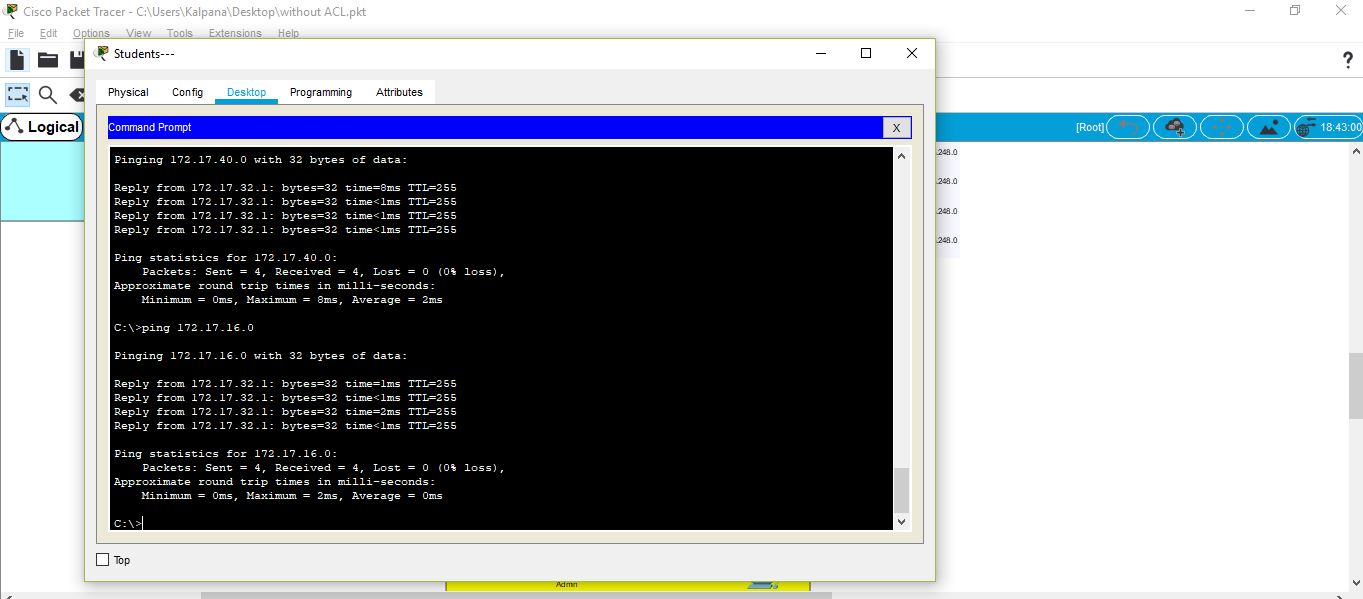
Ping Screenshot (LAN)

The Ping Screenshots of LAN includes the important pinging between each networks in the entire Hogwarts Design.

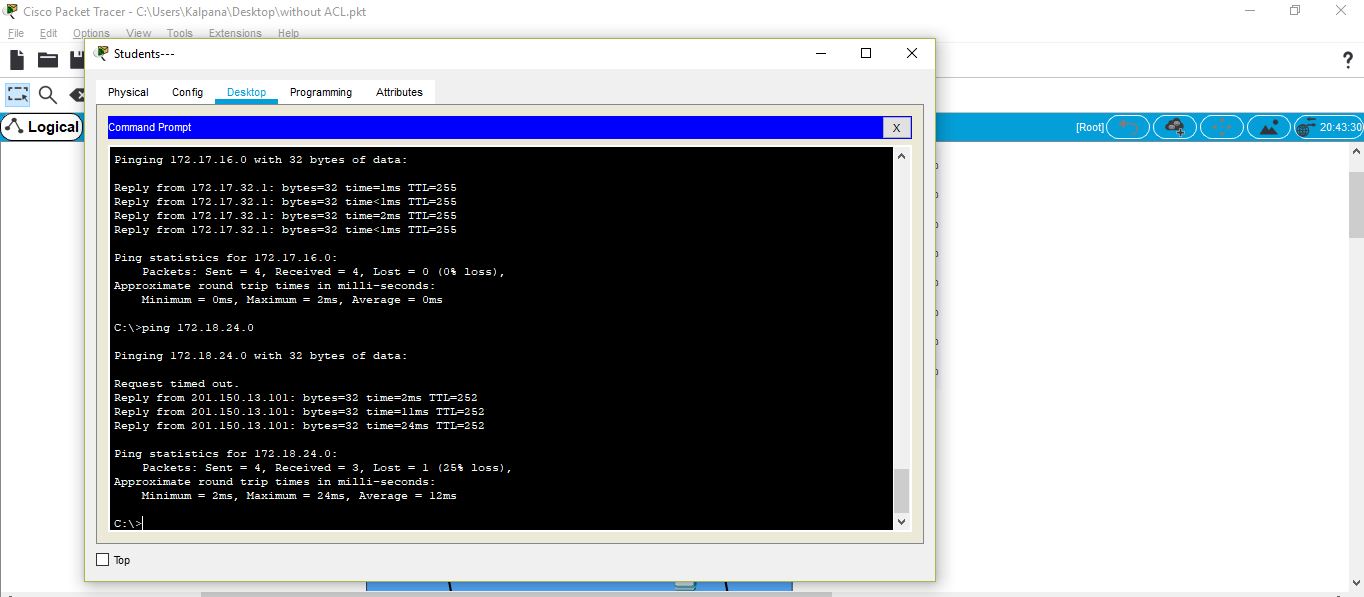
Ping level: Same Building and Same Floor network ping.



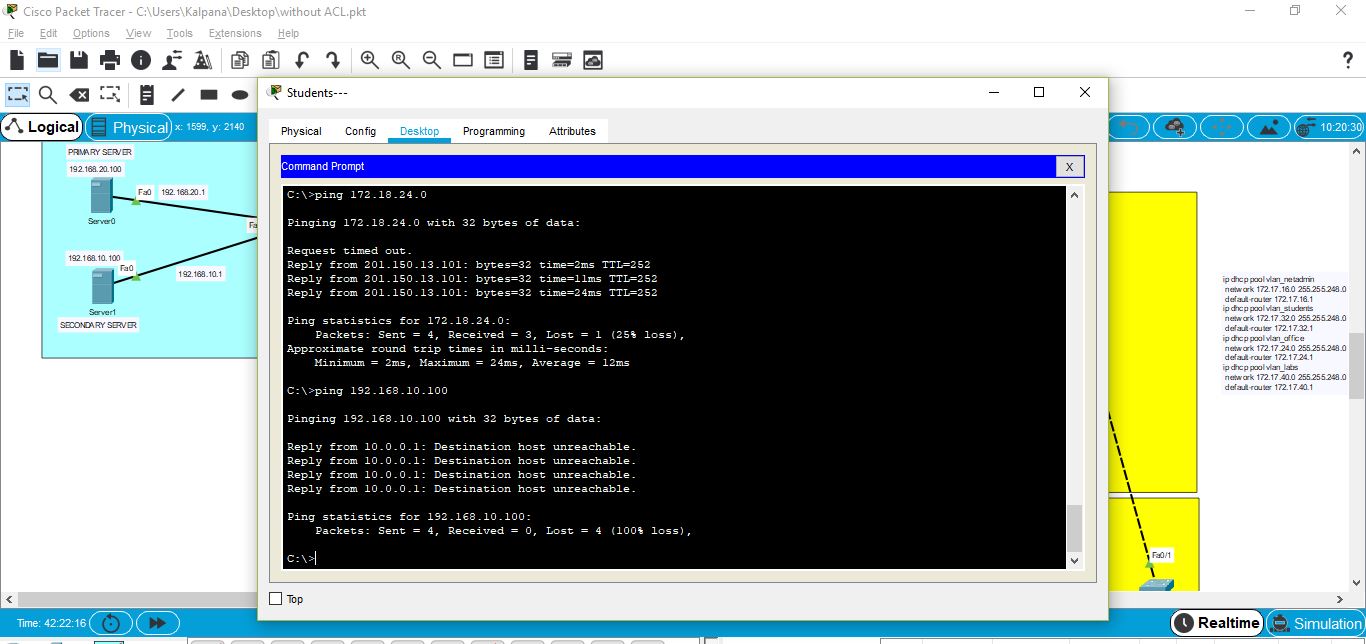
Ping Level: Different floors and diffferent network ping



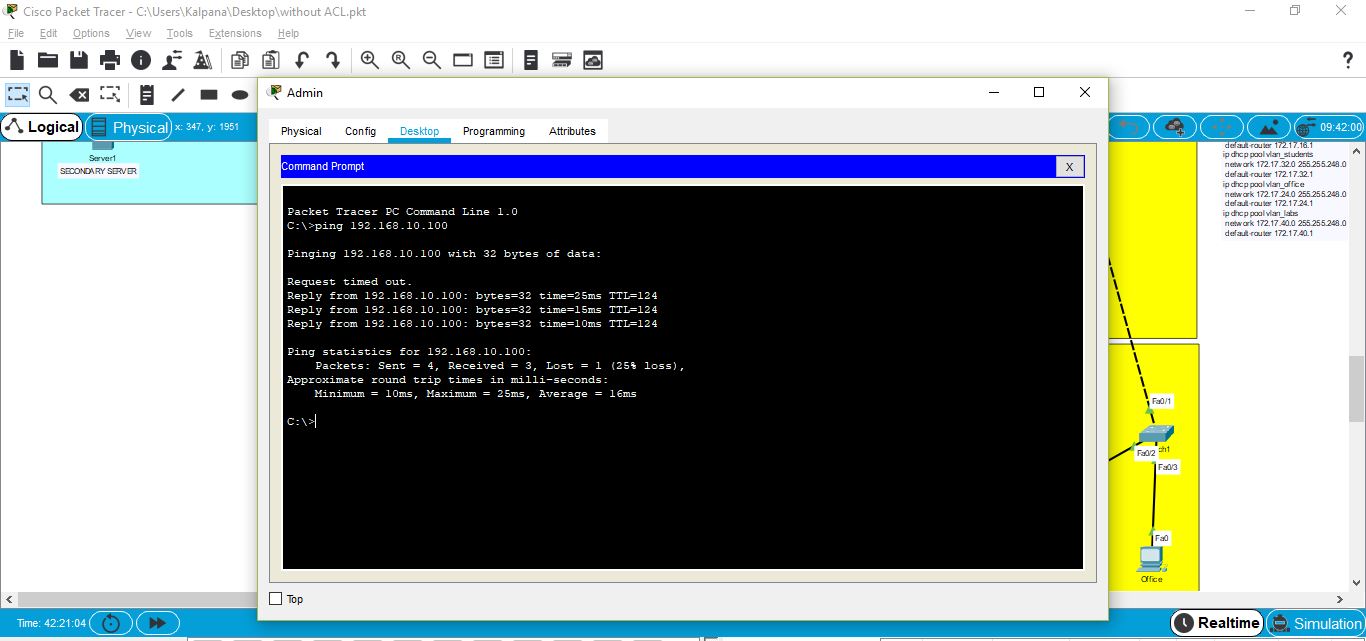
Ping Level : Different Network and Different Location Ping.



Ping Level: Denial of Access to students from accessing the primary and secondary servers

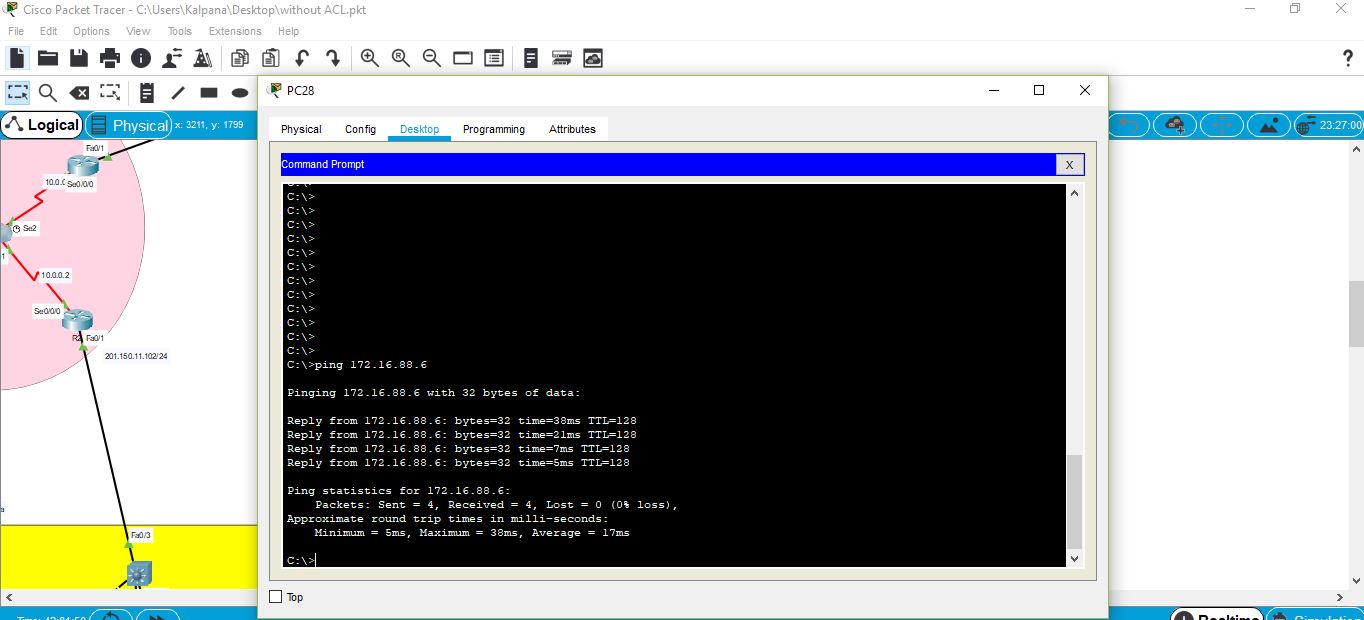


Ping Level: ACL permission granting to the admins for accessing the servers.



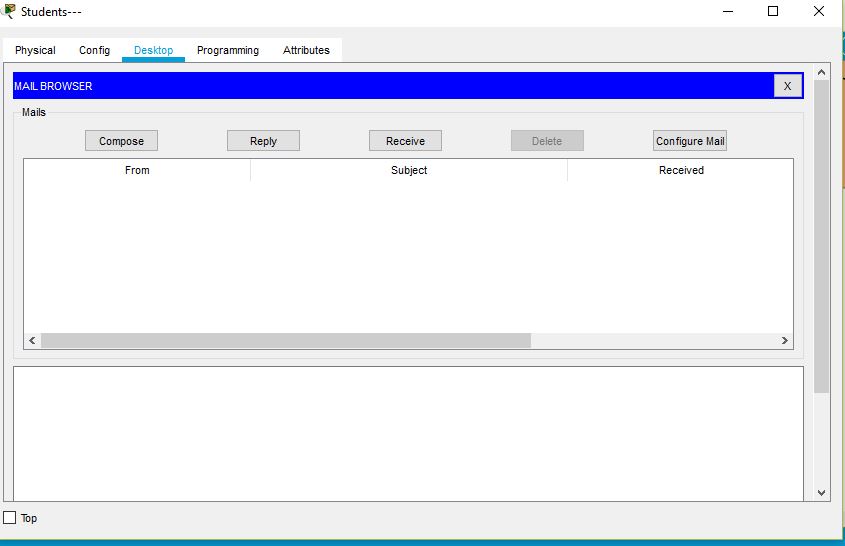
Ping Screenshot (WAN)

Ping Level: Smart phone device ping to a network.

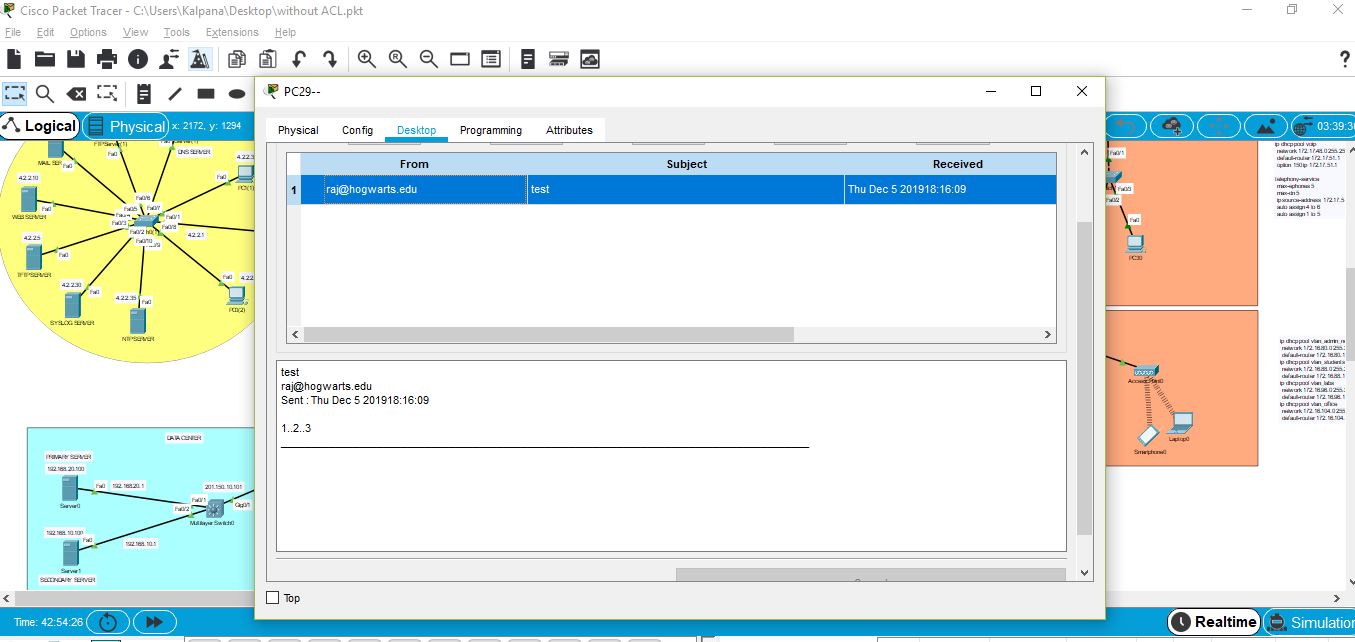


Email Profile

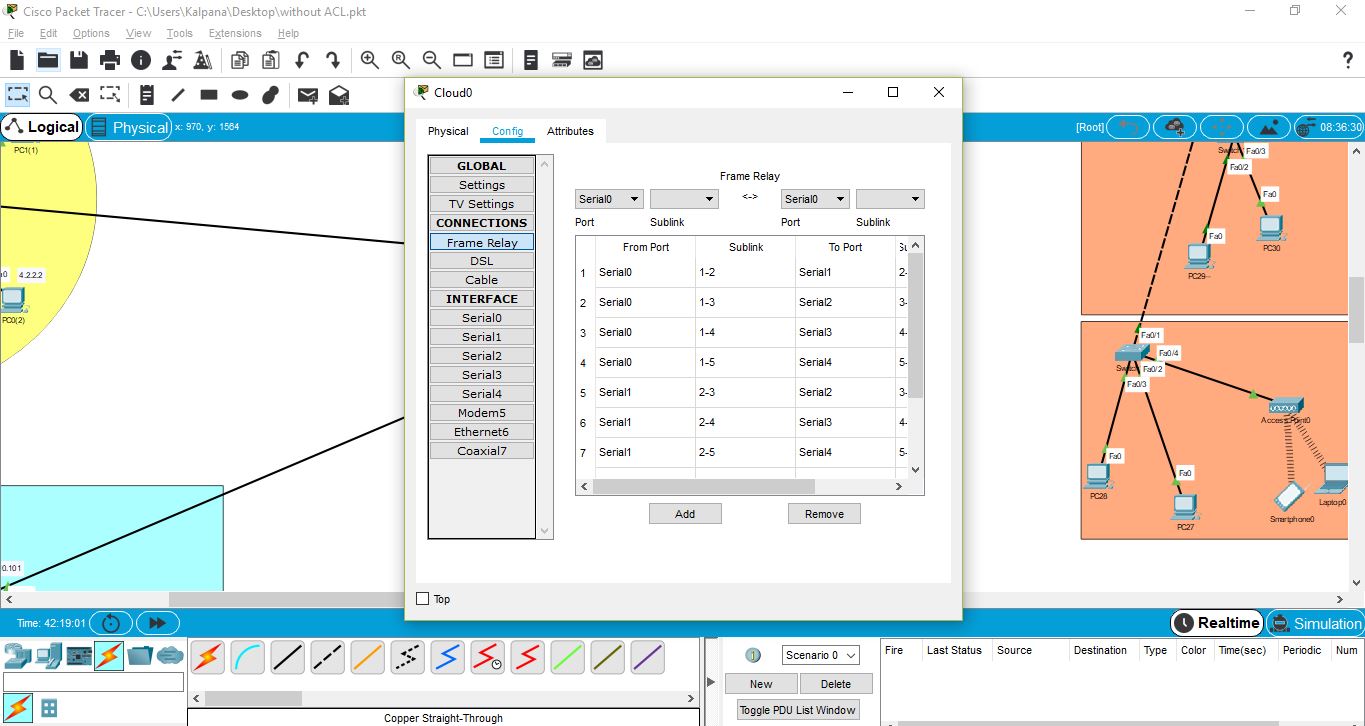
Interface of the email application



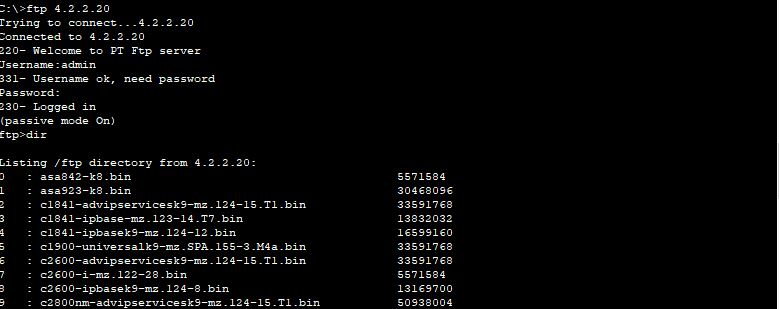
Email Message Received

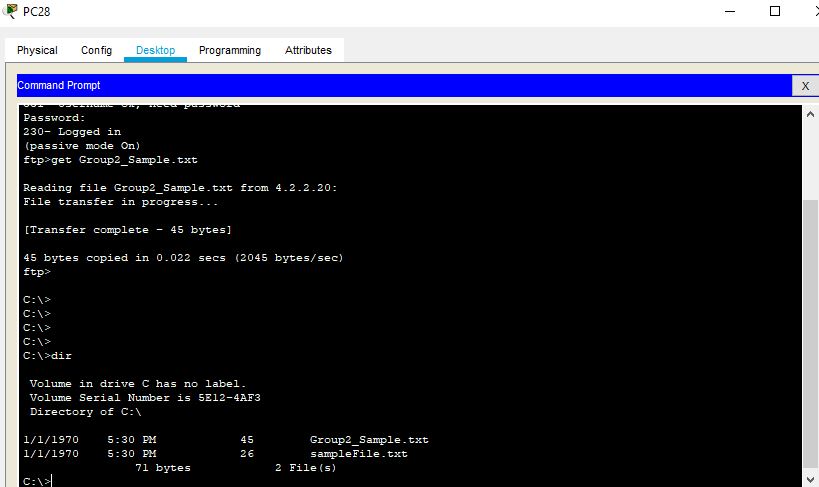


Frame Relay Interface:

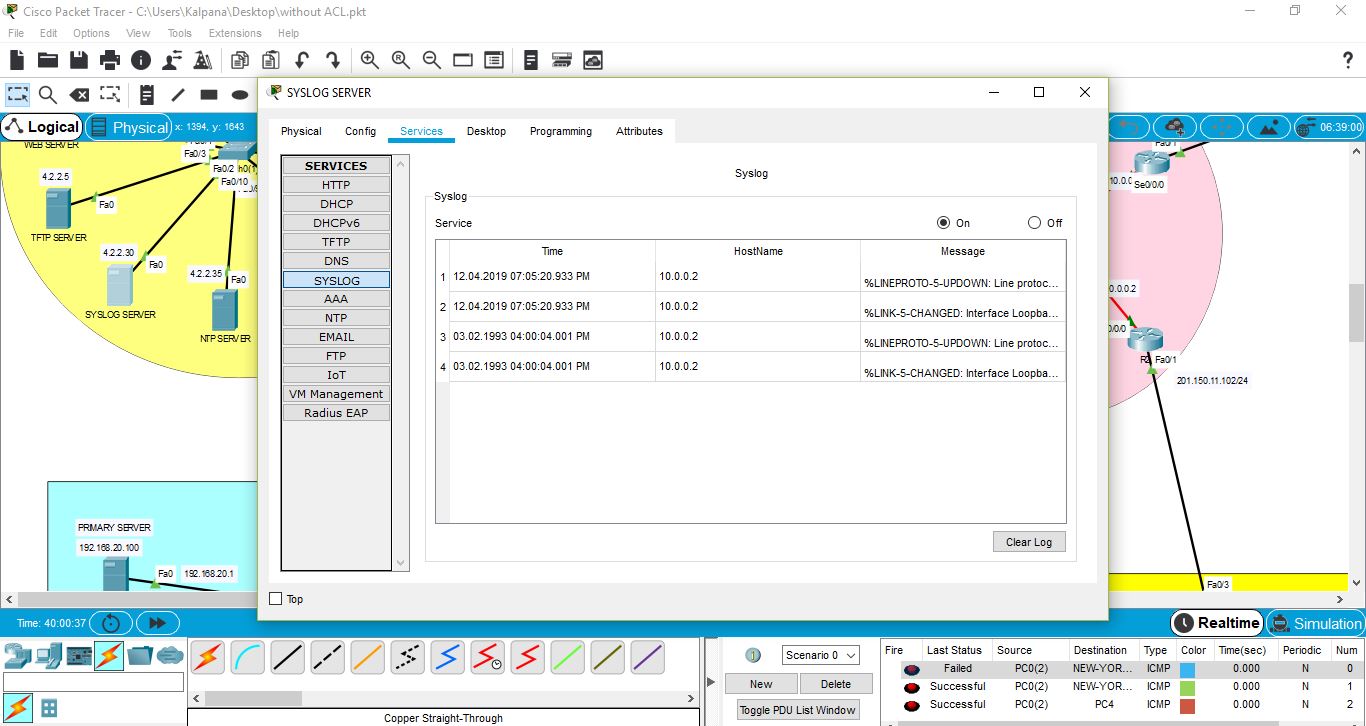


FTP Server

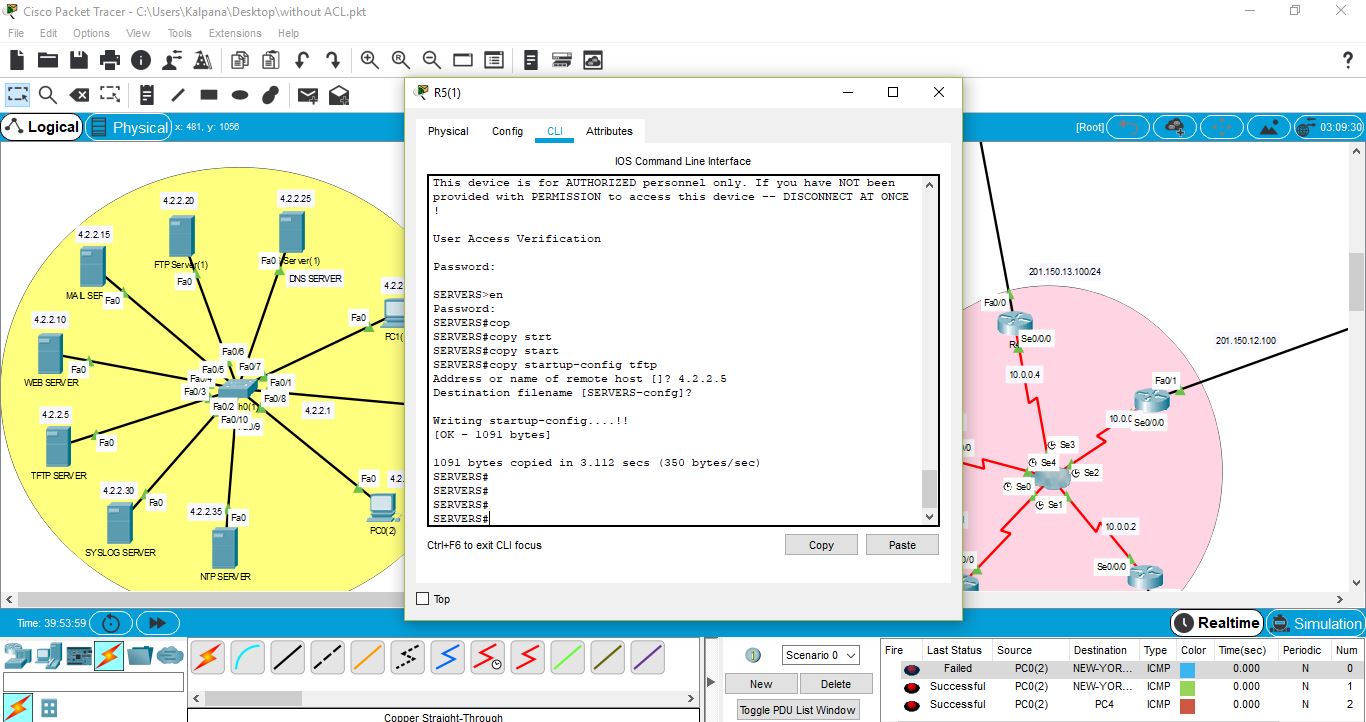




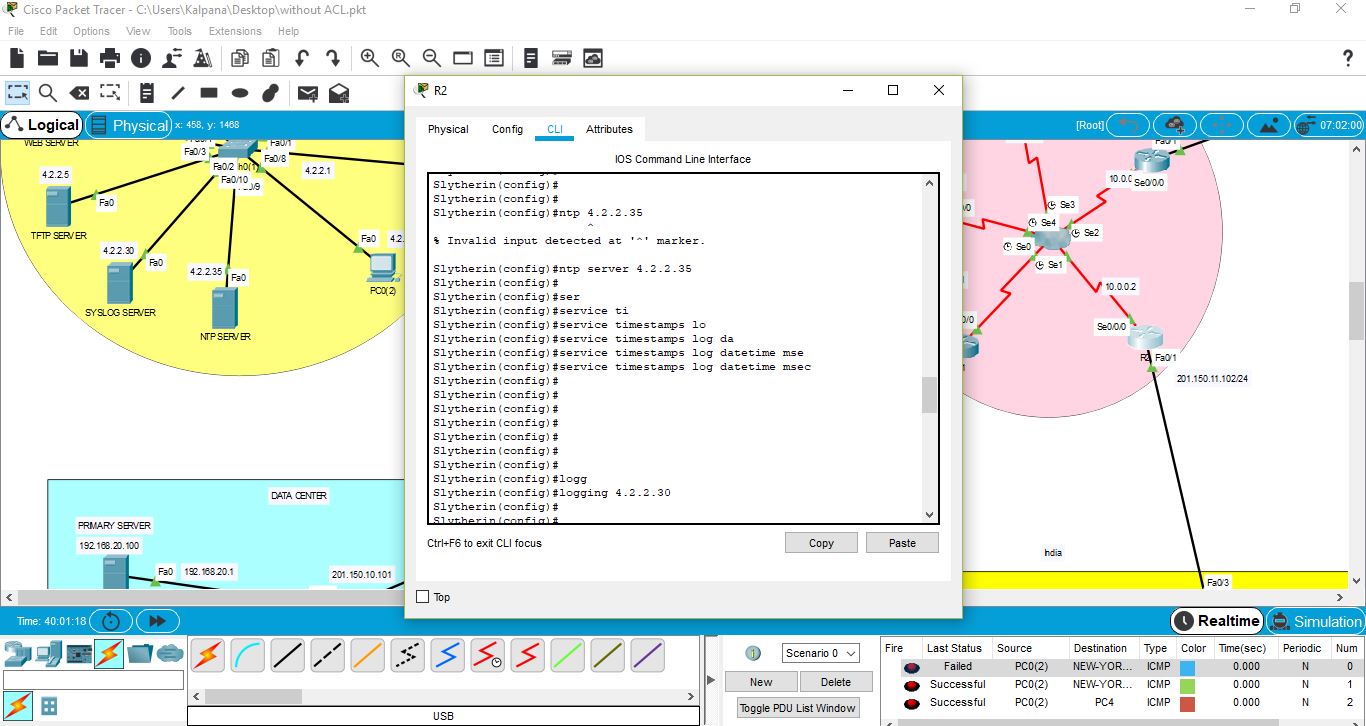
Syslog



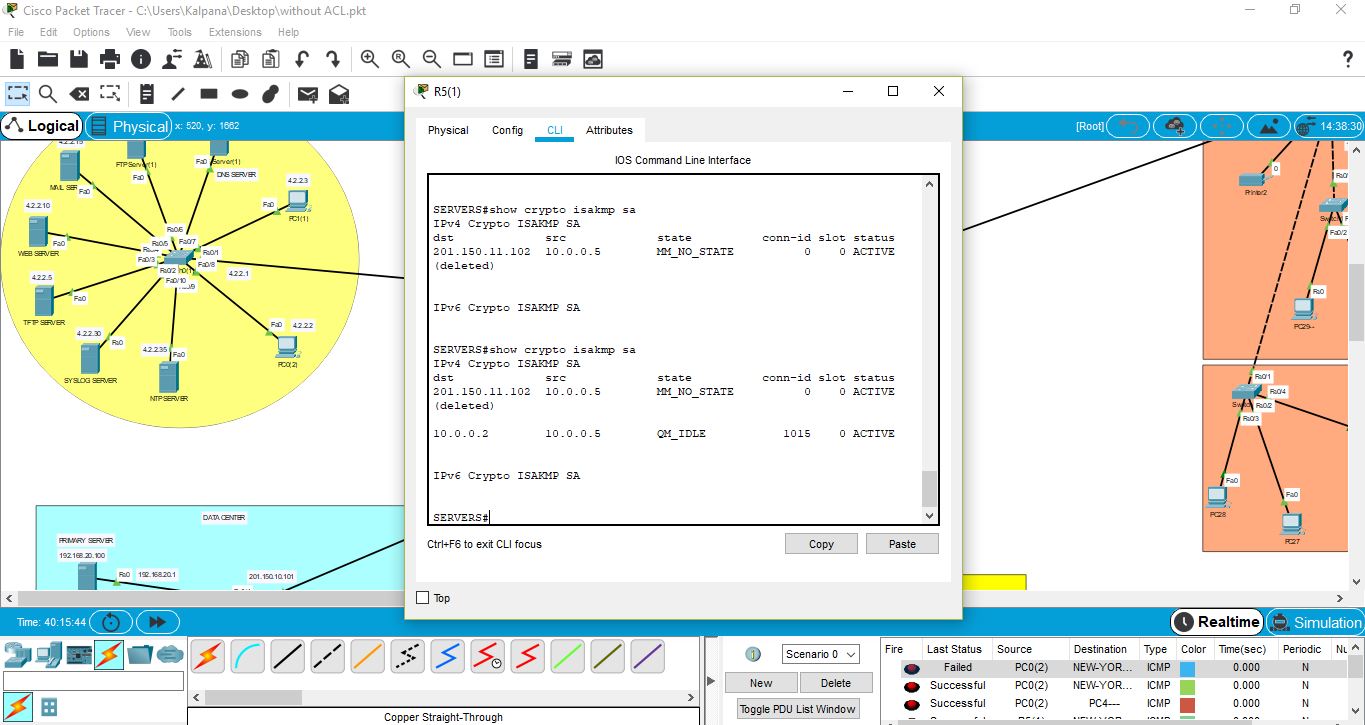
TFTP:

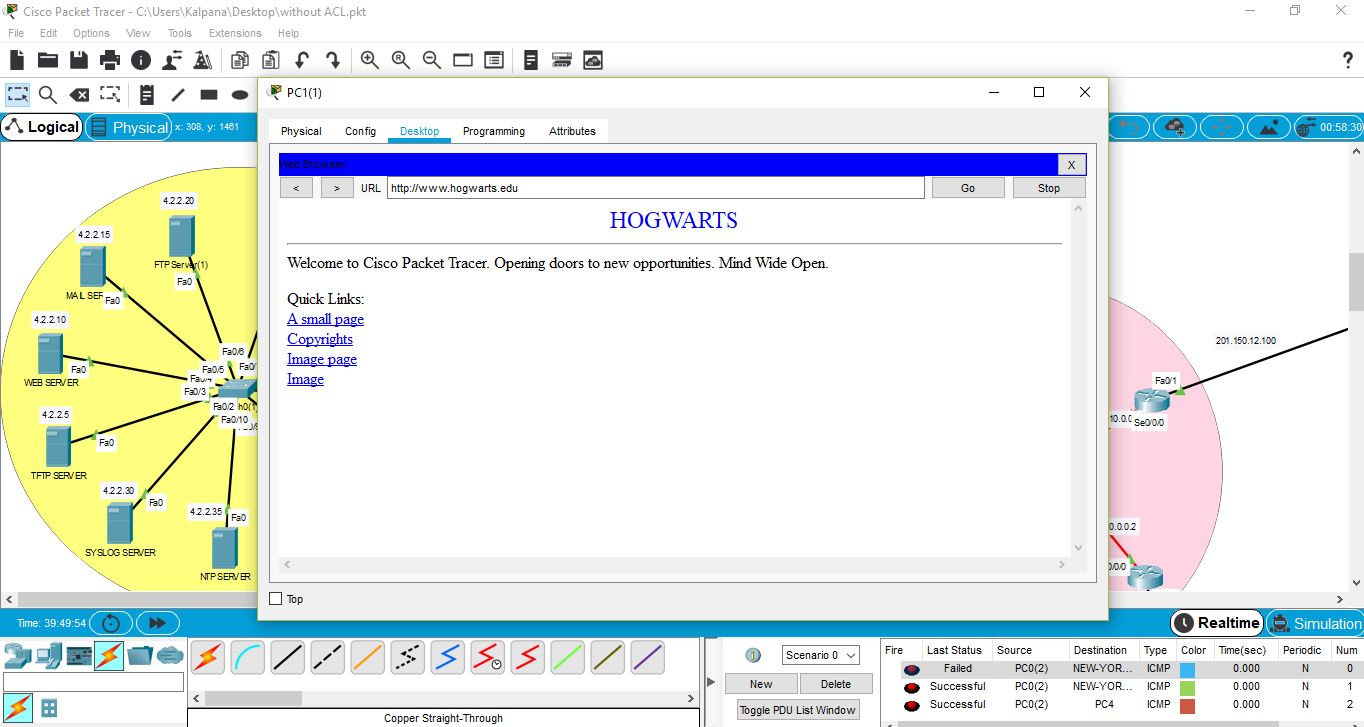


NTP:



VPN :



Web-DNS

Annexure

**Multilayer Switch Commands**

Multi Layer Switch India :

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Building\_2

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

ip dhcp excluded-address 172.17.16.1

ip dhcp excluded-address 172.17.24.1

ip dhcp excluded-address 172.17.32.1

ip dhcp excluded-address 172.17.40.1

!

ip dhcp pool vlan\_netadmin

network 172.17.16.0 255.255.248.0

default-router 172.17.16.1

ip dhcp pool vlan\_students

network 172.17.32.0 255.255.248.0

default-router 172.17.32.1

ip dhcp pool vlan\_office

network 172.17.24.0 255.255.248.0

default-router 172.17.24.1

ip dhcp pool vlan\_labs

network 172.17.40.0 255.255.248.0

default-router 172.17.40.1

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

description TO\_Switch\_1

switchport trunk encapsulation dot1q

!

interface FastEthernet0/2

description TO\_Switch\_2

switchport trunk encapsulation dot1q

!

interface FastEthernet0/3

no switchport

ip address 172.17.64.254 255.255.248.0

duplex auto

speed auto

!

interface FastEthernet0/4

no switchport

no ip address

duplex auto

speed auto

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

no ip address

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan100

mac-address 0060.3e07.9d01

ip address 172.17.16.1 255.255.248.0

!

interface Vlan200

mac-address 0060.3e07.9d02

ip address 172.17.24.1 255.255.248.0

!

interface Vlan300

mac-address 0060.3e07.9d03

ip address 172.17.32.1 255.255.248.0

!

interface Vlan400

mac-address 0060.3e07.9d04

ip address 172.17.40.1 255.255.248.0

!

router eigrp 1

network 10.0.0.0

network 172.17.0.0

auto-summary

!

ip default-gateway 172.17.64.253

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

Multi Layer Switch of New York:

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Building\_3

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

ip dhcp excluded-address 172.18.16.1

ip dhcp excluded-address 172.18.24.1

ip dhcp excluded-address 172.18.32.1

ip dhcp excluded-address 172.18.48.1

ip dhcp excluded-address 172.18.56.1

ip dhcp excluded-address 172.18.64.1

ip dhcp excluded-address 172.18.72.1

ip dhcp excluded-address 172.18.48.3

!

ip dhcp pool VLAN\_STUDENTS

network 172.18.24.0 255.255.248.0

default-router 172.18.24.1

ip dhcp pool VLAN\_labs

network 172.18.16.0 255.255.248.0

default-router 172.18.16.1

ip dhcp pool VLAN\_library

network 172.18.64.0 255.255.248.0

default-router 172.18.64.1

ip dhcp pool VLAN\_research

network 172.18.72.0 255.255.248.0

default-router 172.18.72.1

ip dhcp pool VLAN\_admins

network 172.18.56.0 255.255.248.0

default-router 172.18.56.1

ip dhcp pool VLAN\_office

network 172.18.48.0 255.255.248.0

default-router 172.18.48.1

ip dhcp pool VLAN\_mgmt

network 172.18.40.0 255.255.248.0

default-router 172.18.40.1

ip dhcp pool VLAN\_finance

network 172.18.32.0 255.255.248.0

default-router 172.18.32.1

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

no switchport

ip address 192.168.17.1 255.255.255.0

duplex auto

speed auto

!

interface FastEthernet0/2

description TO\_Floor\_1\_Switch

switchport trunk encapsulation dot1q

!

interface FastEthernet0/3

description TO\_Floor\_2\_Switch

switchport trunk encapsulation dot1q

!

interface FastEthernet0/4

description TO\_Floor\_3\_Switch

switchport trunk encapsulation dot1q

!

interface FastEthernet0/5

description TO\_Floor\_4\_Switch

switchport trunk encapsulation dot1q

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.13.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan500

ip address 172.18.16.1 255.255.248.0

!

interface Vlan510

ip address 172.18.24.1 255.255.248.0

!

interface Vlan520

ip address 172.18.32.1 255.255.248.0

!

interface Vlan530

ip address 172.18.40.1 255.255.248.0

!

interface Vlan540

ip address 172.18.48.1 255.255.248.0

!

interface Vlan550

ip address 172.18.56.1 255.255.248.0

!

interface Vlan560

ip address 172.18.64.1 255.255.248.0

!

interface Vlan570

ip address 172.18.72.1 255.255.248.0

!

router eigrp 1

network 201.150.13.0

network 172.18.0.0

auto-summary

!

ip default-gateway 201.150.13.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

Multi Layer Switch of West Haven :

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Building\_1

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

ip dhcp excluded-address 172.16.80.1

ip dhcp excluded-address 172.16.88.1

ip dhcp excluded-address 172.16.96.1

ip dhcp excluded-address 172.16.104.1

!

ip dhcp pool vlan\_admin\_net

network 172.16.80.0 255.255.248.0

default-router 172.16.80.1

ip dhcp pool vlan\_students

network 172.16.88.0 255.255.248.0

default-router 172.16.88.1

ip dhcp pool vlan\_labs

network 172.16.96.0 255.255.248.0

default-router 172.16.96.1

ip dhcp pool vlan\_office

network 172.16.104.0 255.255.248.0

default-router 172.16.104.1

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

no switchport

ip address 172.16.51.2 255.255.248.0

duplex auto

speed auto

!

interface FastEthernet0/2

description TO\_WEST\_HAVEN\_1\_FLOOR\_1\_SWITCH

switchport trunk encapsulation dot1q

!

interface FastEthernet0/3

description TO\_WEST\_HAVEN\_1\_FLOOR\_1\_SWITCH

switchport trunk encapsulation dot1q

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.12.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan100

mac-address 0001.6462.2e01

ip address 172.16.80.1 255.255.248.0

!

interface Vlan200

mac-address 0001.6462.2e02

ip address 172.16.88.1 255.255.248.0

!

interface Vlan300

mac-address 0001.6462.2e03

ip address 172.16.96.1 255.255.248.0

!

interface Vlan400

mac-address 0001.6462.2e04

ip address 172.16.104.1 255.255.248.0

!

router eigrp 1

network 201.150.12.0

network 172.16.0.0

auto-summary

!

router rip

!

ip default-gateway 201.150.12.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

!

!

Main Switch to Data Center:

hostname data\_switch

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

switchport access vlan 10

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/2

switchport access vlan 20

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/3

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.10.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan10

mac-address 00d0.97b2.8b01

ip address 192.168.20.1 255.255.255.0

!

interface Vlan20

mac-address 00d0.97b2.8b02

ip address 192.168.10.1 255.255.255.0

!

router eigrp 1

network 192.168.10.0

network 192.168.20.0

network 201.150.10.0

auto-summary

!

ip default-gateway 201.150.10.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

login

!

!

!

!

end

data\_switch#

data\_switch#

data\_switch#

data\_switch#copy run

data\_switch#copy running-config st

data\_switch#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

data\_switch#

data\_switch#

data\_switch#

data\_switch#

data\_switch con0 is now available

Press RETURN to get started.

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is down: holding time expired

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is up: new adjacency

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is down: Interface Goodbye received

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is up: new adjacency

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE !

User Access Verification

Password:

data\_switch>en

Password:

data\_switch#sh run

Building configuration...

Current configuration : 1924 bytes

!

version 12.2(37)SE1

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname data\_switch

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

switchport access vlan 10

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/2

switchport access vlan 20

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/3

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.10.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan10

mac-address 00d0.97b2.8b01

ip address 192.168.20.1 255.255.255.0

!

interface Vlan20

mac-address 00d0.97b2.8b02

ip address 192.168.10.1 255.255.255.0

!

router eigrp 1

network 192.168.10.0

network 192.168.20.0

network 201.150.10.0

auto-summary

!

ip default-gateway 201.150.10.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

login

**Router Commands:**

**Router Commands to configure routing protocol EIGRP**

Command 1: router eigrp 1

Command 2: network ip address

Command 3: no shut

**Router Running Configuration**

**Frame Relay Router to Servers :**

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname SERVERS

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

crypto isakmp policy 20

encr 3des

hash md5

authentication pre-share

lifetime 3600

!

crypto isakmp key Group2@123 address 10.0.0.2

crypto isakmp key Group2@123 address 201.150.11.102

!

!

!

crypto ipsec transform-set HOGWARTS-SET esp-3des esp-md5-hmac

!

crypto map HOGWARTS\_MAP 20 ipsec-isakmp

set peer 201.150.11.102

set peer 10.0.0.2

set transform-set HOGWARTS-SET

match address 100

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

ip address 192.168.17.10 255.255.255.0

duplex auto

speed auto

!

interface FastEthernet0/1

ip address 4.2.2.254 255.255.255.0

duplex auto

speed auto

!

interface Serial0/0/0

ip address 10.0.0.5 255.0.0.0

encapsulation frame-relay

crypto map HOGWARTS\_MAP

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 192.168.17.0

network 4.0.0.0

auto-summary

!

ip classless

!

ip flow-export version 9

!

!

access-list 100 permit ip 4.0.0.0 0.255.255.255 172.17.0.0 0.0.255.255

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

**Frame Relay Router to Primary and Secondary Data Servers :**

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Data\_center

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

ip address 201.150.10.100 255.255.255.0

ip access-group 10 in

ip access-group 1 out

duplex auto

speed auto

!

interface FastEthernet0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/0/0

ip address 10.0.0.1 255.0.0.0

encapsulation frame-relay

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface GigabitEthernet0/1/0

no ip address

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 201.150.10.0

network 192.168.0.0

auto-summary

!

router rip

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/0

!

ip flow-export version 9

!

!

access-list 1 deny 172.16.96.0 0.0.0.255

access-list 1 deny 172.16.88.0 0.0.0.255

access-list 1 deny 172.17.32.0 0.0.0.255

access-list 1 deny 172.17.40.0 0.0.0.255

access-list 1 deny 172.18.24.0 0.0.0.255

access-list 1 deny 172.18.16.0 0.0.0.255

access-list 1 deny 172.18.64.0 0.0.0.255

access-list 1 deny 172.18.72.0 0.0.0.255

access-list 1 permit any

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

!

**Frame Relay To India Router :**

service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Slytherin

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

crypto isakmp policy 20

encr 3des

hash md5

authentication pre-share

lifetime 3600

!

crypto isakmp key Group2@123 address 10.0.0.5

!

!

!

crypto ipsec transform-set HOGWARTS-SET esp-3des esp-md5-hmac

!

crypto map HOGWARTS\_MAP 20 ipsec-isakmp

set peer 10.0.0.5

set transform-set HOGWARTS-SET

match address 100

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface Loopback0

no ip address

shutdown

!

interface FastEthernet0/0

ip address 192.168.52.10 255.255.255.0

duplex auto

speed auto

!

interface FastEthernet0/1

ip address 172.17.64.253 255.255.248.0

duplex auto

speed auto

!

interface Serial0/0/0

ip address 10.0.0.2 255.0.0.0

encapsulation frame-relay

crypto map HOGWARTS\_MAP

!

interface Serial0/0/1

no ip address

clock rate 2000000

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 192.168.52.0

network 201.150.11.0

network 201.150.0.0

network 172.16.0.0

network 172.17.0.0

auto-summary

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/1

!

ip flow-export version 9

!

!

access-list 100 permit ip 172.17.0.0 0.0.255.255 4.0.0.0 0.255.255.255

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

logging 4.2.2.30

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

!

ntp server 4.2.2.35

Frame Relay to West Haven Router:

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Gryffindor

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

no ip address

duplex auto

speed auto

!

interface FastEthernet0/1

ip address 201.150.12.100 255.255.255.0

duplex auto

speed auto

!

interface Serial0/0/0

ip address 10.0.0.3 255.0.0.0

encapsulation frame-relay

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 192.168.48.0

network 172.16.0.0

network 201.150.12.0

network 201.150.0.0

network 172.18.0.0

auto-summary

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/1

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

!

Frame Relay To NYC Router :

!

hostname Hufflepuff

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

ip address 201.150.13.100 255.255.255.0

duplex auto

speed auto

!

interface FastEthernet0/1

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/0/0

ip address 10.0.0.4 255.0.0.0

encapsulation frame-relay

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 201.150.13.0

network 10.0.0.0

network 172.18.0.0

auto-summary

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/0

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

Frame Relay Router to New York :

hostname data\_switch

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

switchport access vlan 10

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/2

switchport access vlan 20

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/3

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.10.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan10

mac-address 00d0.97b2.8b01

ip address 192.168.20.1 255.255.255.0

!

interface Vlan20

mac-address 00d0.97b2.8b02

ip address 192.168.10.1 255.255.255.0

!

router eigrp 1

network 192.168.10.0

network 192.168.20.0

network 201.150.10.0

auto-summary

!

ip default-gateway 201.150.10.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

login

!

!

!

!

end

data\_switch#

data\_switch#

data\_switch#

data\_switch#copy run

data\_switch#copy running-config st

data\_switch#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

data\_switch#

data\_switch#

data\_switch#

data\_switch#

data\_switch con0 is now available

Press RETURN to get started.

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is down: holding time expired

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is up: new adjacency

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is down: Interface Goodbye received

%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 201.150.10.100 (GigabitEthernet0/1) is up: new adjacency

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE !

User Access Verification

Password:

data\_switch>en

Password:

data\_switch#sh run

Building configuration...

Current configuration : 1924 bytes

!

version 12.2(37)SE1

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname data\_switch

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

ip routing

!

!

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/1

switchport access vlan 10

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/2

switchport access vlan 20

switchport mode access

switchport nonegotiate

!

interface FastEthernet0/3

!

interface FastEthernet0/4

!

interface FastEthernet0/5

!

interface FastEthernet0/6

!

interface FastEthernet0/7

!

interface FastEthernet0/8

!

interface FastEthernet0/9

!

interface FastEthernet0/10

!

interface FastEthernet0/11

!

interface FastEthernet0/12

!

interface FastEthernet0/13

!

interface FastEthernet0/14

!

interface FastEthernet0/15

!

interface FastEthernet0/16

!

interface FastEthernet0/17

!

interface FastEthernet0/18

!

interface FastEthernet0/19

!

interface FastEthernet0/20

!

interface FastEthernet0/21

!

interface FastEthernet0/22

!

interface FastEthernet0/23

!

interface FastEthernet0/24

!

interface GigabitEthernet0/1

no switchport

ip address 201.150.10.101 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

!

interface Vlan1

no ip address

shutdown

!

interface Vlan10

mac-address 00d0.97b2.8b01

ip address 192.168.20.1 255.255.255.0

!

interface Vlan20

mac-address 00d0.97b2.8b02

ip address 192.168.10.1 255.255.255.0

!

router eigrp 1

network 192.168.10.0

network 192.168.20.0

network 201.150.10.0

auto-summary

!

ip default-gateway 201.150.10.100

ip classless

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

login

Frame Relay Router to West Haven:

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Gryffindor

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

no ip address

duplex auto

speed auto

!

interface FastEthernet0/1

ip address 201.150.12.100 255.255.255.0

duplex auto

speed auto

!

interface Serial0/0/0

ip address 10.0.0.3 255.0.0.0

encapsulation frame-relay

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 192.168.48.0

network 172.16.0.0

network 201.150.12.0

network 201.150.0.0

network 172.18.0.0

auto-summary

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/1

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

!

!

!

end

Gryffindor#

Gryffindor con0 is now available

Press RETURN to get started.

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE !

User Access Verification

Password:

Gryffindor>en

Password:

Gryffindor#sh run

Building configuration...

Current configuration : 1182 bytes

!

version 12.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

service password-encryption

!

hostname Gryffindor

!

!

!

enable secret 5 $1$mERr$7iEXza.wOU6GpxcepA4jQ.

!

!

!

!

!

!

no ip cef

no ipv6 cef

!

!

!

!

!

!

!

!

!

!

!

!

spanning-tree mode pvst

!

!

!

!

!

!

interface FastEthernet0/0

no ip address

duplex auto

speed auto

!

interface FastEthernet0/1

ip address 201.150.12.100 255.255.255.0

duplex auto

speed auto

!

interface Serial0/0/0

ip address 10.0.0.3 255.0.0.0

encapsulation frame-relay

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router eigrp 1

network 10.0.0.0

network 192.168.48.0

network 172.16.0.0

network 201.150.12.0

network 201.150.0.0

network 172.18.0.0

auto-summary

!

ip classless

ip route 0.0.0.0 0.0.0.0 FastEthernet0/1

!

ip flow-export version 9

!

!

!

banner motd ^C

This device is for AUTHORIZED personnel only. If you have NOT been provided with PERMISSION to access this device -- DISCONNECT AT ONCE ! ^C

!

!

!

!

!

line con 0

password 7 082943491E18170301

login

!

line aux 0

!

line vty 0 4

password 7 082943491E18170301

login

# Unimplemented Concepts

As per your directions I am adding this section which discusses BGP and Transparent Firewall.

BGP is acronym for Border Gateway Protocol which makes the web work and it is the routing protocol used to route traffic over the web. Routing protocols like BGP, OSPF, RIP, EIGRP are intended to assist router with neighbouring systems and since the web is a network of network, BGP spreads these networks to all BGP Routers over the world.

BGP neighbours, called peers, are built up by manual design among routers to make a TCP session. A BGP sends keep-alive messages each 60 seconds to keep up the connection. Among routing protocol, BGP utilizes TCP as its transport routing in an efficient manner.

When BGP runs between two peers in the equivalent Autonomous system, it is alluded to as Internal BGP. At the point when it runs between various Autonomous system frameworks, it is called External BGP. Routers on the limit of one Autonomous system trading data with another Autonomous system are called external BGP or edge routers and are regularly associated legitimately, while internal BGP peers can be interconnected through intermediate router. Other topologies are additionally conceivable, for example, running external BGP peering inside a VPN, permitting two remote locale to trade routing data in a protected and confined way. The primary contrast among internal BGP and external BGP peering is standing out routes that were gotten from one peer are proliferated to different peers. For example, new routes gained from an external BGP peer are ordinarily redistributed to all internal BGP peers just as all other external BGP peers. However, if new routes are found out on an internal BGP peering, at that point they are re-publicized distinctly to all external BGP peers. These routes spread principles adequately necessitate that all internal BGP looks inside an Autonomous system are interconnected in a full work.

Internal BGP is the concept we tried to implement and we couldn’t due to the lack of feature in Packet Tracer.

**Transparent Firewall**

Transparent firewall works on layer 2 and not considered as hop. It often calls as bump in the wire. It deals with mac lookup and forwarding is done through destination mac address. It’s outside and inside interface exists in the same network. We can induct a transparent firewall easily into an existing network because of its layer 2 characteristic.

**Some of the features of transparent firewall**

1. Each interface is a broadcast domain.
2. ASA performing secure transparent bridging between two broadcast domains in form of VLA
3. No routing protocol to troubleshoot
4. In common mode is going to see route lookup. In transparent mode it going to see media access lookup.
5. It supports – mac application talk, IPX traffic, MPLS traffic, BPDU traffic,
   * ARP inspection (most popular transparent inspection)

**Unsupported features of transparent firewall**

1. Dynamic DNS
2. HDCP relay
3. Dynamic routing protocol
4. Multicast ip routing
5. QOS (no investigation on layer 3)
6. VPN termination
7. Before 8.2 it doesn’t support

# Future Scope of the Network

The Hogwarts network is predicted to grow by 30% and the networks and features will help in the growth of the network and we can call the network as Dynamic Network because of this particular reason. Even the entire network gets three times of it is now Hogwarts Network can handle it.

## Cost Estimation of the Network

In real time these are the networks used and this will be the approximate cost of the entire network.

|  |  |
| --- | --- |
| **Device** | **Cost** |
| Cisco 9300 | $72,000 |
| Triplite SMART1500RMXL2UA UPS | $4,800 |
| Locking 520-P power cord | $424 |
| Cisco 10GBase-LR SFP 20km | $63,920 |
| Cisco 10GBase-LR SFP 10km | $36,000 |
| Single mode Fiber Patch cables 6 meter | $480 |
| Contract labor cable runs (cat6 and single mode fiber) | $32,000 |
| HPE ProLiant DL380 Gen10 Server (for HyperV private cloud) | $19,807.68 |
| Triplite ripp Lite 45U threaded 4-Post Rack | $1,519.96 |
| 19” Rack-Mount Equipment Cooling Fans. | $169.56 |
| **Total Network Cost** | **$ 231,121.00** |
| **Monthly Recurring Costs** | **$ 5,750** |

These are the approximate costs that going to cost for the Hogwarts network.

# References

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