Ball State Campus Area Network Design

An Honors Thesis (HONR 499)

by

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Abstract

Computer networks are the behind-the-scenes backbone of the any organization. For campus areas, such as universities or large companies, a campus area network is ideal as it is designed to have a lot of users and accessibility across many buildings. Due to its complexity and size, it is important that a network design is clear, concise, and can easily be replicated. The success of a business directly coincides with the success of the network supporting it. For a campus area such as Ball State University, many users are spread throughout many buildings so the network needs to support this. This paper discusses best practices for campus area network design and the design of a simple network for the Ball State University Campus.

Acknowledgements

I would like to thank Dr. David Hua for his help with this project. Without his guidance, I would probably still be staring at a blank screen trying to figure out how to get my ideas from my head to the paper. I am thankful for the support of the CT faculty as each one had a hand in my project by teaching me the skills necessary to succeed.

I would like to thank my family and friends for their support and willingness to help me with tasks to allow me to focus on my design. I would like to thank my classmates for their willingness to let me bounce ideas off them and their helpful words of advice to help guide me.

I would like to thank Cisco for having many helpful guides that I was able to use to better understand concepts and see examples when I found myself getting stuck or unsure.

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Process Analysis Statement

I knew what I wanted to do far before I figured out how to do it for this project. I knew I wanted to design a medium sized network and that I wanted to do it well. I did a couple network design case studies in my previous classes and loved what I was doing. I wanted to take that experience and build my own. Previously, I had worked with groups, so I was aware of what the others were doing, but I did not get to try those portions myself. I wanted to improve on those experiences and create a network in the way that I thought would be best. Finally, I knew I wanted to create something I was proud of. I wanted to create a clear, detailed plan that I can use as a reference down the road. I want to be able to take this to future interviews and confidently talk on my experiences and have something to show for it.

To start, I did a lot of brainstorming and researching to discover how best to go about my design. I looked through projects from past classes that were of a similar nature to get ideas. From here, I researched recommended practices, design ideas, and diagrams to help me envision how I would like my design to be set up. I knew initially that I wanted to do a hierarchical model for the design of this network and that I wanted to break it into smaller pieces. I decided it would be much easier to design my network if I could see it, so I started with a quick drawing of Johnson East on a half sheet of paper while working on something unrelated. From here it became a more detailed drawing on a full page. I started to build my Johnson East design using Visio but quickly decided to move to packet tracer so I could build my design and be able to configure it from the same place to save time and energy.

My packet tracer began with the data center. I built the data center first because at the time, I was unsure how to begin with the main campus. I built the data center then realized I needed to figure out my IP scheme, VLANs, and subnets in order to really do anything beyond that point. This led me to a lot of research as I knew in theory how I wanted my network to be addressed but struggled understanding how to make that idea into reality. I started to design based on my old projects, but as I went, these addressing schemes changed several times. I sat down with Dr. Hua, and he was able to help clear up my confusion leading me to my nearly final IP Scheme, VLAN Design, and VLSM. A few alterations of numbers were made as I implemented these plans on my Packet Tracer design.

With a successful plan, I was able to start with building my network. I started with a map of Ball State and making a list of all the buildings in the main campus area and their correlated building code name. I ended up with 56 buildings that I split into 8 Nodes. Nodes have between 6 and 9 buildings in them. I wanted to plan for future expansion and to keep from overloading my devices. The nodes are split into relative geographical areas starting at the north end of campus. Many of these splits occur where roads or other places felt natural for a separation. Node A is the largest node and the first one, so I started with my design here. I designed a topology for a large building to accommodate dorms as the dorms feature two ethernet ports per room. I estimated that it would take about 17 switches to accommodate the ethernet ports for Johnson East which was unfeasible for me to design to scale. I decided since many of these buildings would face the same problem to make generalized topologies for different sized buildings. I took into account how many end devices would be needed and adjusted the Layer 2 switch number from there. Once that was adjusted, I decided how many Multilayer (Layer 3) switches would be necessary. Once I designed my building types, I split my remaining buildings into size to determine which building would get which design. After I designed Node A, I designed the core on a basic level. This design changed slightly when I implemented it and discovered a neater way.

I started with a single building, Johnson East, and worked on applying IP addresses to device starting with the multilayer switches and ending with the end devices. I also configured hostnames and OSPF and

ensured all routing was working and all devices could ping. When I had Johnson East done, I did the same for Johnson West, followed by District Energy North, etc. until I had all Node A buildings complete. Once all buildings could route within itself, I moved up to the Node A devices to configure the node as a whole. After routing was working for the node, I moved on to Node B and did the same thing. When I had nodes A and B routing properly, I was able to create the other 6 nodes with their designs. I went through each device and changed the appropriate features to allow routing across the whole network. With all nodes configured, I configured routing for the core and for all connections to it. Throughout this process, I had many problems with OSPF and routing that I worked through either with a collection of online resources such as YouTube videos and reached out for help from others. After I had routing throughout the network, I started to work on documenting all I had done and showing examples of each piece. I continued to work on documentation and the Packet Tracer by working on it a little at a time, correcting errors at the time of finding, and making great progress.

I made all my decisions based on Cisco and other Industry recommendations combined with my experience. I picked the protocols and design that I thought would best suit my network. These decisions were made after evaluating past network design projects and determining what I liked and did not like about those results. I took the pieces I did not like and reevaluated them, researched, and came up with a different way. This design ultimately combines all the pieces I liked best from previous designs with how I think an ideal network would be. I am happy with the decisions I chose on protocols, design, and even devices. I feel as if this design highlights what I have learned through my program in a clear way that can directly translate to the professional field.

One of my biggest problems with this thesis was I ran into a huge roadblock where my network was too large for Packet Tracer to run effectively. I spent many days trying to work around it, but ultimately decided to shift my focus to documentation and the design itself. The design features some features that were not installed in their entirety due to this. These features have been left in the design as this was a problem with current available resources. I also struggled deciding where to put information in my documentation. Since I have a primarily technical project rather than creative or research, I struggled with where to put different pieces such as the technologies used or the reasons why I chose the design features I did. In the end, I decided to organize my documentation the way I felt was best. As the architect of this design, I chose to put it how it felt natural and how I wanted my readers to have the information. If I had more time, I would continue to build this network by configuring more features on the packet tracer and testing it on hardware. I would also add telephony services to allow voice traffic and add the wireless infrastructure to the current. I would eventually like to build on to this network design with more in-depth details as I learn more and try to enter the field of networking.

Introduction

In our daily lives, it is hard to picture going without internet connection. For most people, they never think anything of it. However, it does not just happen magically. It is powered by a computer network that allows connectivity between devices, buildings, and to the outside world. For a university, such as Ball State University, it is important that all users can be connected successfully and with few to no problems. The network design best suited for Ball State is a campus area network which is designed to accommodate an area with many buildings.

Best Practices of Campus Design

The network of an organization is sometimes considered the backbone to success. Without a successful network, the organization is likely to face problems and be less productive. "A Campus Area Network is a computer network that links the buildings and consists of two or more local area networks (LANs) within the limited geographical area("*Campus area Networks (CAN). computer and Network examples*")." It should be broad enough to cover a large territory, and it includes point-to-point access which distributes a separate network in each building or small area. A Campus Area Network is a type of small Metropolitan Area Network (MAN) and is common for the design of a college campus, enterprise campus, office buildings, military base, and industrial complex.

"Network design is the planning phase a company's IT infrastructure must go through before it is implemented. It involves evaluating and understanding how all the elements of the network link together (from routers, switches, and servers to desktops, laptops, and printers) and how they can be made to run as efficiently as possible. (*How to design a NETWORK: Design best Practices: N-able*)" Campus Area Network Design is often considered the foundation for network design and it serves as a vital stepping-stone for designs such as Wireless Networks and IP Telephony networks. The steps used for Campus Area Design are the first steps taken in a more complex network and the practices learned are key elements of a secure, highly available network.

A network design should feature a network diagram that shows what devices connect where. It is important to take this step in order to have a successful network as it helps show the entire picture which allows the architect to make accurate plans. It is important to consider all requirements of building a campus area network when starting the design process. The design varies based on several factors such as the size of the network and the number of users. "Some of these factors are:

- The purpose of the network - exchange of information/data between computers, applications/database hosting, voice/messaging services
- The size of the network - number of users, area of coverage, location of the users, hardware etc.
- The amount of data being transferred/exchanged
- Security of the data
- Other important factors to be considered - connectivity requirements (whether wired, wireless or combination), the type of cabling, the type of computers/equipment to be used and their location(s), the software, and operating system(s) to be used (*How to Design a Network: Basics & Examples*)."

Essentially, the purpose of the network and desired locations must be determined, total users estimated, the number of devices determined, and connections planned. As there are many pieces to network design, it is important to keep all these factors in mind to make the most efficient network. It is important that the network is always available, able to be adapted for the changing needs of the organization, and secure to protect the organization, their users, and all their data.

The design of a Campus Area Network (CAN) is not a standard, cookie cutter design. It is unique to each network as companies have different needs. Some of these needs include network requirements, number of users, size of building, resources available, and budget. Theses designs can vary in size and complexity and may have different technologies in use. Choices for network designs are often based off the needs for network capacity. It is important that all devices meet compliance requests and any requirements for the company.

One of the design models of Campus Wired Networks is the hierarchical design model. This design is very common, especially in academic settings. It provides services that enable tiered LAN connectivity, wired network access for employees, IP Multicast for efficient data distribution, and wired infrastructure for multimedia services. The hierarchical design features modular groups or layers to allow each group to implement specific functions. This helps simplify the network allowing deployment and management of the network to improve as well. It allows an element to be created then replicated throughout the network. These groups allow a quick and easy way of scaling a network and a consistent deployment method. These are also helpful for organization as it can be laid out easier. Hierarchical designs are used to keep network changes controlled as the changes can be implemented on a layer to layer or group to group level. This prevents the change from hitting a large number of systems at once which can cause outages and problems which could cause a loss of data or productivity in the company.

Hierarchical designs typically have three layers: Access layer, Distribution Layer, Core Layer. The access layer is the bottom layer, and it supports end user devices such as PCs, IP phones, and printers. It provides direct access to the network from user devices and can provide both wired and wireless connectivity. The access layer also provides resiliency and security as it must protect against human actions.

The distribution layer lies between the access layer and the core. It serves as an aggregation point across access layer devices as it takes the data from the access layer and transmits packets to the core. It can lower operating costs by making the network more efficient and increases network availability. Routing between LAN subnets and VLANs, and routing between routing domains such as EIGRP to OSPF occurs here. Load-balancing and redundant networks are other services the distribution layer can provide.

The core is the top layer for many networks, and it connects the distribution layer devices. It is often considered the backbone of a network. The primary goal of the core is to switch packets as fast as possible. It usually has the best, most up-to-date devices. It is recommended to use a core layer if there are more than three distribution layer devices. Only layer three devices can connect to the core which increases stability and resiliency. The hierarchical model is designed to be easily scalable so not all networks have all three levels as smaller networks are less likely to need a core. Scalability means how easily the design can be changed for a growing network without taking down the current network. A perfect design would be easily scalable to allow a company to not have down time, or very minimal down time, while adding onto the network. A modular design easily supports this as it allows new sites to be added with ease.

Considering the future of the organization and network trends is important for designing a network. A company is likely to grow so it must have a network that can grow to support the additional users. This means the ability to add new devices to the network without taking down any of the existing devices or causing a loss in connectivity. It is important to plan how these devices will be connected, what ports could go down, and to leave room for error. As the network grows, different technologies should be used, and security features need to be kept up to date in order to keep the company running as it should.

When designing a network it is recommended to follow best practices and standards of network design to ensure the network is as optimized as possible. Some best practices are:

- Draw the design
- Choose the best equipment for business requirements

- Plan for future growth
- Standardize the design
- Secure the network.
- Take Wiring and Cabling into Account
- Consider Redundancy
- Monitor and Manage
- Be certain about decisions
- Ask for help

Following these best practices is the base of a successful network. Each practice is important to abide by while designing a network so the network can be as resilient and secure as possible. While design is important, it is also important to keep good documentation to refer back to in case of a problem or when it is time to expand.

Practices Used

This design is an academic example of a campus area network design. As this is an academic example, some features may alter from how they would be in a real-world setting. This is based on resources available, time, and functionality. For example, buildings may feature one Layer 2 switch where in reality there would be 17. Since all these devices would be essentially identical and resources do not support the size of the network, it is scaled down.

I have made buildings in three variations of size. The small network contains one multilayer switch, one layer 2 switch, and various end devices. These are buildings that do not support many users and have few end devices. This includes buildings such as District Energy Station North and Lewellen Pool. The medium network contains one multilayer switch, two layer 2 switches, and various end devices. This supports buildings that are small but still have some offices requiring ethernet connection. Buildings such as the CAP Design Lab are included in this size. The third design is the large network. The large network is for buildings such as academic buildings, Bracken Library, and dormitories such as Johnson East or North Hall. These networks include two multilayer switches, four layer 2 switches, and various end devices.

This design uses a hierarchical model as is common practice for Campus Area Design. This hierarchical model allows specific layers to focus on specific functions. With the hierarchical design of my network, it allows an easy way to scale the network up for a larger building and down for a smaller one. With the hierarchical design, it helps keep the topology simple and easy to understand. As this is an academic example of a network, the hierarchical design is a common design and is recommended for passing broadcast packets. Hierarchical design helps minimize costs and can enable accurate capacity. By using a Hierarchical model, I was able to split my network into nodes. Each node of buildings contains 6 to 9 buildings in the same relative geographical area. They all connect to two Node Core devices which are L3 switches. The two L3 node switches connect to the core which is comprised of four L3 switches in a square. Each node switch This was done to keep the design uncluttered as well as for ease. The modular design is popular in campus area networks as it allows an admin to duplicate designs as well as keeping the network uniform. These nodes are broken down in Appendix B.

I implemented a VLSM Scheme for my network. Variable Length Subnet Masking is a way to divide an IP address into different size subnets. This allows an administrator to use more IP address for a specific VLAN. This allowed me to have more IP addresses for end devices in each building to allow for the current number of machines and allow future expansion.

I picked all technologies and practices based off what I think would work best for the network and its size. I used all the best practices as a guide, implementing the ones that I thought would make the network as successful as possible. I chose designs that I could implement easily, that are uniform, and that would make this network easy to understand from an outside perspective. I did this as in a real-world setting, it would never just be me working on a project of this size. I wanted designs that my team would be able to follow and that the coordinators between my team and the business would be able to understand as well. This includes documenting each step along the way.

Used Technologies

DHCP: The Dynamic Host Configuration Protocol is a network management tool. A DHCP server dynamically assigns an IP address to devices set to DHCP so they can communicate without static IPs. This is helpful for a company with a lot of end devices.

VLAN: A Virtual Local Area Network is a grouping of computers and network devices. VLANs allow these devices to communicate in a simulated environment, as though they existed in a single LAN (local area network), sharing a single broadcast/multicast domain.

InterVLAN Routing: InterVLAN Routing allows VLANs to communicate with one another. When hosts in one VLAN need to communicate with hosts in another VLAN, the traffic must be routed between them, aka InterVLAN Routing. This was implemented with the use of OSPF.

OSPF: Open Shortest Path First is an Interior Gateway Protocol that uses Link State Advertisements to help find the best paths between source and destination. OSPF provides neighbor authentication with a simple, SHA, or MD5 password. It is configured on enabled router interfaces. OSPF allows routing between VLANs enabling all buildings to see one another.

NAT: NAT allows private IP addresses to connect to the Internet. Operating on a router, NAT usually connects two networks together and translates the private address in the internal network into “legal” addresses.

ACLs: An Access Control List acts as a sort of firewall, either allowing or disallowing traffic to enter or exit one or more subnets. This is seen as an optional layer of security.

VTP: VLAN Trunking Protocol is used by Cisco switches to propagate VLAN definitions to the whole LAN allowing the exchange of information.

STP: Spanning Tree Protocol builds a loop-free logical topology for LANs. The basic function of STP is to prevent bridge loops and the resulting fallout of them.

HSRP: Hot Standby Router Protocol was developed by Cisco to provide gateway redundancy. When HSRP is configured between two routers, they work together to present the appearance of a single virtual router to the hosts of the LAN.

Security

This network would feature a lot of security to help protect the infrastructure of the University. Each device would feature device security by having secure, encrypted passwords. Each device would have a console password, a line password, and a privileged password. Each password would be encrypted and different. Before implementing the network, I would add features such as password complexity and password aging. All unused ports would be shutdown and assigned to a blackhole VLAN. This is an unused VLAN used to add an extra layer of security as it requires more actions for someone to use these ports than it would without them. It is not recommended to use VLAN 1 (the default) during implementation as it would allow anyone to plug into a port and have access to the device. The Blackhole VLAN provides another layer of security as keeping data secure is a priority.

The network would also feature physical security. Each device would be contained in a network rack that is locked in a locked room that only admins and necessary people had access to. These rooms would each have a security system with a key code unique for each person who has access. The room would also have a key card swipe access to allow access to people who should not have a key. This system would allow the admin to easily track who has accessed the equipment rooms and when. These rooms would also have security cameras in the event something does happen. Finally, the devices would be backed up properly and insured in case of damage or theft.

Addressing

The campus has an IP subnet of 10.0.0.0/8. This allows it to have unique IP addresses for each node, building, and device. Each node has a range of addresses subnetted for each building and a range of subnets for each Node Core. These connect into the core which is on its own subnet. This is an example of the VLSM scheme for Node A. The full VLSM scheme can be found in Appendix D.

Ball State	10.0.0.0/8			
Johnson East		10.2.0.0/16		
	VLAN 10		10.2.10.0/22	
	VLAN 20			10.2.20.0/24
	VLAN 30			10.2.30.0/24
	VLAN 40			10.2.40.0/24
	VLAN 50			10.2.50.0/24

Description	VLAN ID
End Devices	10
Voice	20
Servers	30
Printers	40
Management	50

Devices read from left to right which is how the IP addresses flow as well. Each building was given a unique 10.X.0.0/16 address to allow each building to implement VLANs within it. For sake of consistency, buildings increase by two in the second octet. VLANs were created for different functions of the network, each was given an IP address and a name representing what area that VLAN covers. VLAN addresses use the VLAN ID as the third octet number. VLAN 10 for end devices has a /22 address to allow for the necessary amount of end devices. Other VLANs are /24 unless otherwise noted.

.All switches were assigned static IP addresses and all Layer 3 ports were assigned the appropriate IP address to match its counterpart. Each size building topology follows the same addressing scheme. Here is an example of the static IP addresses for a Layer 3 building switch. See examples of static IP addresses for a large, medium, and small building in Appendix C.

JE-Multi-1	
Fa0/5	10.20.255.2
Fa0/6	10.20.255.10
VLAN 10	10.2.10.2
VLAN 20	10.2.20.2
VLAN 30	10.2.30.2
VLAN 40	10.2.40.2
VLAN 50	10.2.50.2

Recommended Technology

I based my technology recommendations off Cisco devices as Cisco is the leader in the industry making it the most reasonably priced and easiest to find. Cisco devices are used in many businesses and institutions making it more practical for the team to use as they would be more familiar with these devices. Cisco also provides the best documentation and support for their devices making it easier to troubleshoot and repair problems. Cisco would be the most affordable option as it would be a good price and a good quality making it last longer. It felt in the best interest of the network to choose Cisco. Cisco recommends the following devices for Campus Area Network Design:

Access Layer:

- Cisco Catalyst 9400 Series Switches (modular chassis)
- Cisco Catalyst 9300 and 9300-L Series Switches
- Cisco Catalyst 9200 and 9200-L Series Switches

Distribution Layer:

- Cisco Catalyst 9600 Series Switches (modular chassis)
- Cisco Catalyst 9500 Series Switches
- Cisco Catalyst 9400 Series Switches (modular chassis)

Core Layer:

- Cisco Catalyst 9600 Series Switches (modular chassis)
- Cisco Catalyst 9500 Series Switches

Other Equipment Needed:

- Cat 6e Cabling
- RJ45 Cable tips
- RJ45 Wall Plates
- Patch Panel
- Equipment Racks

Switching Tables

To better understand my topology, I have included examples of how the devices are wired. As all nodes have a very similar setup and each building has a similar layout, I have not included all buildings or devices, but rather an example of a layer 3 building switch and access layer switch from Johnson East (large building) and layer 3 node switch from Node A. See the switching tables in Appendix F.

Device Naming

All buildings are named after the pre-existing Ball State building names. These names are two letter representations of the building name. For the buildings without codes, I assigned them a two-letter code to match the rest of the buildings. The full building names are available under Appendix C.

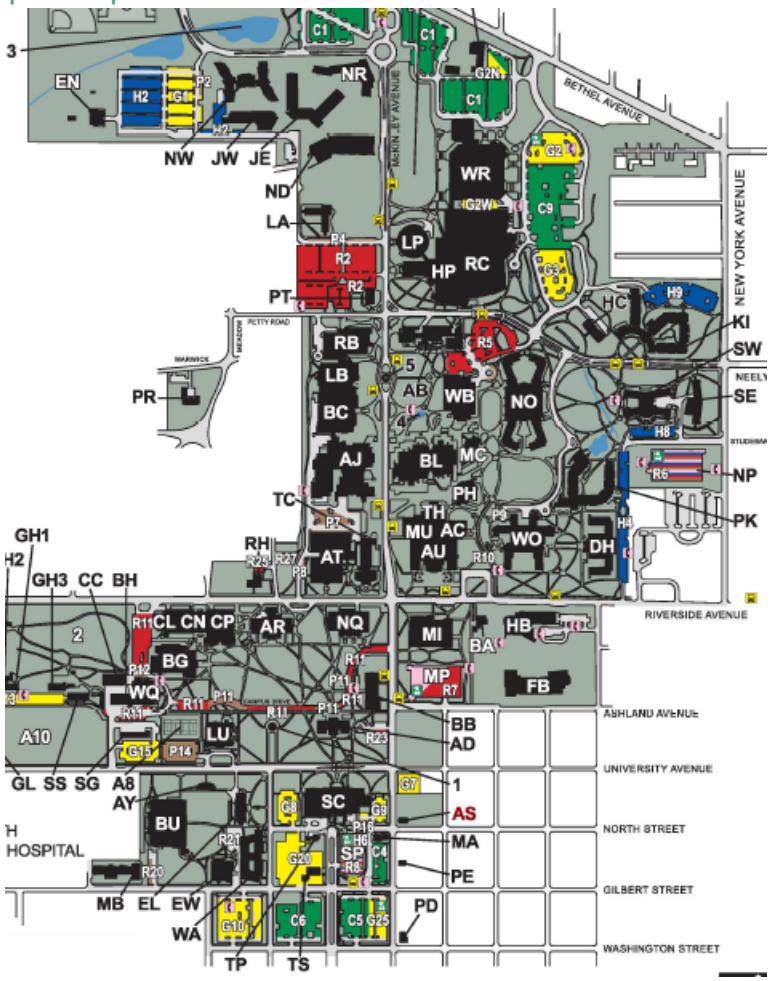
Buildings are named in the following format:

BuildingCode-Device-NumberofDevice

BA-Access-1

Appendices

Appendix A: Campus Map



Appendix B: Nodes

Node A:
Johnson East (JE): JE-Access-1
Johnson West (JW): JW-Access-1
Rec Center (RC): RC-Access-1
Lewellen Pool (LP): LP-Access-1
District Energy Station North (EN): EN-Access-1
CAP Design Lab (PT): PT-Access-1
North Dining Hall (ND): ND-Access-1
North Hall (NR): NR-Access-1
Worthern Arena (WR): WR-Access-1
Node B:
Health Center (HC): HC-Access-1
Kinghorn (KI): KI-Access-1
Studebaker East (SE): SE-Access-1
Studebaker West (SW): SW-Access-1
Noyer Complex (NO): NO-Access-1
Park Hall (PK): PK-Access-1
Dehority Complex (DH): DH-Access-1
Woodworth (WO): WO-Access-1
Node C:
Robert Bell (RB): RB-Access-1
Sponsored Projects Administration (RH): RH-Access-1
Art and Journalism (AJ): AJ-Access-1
Letterman Building (LB): LB-Access-1
Applied Technology (AT): AT-Access-1
Ball Communication (BC): BC-Access-1
Teachers College (TC): TC-Access-1
Node D:
Multicultural Center (MA): MA-Access-1
Pruis Hall (PH): PH-Access-1
Architecture Building (AB): AB-Access-1
Bracken Library (BL): BL-Access-1
University Theatre (TH): TH-Access-1
Whittinger Business Building (WB): WB-Access-1
Node E:
Cooper Life (CL): CL-Access-1
Cooper Nursing (CN): CN-Access-1
Cooper Physical (CP): CP-Access-1
Burkhardt Building (BB): BB-Access-1
Charles W Brown Planetarium (CBP)- CBP-Access-1
Ball Gymnasium (BG): BG-Access-1
Fine Arts Building (AR): AR-Access-1

Node F:
Health Professions Building (HB): HB-Access-1
North Quad (NQ): NQ-Access-1
Emens Auditorium (AU): AU-Access-1
Music Instruction Building (MI): MI-Access-1
Arts and Communications (AC): AC-Access-1
Ball Honors House (BA): BA-Access-1
Music Building (MU): MU-Access-1
Node G:
Central Chilling Plant (CC): CC-Access-1
Christy Woods Office (SS): SS-Access-1
Heat Plant (BH): BH-Access-1
Glass Center (GL): GL-Access-1
Greenhouse (GH): GH-Access-1
West Quad (WQ): WQ-Access-1
Node H:
Lucina Hall (LU): LU-Access-1
Elliott Hall (EL): EL-Access-1
Student Center (SC): SC-Access-1
Admin Building (AD): AD-Access-1
Center for Peace and Conflict (PE): PE-Access-1
University Police Department (UPD): UPD-Access-1

Appendix C: Addressing

Node A:

Node-A-1	
Fa0/1	**10.20.255.1**
Fa0/2	**10.20.255.5**
Fa0/3	**10.20.255.17**
Fa0/4	**10.20.255.21**
Fa0/5	**10.20.255.33**
Fa0/6	**10.20.255.41**
Fa0/7	**10.20.255.45**
Fa0/8	**10.20.255.57**
Fa0/9	**10.20.255.65**
Fa0/10	**10.20.255.73**
Fa0/11	**10.20.255.81**
Fa0/12	**10.20.255.89**
Fa0/13	**10.20.255.97**
Fa0/14	**10.175.255.30**
Fa0/15	**10.175.255.46**

Node-A-1	
Fa0/1	**10.20.255.9**
Fa0/2	**10.20.255.13**
Fa0/3	**10.20.255.25**
Fa0/4	**10.20.255.29**
Fa0/5	**10.20.255.37**
Fa0/6	**10.20.255.49**
Fa0/7	**10.20.255.53**
Fa0/8	**10.20.255.61**
Fa0/9	**10.20.255.69**
Fa0/10	**10.20.255.77**
Fa0/11	**10.20.255.85**
Fa0/12	**10.20.255.93**
Fa0/13	**10.20.255.98**
Fa0/14	**10.175.255.34**
Fa0/15	**10.175.255.50**

Johnson East:

JE-Multi-1	
Fa0/5	**10.20.255.2**
Fa0/6	**10.20.255.10**
VLAN 10	**10.2.10.2**
VLAN 20	**10.2.20.2**
VLAN 30	**10.2.30.2**
VLAN 40	**10.2.40.2**
VLAN 50	**10.2.50.2**

JE-Multi-2	
Fa0/5	**10.2.255.6**
Fa0/6	**10.2.255.14**
VLAN 10	**10.2.10.3**
VLAN 20	**10.2.20.3**
VLAN 30	**10.2.30.3**
VLAN 40	**10.2.40.3**
VLAN 50	**10.2.50.3**

JE-Access-1	
VLAN 50	**10.2.50.4**
JE-Access-2	
VLAN 50	**10.2.50.5**
JE-Access-3	
VLAN 50	**10.2.50.6**
JE-Access-4	
VLAN 50	**10.2.50.7**

North Dining:

ND-Multi-1	
Fa0/3	**10.20.255.58**
Fa0/4	**10.20.255.62**
VLAN 10	**10.10.10.2**
VLAN 20	**10.10.20.2**
VLAN 30	**10.10.30.2**
VLAN 40	**10.10.40.2**
VLAN 50	**10.10.50.2**
ND-Access-1	
VLAN 50	**10.10.50.3**
ND-Access-2	
VLAN 50	**10.10.50.4**

District Energy North:

EN-Multi-1	
Fa0/2	10.20.255.34
Fa0/3	10.20.255.38
VLAN 10	10.6.10.2
VLAN 20	10.6.20.2
VLAN 30	10.6.30.2
VLAN 40	10.6.40.2
VLAN 50	10.6.50.2
EN-Access-1	
VLAN 50	**10.6.50.3**

Appendix D: VLSM

Node A:

Ball State	10.0.0.0/8			
Johnson East		10.2.0.0/16		
	VLAN 10		10.2.10.0/22	
	VLAN 20			10.2.20.0/24
	VLAN 30			10.2.30.0/24
	VLAN 40			10.2.40.0/24
	VLAN 50			10.2.50.0/24
Johnson West		10.4.0.0/16		
	VLAN 10		10.4.10.0/22	
	VLAN 20			10.4.20.0/24
	VLAN 30			10.4.30.0/24
	VLAN 40			10.4.40.0/24
	VLAN 50			10.4.50.0/24
District Energy North		10.6.0.0/16		
	VLAN 10		10.6.10.0/22	
	VLAN 20			10.6.20.0/24
	VLAN 30			10.6.30.0/24
	VLAN 40			10.6.40.0/24
	VLAN 50			10.6.50.0/24
North Hall		10.8.0.0/16		
	VLAN 10		10.8.10.0/22	
	VLAN 20			10.8.20.0/24
	VLAN 30			10.8.30.0/24
	VLAN 40			10.8.40.0/24
	VLAN 50			10.8.50.0/24
North Dining		10.10.0.0/16		
	VLAN 10		10.10.10.0/22	
	VLAN 20			10.10.20.0/24
	VLAN 30			10.10.30.0/24
	VLAN 40			10.10.40.0/24
	VLAN 50			10.10.50.0/24

Lewellen Pool		10.12.0.0/16			
	VLAN 10		10.12.10.0/22		
	VLAN 20			10.12.20.0/24	
	VLAN 30			10.12.30.0/24	
	VLAN 40			10.12.40.0/24	
	VLAN 50			10.12.50.0/24	
Worthern Arena		10.14.0.0/16			
	VLAN 10		10.14.10.0/22		
	VLAN 20			10.14.20.0/24	
	VLAN 30			10.14.30.0/24	
	VLAN 40			10.14.40.0/24	
	VLAN 50			10.14.50.0/24	
Rec Center		10.16.0.0/16			
	VLAN 10		10.16.10.0/22		
	VLAN 20			10.16.20.0/24	
	VLAN 30			10.16.30.0/24	
	VLAN 40			10.16.40.0/24	
	VLAN 50			10.16.50.0/24	
CAP Design Lab		10.18.0.0/16			
	VLAN 10		10.18.10.0/22		
	VLAN 20			10.18.20.0/24	
	VLAN 30			10.18.30.0/24	
	VLAN 40			10.18.40.0/24	
	VLAN 50			10.18.50.0/24	
Node A		10.20.0.0/16			
					10.20.255.0/30

Node B:

Health Center		10.22.0.0/16		
	VLAN 10		10.22.10.0/22	
	VLAN 20			10.22.20.0/24
	VLAN 30			10.22.30.0/24
	VLAN 40			10.22.40.0/24
	VLAN 50			10.22.50.0/24
Kinghorn		10.24.0.0/16		
	VLAN 10		10.24.10.0/22	
	VLAN 20			10.24.20.0/24
	VLAN 30			10.24.30.0/24
	VLAN 40			10.24.40.0/24
	VLAN 50			10.24.50.0/24
Studebaker West		10.26.0.0/16		
	VLAN 10		10.26.10.0/22	
	VLAN 20			10.26.20.0/24
	VLAN 30			10.26.30.0/24
	VLAN 40			10.26.40.0/24
	VLAN 50			10.26.50.0/24
Studebaker East		10.28.0.0/16		
	VLAN 10		10.28.10.0/22	
	VLAN 20			10.28.20.0/24
	VLAN 30			10.28.30.0/24
	VLAN 40			10.28.40.0/24
	VLAN 50			10.28.50.0/24
Noyer Complex		10.30.0.0/16		
	VLAN 10		10.30.10.0/22	
	VLAN 20			10.30.20.0/24
	VLAN 30			10.30.30.0/24
	VLAN 40			10.30.40.0/24
	VLAN 50			10.30.50.0/24

Park Hall		10.32.0.0/16			
	VLAN 10		10.32.10.0/22		
	VLAN 20			10.32.20.0/24	
	VLAN 30			10.32.30.0/24	
	VLAN 40			10.32.40.0/24	
	VLAN 50			10.32.50.0/24	
Dehority Complex		10.34.0.0/16			
	VLAN 10		10.34.10.0/22		
	VLAN 20			10.34.20.0/24	
	VLAN 30			10.34.30.0/24	
	VLAN 40			10.34.40.0/24	
	VLAN 50			10.34.50.0/24	
Woodworth		10.36.0.0/16			
	VLAN 10		10.36.10.0/22		
	VLAN 20			10.36.20.0/24	
	VLAN 30			10.36.30.0/24	
	VLAN 40			10.36.40.0/24	
	VLAN 50			10.36.50.0/24	
Node B		10.40.0.0/16			
					10.40.255.0/30

Node C:

Sponsored Projects		10.42.0.0/16		
	VLAN 10		10.42.10.0/22	
	VLAN 20			10.42.20.0/24
	VLAN 30			10.42.30.0/24
	VLAN 40			10.42.40.0/24
	VLAN 50			10.42.50.0/24
Robert Bell		10.44.0.0/16		
	VLAN 10		10.44.10.0/22	
	VLAN 20			10.44.20.0/24
	VLAN 30			10.44.30.0/24
	VLAN 40			10.44.40.0/24
	VLAN 50			10.44.50.0/24
Letterman Building		10.46.0.0/16		
	VLAN 10		10.46.10.0/22	
	VLAN 20			10.46.20.0/24
	VLAN 30			10.46.30.0/24
	VLAN 40			10.46.40.0/24
	VLAN 50			10.46.50.0/24
Ball Communication		10.48.0.0/16		
	VLAN 10		10.48.10.0/22	
	VLAN 20			10.48.20.0/24
	VLAN 30			10.48.30.0/24
	VLAN 40			10.48.40.0/24
	VLAN 50			10.48.50.0/24
Arts and Journalism		10.50.0.0/16		
	VLAN 10		10.50.10.0/22	
	VLAN 20			10.50.20.0/24
	VLAN 30			10.50.30.0/24
	VLAN 40			10.50.40.0/24
	VLAN 50			10.50.50.0/24

Teachers College		10.52.0.0/16			
	VLAN 10		10.52.10.0/22		
	VLAN 20			10.52.20.0/24	
	VLAN 30			10.52.30.0/24	
	VLAN 40			10.52.40.0/24	
	VLAN 50			10.52.50.0/24	
Applied Technology		10.54.0.0/16			
	VLAN 10		10.54.10.0/22		
	VLAN 20			10.54.20.0/24	
	VLAN 30			10.54.30.0/24	
	VLAN 40			10.54.40.0/24	
	VLAN 50			10.54.50.0/24	
Node C		10.60.0.0/16			
					10.60.255.0/30

Node D:

Architecture Building		10.62.0.0/16			
	VLAN 10		10.62.10.0/22		
	VLAN 20			10.62.20.0/24	
	VLAN 30			10.62.30.0/24	
	VLAN 40			10.62.40.0/24	
	VLAN 50			10.62.50.0/24	
Whittinger Business		10.64.0.0/16			
	VLAN 10		10.64.10.0/22		
	VLAN 20			10.64.20.0/24	
	VLAN 30			10.64.30.0/24	
	VLAN 40			10.64.40.0/24	
	VLAN 50			10.64.50.0/24	
Multicultural Center		10.66.0.0/16			
	VLAN 10		10.66.10.0/22		
	VLAN 20			10.66.20.0/24	
	VLAN 30			10.66.30.0/24	
	VLAN 40			10.66.40.0/24	
	VLAN 50			10.66.50.0/24	
Bracken Library		10.68.0.0/16			
	VLAN 10		10.68.10.0/22		
	VLAN 20			10.68.20.0/24	
	VLAN 30			10.68.30.0/24	
	VLAN 40			10.68.40.0/24	
	VLAN 50			10.68.50.0/24	
Pruis Hall		10.70.0.0/16			
	VLAN 10		10.70.10.0/22		
	VLAN 20			10.70.20.0/24	
	VLAN 30			10.70.30.0/24	
	VLAN 40			10.70.40.0/24	
	VLAN 50			10.70.50.0/24	
University Theatre		10.72.0.0/16			
	VLAN 10		10.72.10.0/22		
	VLAN 20			10.72.20.0/24	
	VLAN 30			10.72.30.0/24	
	VLAN 40			10.72.40.0/24	
	VLAN 50			10.72.50.0/24	
Node D		10.80.0.0/16			
					10.80.255.0/30

Node E:

Charles Brown Planetarium		10.82.0.0/16		
	VLAN 10		10.82.10.0/22	
	VLAN 20			10.82.20.0/24
	VLAN 30			10.82.30.0/24
	VLAN 40			10.82.40.0/24
	VLAN 50			10.82.50.0/24
Fine Arts Building		10.84.0.0/16		
	VLAN 10		10.84.10.0/22	
	VLAN 20			10.84.20.0/24
	VLAN 30			10.84.30.0/24
	VLAN 40			10.84.40.0/24
	VLAN 50			10.84.50.0/24
Cooper Life		10.86.0.0/16		
	VLAN 10		10.86.10.0/22	
	VLAN 20			10.86.20.0/24
	VLAN 30			10.86.30.0/24
	VLAN 40			10.86.40.0/24
	VLAN 50			10.86.50.0/24
Cooper Physical		10.88.0.0/16		
	VLAN 10		10.88.10.0/22	
	VLAN 20			10.88.20.0/24
	VLAN 30			10.88.30.0/24
	VLAN 40			10.88.40.0/24
	VLAN 50			10.88.50.0/24
Cooper Nursing		10.90.0.0/16		
	VLAN 10		10.90.10.0/22	
	VLAN 20			10.90.20.0/24
	VLAN 30			10.90.30.0/24
	VLAN 40			10.90.40.0/24
	VLAN 50			10.90.50.0/24

Ball Gym		10.92.0.0/16			
	VLAN 10		10.92.10.0/22		
	VLAN 20			10.92.20.0/24	
	VLAN 30			10.92.30.0/24	
	VLAN 40			10.92.40.0/24	
	VLAN 50			10.92.50.0/24	
Burkhardt		10.94.0.0/16			
	VLAN 10		10.94.10.0/22		
	VLAN 20			10.94.20.0/24	
	VLAN 30			10.94.30.0/24	
	VLAN 40			10.94.40.0/24	
	VLAN 50			10.94.50.0/24	
		10.96.0.0/16			
		10.98.0.0/16			
Node E		10.100.0.0/16			
					10.100.255.0/30

Node F:

Honors House		10.102.0.0/16		
	VLAN 10		10.102.10.0/22	
	VLAN 20			10.102.20.0/24
	VLAN 30			10.102.30.0/24
	VLAN 40			10.102.40.0/24
	VLAN 50			10.102.50.0/24
Music Building		10.104.0.0/16		
	VLAN 10		10.104.10.0/22	
	VLAN 20			10.104.20.0/24
	VLAN 30			10.104.30.0/24
	VLAN 40			10.104.40.0/24
	VLAN 50			10.104.50.0/24
Emens Auditorium		10.106.0.0/16		
	VLAN 10		10.106.10.0/22	
	VLAN 20			10.106.20.0/24
	VLAN 30			10.106.30.0/24
	VLAN 40			10.106.40.0/24
	VLAN 50			10.106.50.0/24
Music Instruction Building		10.108.0.0/16		
	VLAN 10		10.108.10.0/22	
	VLAN 20			10.108.20.0/24
	VLAN 30			10.108.30.0/24
	VLAN 40			10.108.40.0/24
	VLAN 50			10.108.50.0/24
Health Professions		10.110.0.0/16		
	VLAN 10		10.110.10.0/22	
	VLAN 20			10.110.20.0/24
	VLAN 30			10.110.30.0/24
	VLAN 40			10.110.40.0/24
	VLAN 50			10.110.50.0/24

North Quad		10.112.0.0/16			
	VLAN 10		10.112.10.0/22		
	VLAN 20			10.112.20.0/24	
	VLAN 30			10.112.30.0/24	
	VLAN 40			10.112.40.0/24	
	VLAN 50			10.112.50.0/24	
Arts and Communication		10.114.0.0/16			
	VLAN 10		10.114.10.0/22		
	VLAN 20			10.114.20.0/24	
	VLAN 30			10.114.30.0/24	
	VLAN 40			10.114.40.0/24	
	VLAN 50			10.114.50.0/24	
		10.116.0.0/16			
		10.118.0.0/16			
Node F		10.120.0.0/16			
					10.120.255.0/30

Node G:

Central Chilling Plant		10.122.0.0/16			
	VLAN 10		10.122.10.0/22		
	VLAN 20			10.122.20.0/24	
	VLAN 30			10.122.30.0/24	
	VLAN 40			10.122.40.0/24	
	VLAN 50			10.122.50.0/24	
West Quad		10.124.0.0/16			
	VLAN 10		10.124.10.0/22		
	VLAN 20			10.124.20.0/24	
	VLAN 30			10.124.30.0/24	
	VLAN 40			10.124.40.0/24	
	VLAN 50			10.124.50.0/24	
Christy Woods Office		10.126.0.0/16			
	VLAN 10		10.126.10.0/22		
	VLAN 20			10.126.20.0/24	
	VLAN 30			10.126.30.0/24	
	VLAN 40			10.126.40.0/24	
	VLAN 50			10.126.50.0/24	
Greenhouse		10.128.0.0/16			
	VLAN 10		10.128.10.0/22		
	VLAN 20			10.128.20.0/24	
	VLAN 30			10.128.30.0/24	
	VLAN 40			10.128.40.0/24	
	VLAN 50			10.128.50.0/24	
Heat Plant		10.130.0.0/16			
	VLAN 10		10.130.10.0/22		
	VLAN 20			10.130.20.0/24	
	VLAN 30			10.130.30.0/24	
	VLAN 40			10.130.40.0/24	
	VLAN 50			10.130.50.0/24	

Glass Center		10.132.0.0/16			
	VLAN 10		10.132.10.0/22		
	VLAN 20			10.132.20.0/24	
	VLAN 30			10.132.30.0/24	
	VLAN 40			10.132.40.0/24	
	VLAN 50			10.132.50.0/24	
		10.134.0.0/16			
		10.136.0.0/16			
		10.138.0.0/16			
Node G		10.140.0.0/16			
					10.140.255.0/30

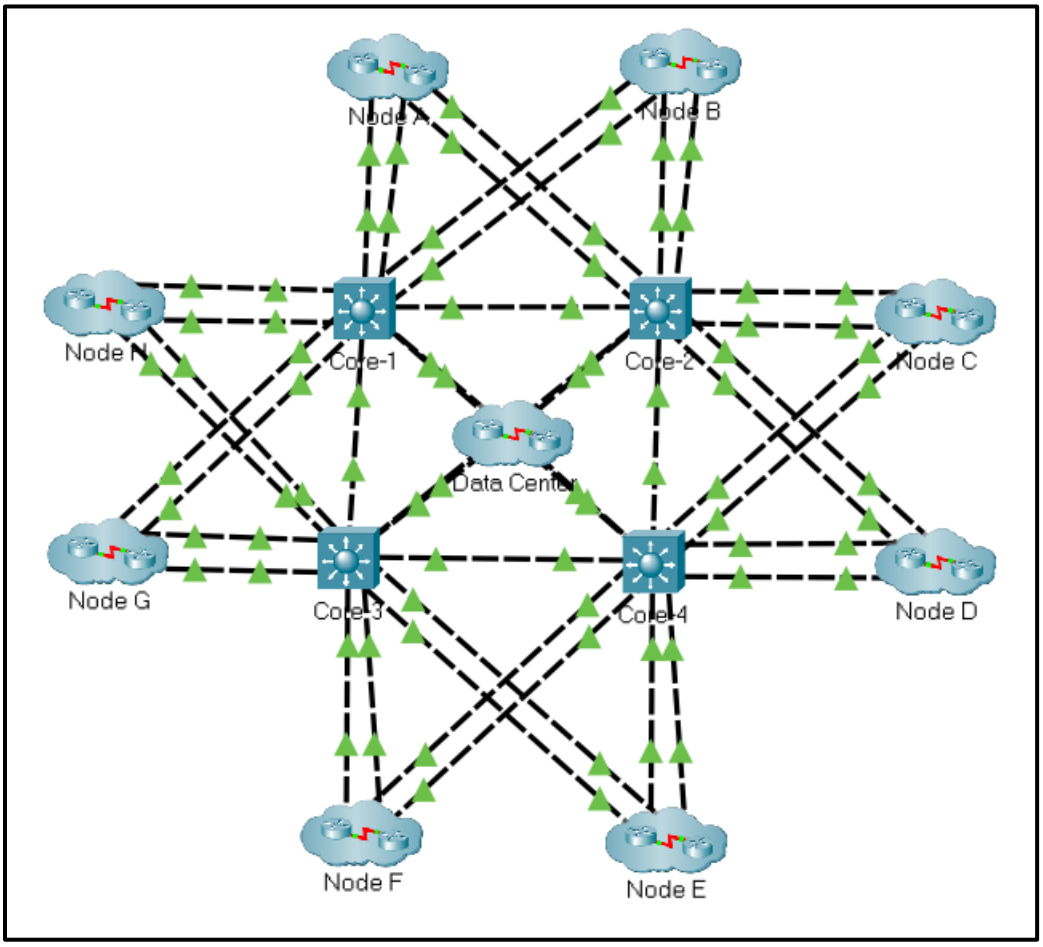
Node H:

University Police		10.142.0.0/16			
	VLAN 10		10.142.10.0/22		
	VLAN 20			10.142.20.0/24	
	VLAN 30			10.142.30.0/24	
	VLAN 40			10.142.40.0/24	
	VLAN 50			10.142.50.0/24	
Administration Building		10.144.0.0/16			
	VLAN 10		10.144.10.0/22		
	VLAN 20			10.144.20.0/24	
	VLAN 30			10.144.30.0/24	
	VLAN 40			10.144.40.0/24	
	VLAN 50			10.144.50.0/24	
Student Center		10.146.0.0/16			
	VLAN 10		10.146.10.0/22		
	VLAN 20			10.146.20.0/24	
	VLAN 30			10.146.30.0/24	
	VLAN 40			10.146.40.0/24	
	VLAN 50			10.146.50.0/24	
Lucina Hall		10.148.0.0/16			
	VLAN 10		10.148.10.0/22		
	VLAN 20			10.148.20.0/24	
	VLAN 30			10.148.30.0/24	
	VLAN 40			10.148.40.0/24	
	VLAN 50			10.148.50.0/24	
Elliott Hall		10.150.0.0/16			
	VLAN 10		10.150.10.0/22		
	VLAN 20			10.150.20.0/24	
	VLAN 30			10.150.30.0/24	
	VLAN 40			10.150.40.0/24	
	VLAN 50			10.150.50.0/24	

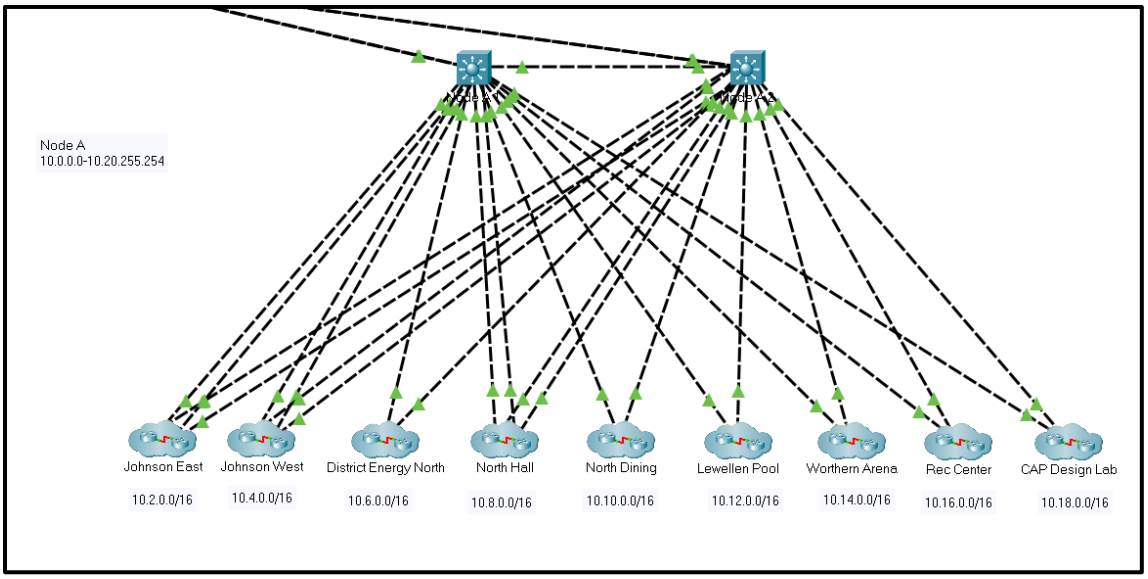
Center for Peace and Conflict		10.152.0.0/16			
	VLAN 10		10.152.10.0/22		
	VLAN 20			10.152.20.0/24	
	VLAN 30			10.152.30.0/24	
	VLAN 40			10.152.40.0/24	
	VLAN 50			10.152.50.0/24	
		10.154.0.0/16			
		10.156.0.0/16			
		10.158.0.0/16			
Node H		10.160.0.0/16			
					10.160.255.0/30

Appendix E: Topologies

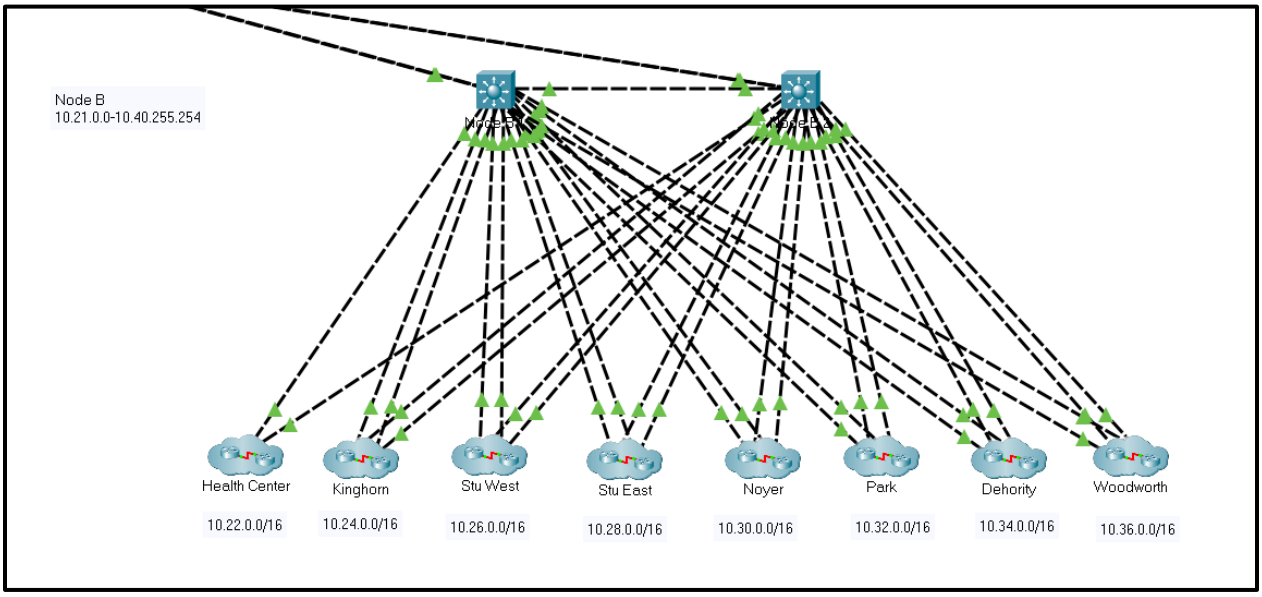
Core:



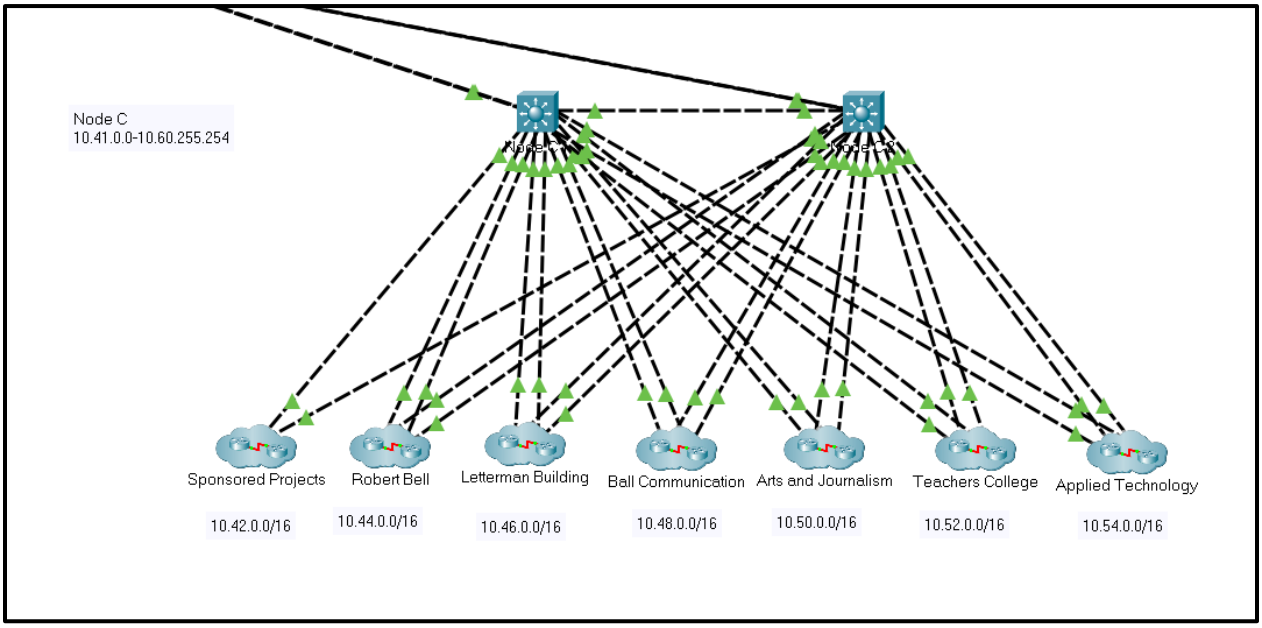
Node A:



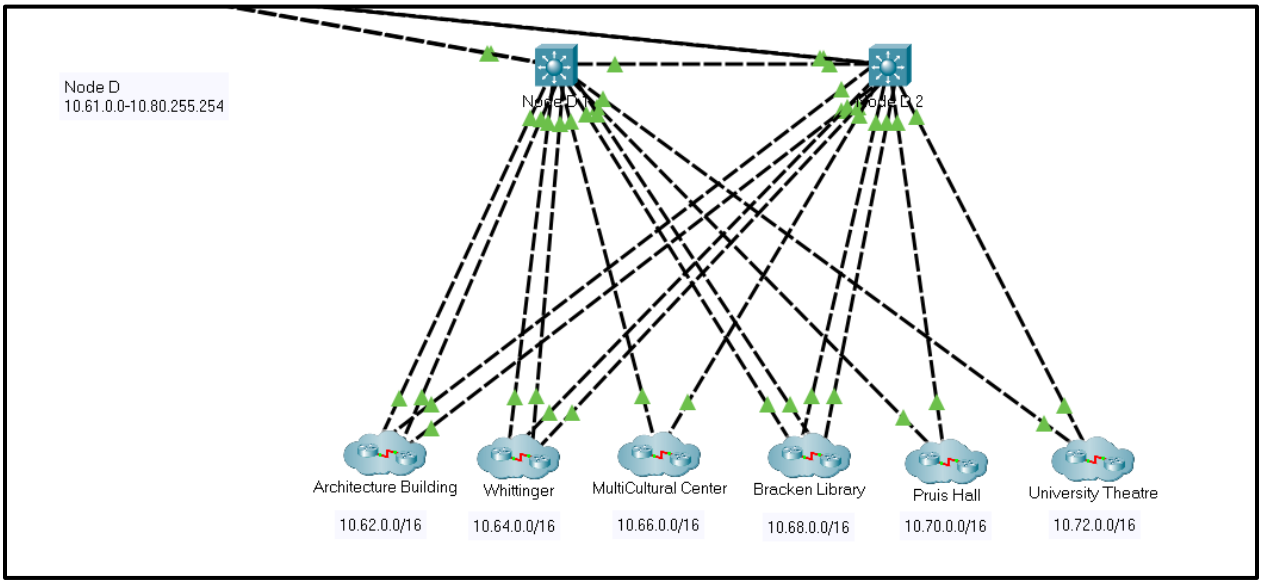
Node B:


Node B
10.21.0.0-10.40.255.254
Health Center
10.22.0.0/16
Kinghorn
10.24.0.0/16
Stu West
10.26.0.0/16
Stu East
10.28.0.0/16
Noyer
10.30.0.0/16
Park
10.32.0.0/16
Dehority
10.34.0.0/16
Woodworth
10.36.0.0/16

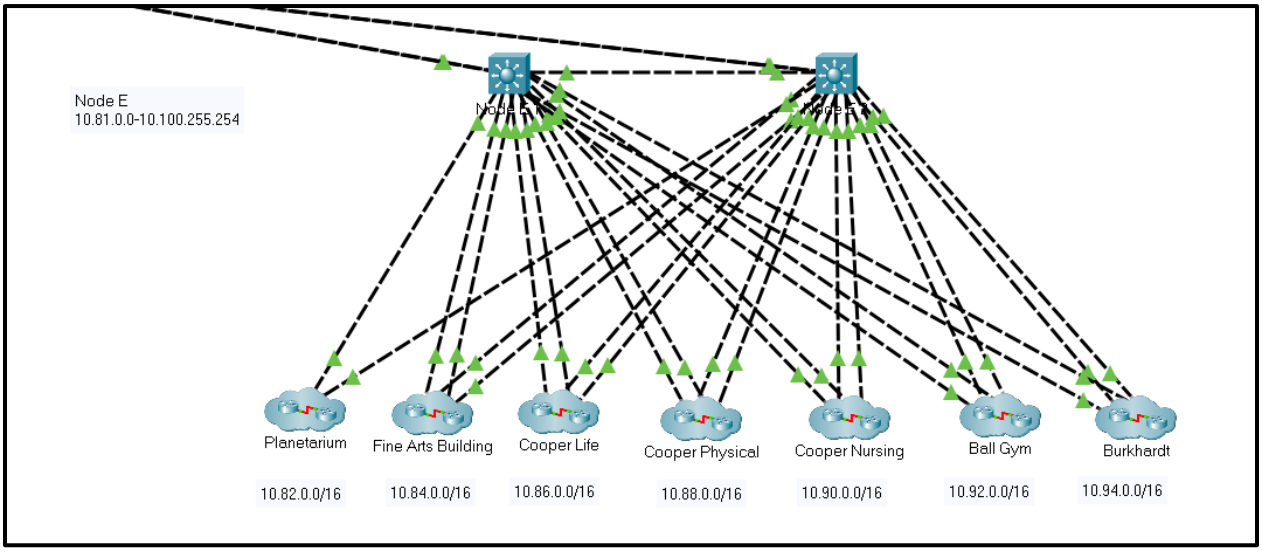
Node C:


Node C
10.41.0.0-10.60.255.254
Sponsored Projects
10.42.0.0/16
Robert Bell
10.44.0.0/16
Letterman Building
10.46.0.0/16
Ball Communication
10.48.0.0/16
Arts and Journalism
10.50.0.0/16
Teachers College
10.52.0.0/16
Applied Technology
10.54.0.0/16

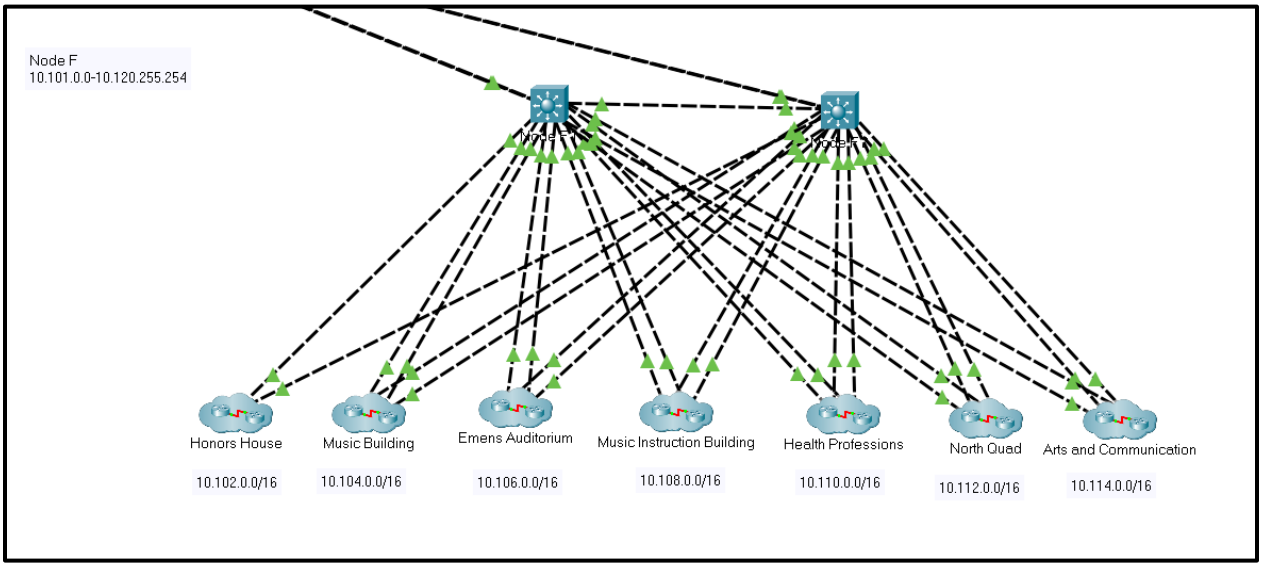
Node D:


Node D
10.61.0.0-10.80.255.254
Node D 1
Node D 2
Architecture Building
10.62.0.0/16
Whittinger
10.64.0.0/16
MultiCultural Center
10.66.0.0/16
Bracken Library
10.68.0.0/16
Pruis Hall
10.70.0.0/16
University Theatre
10.72.0.0/16

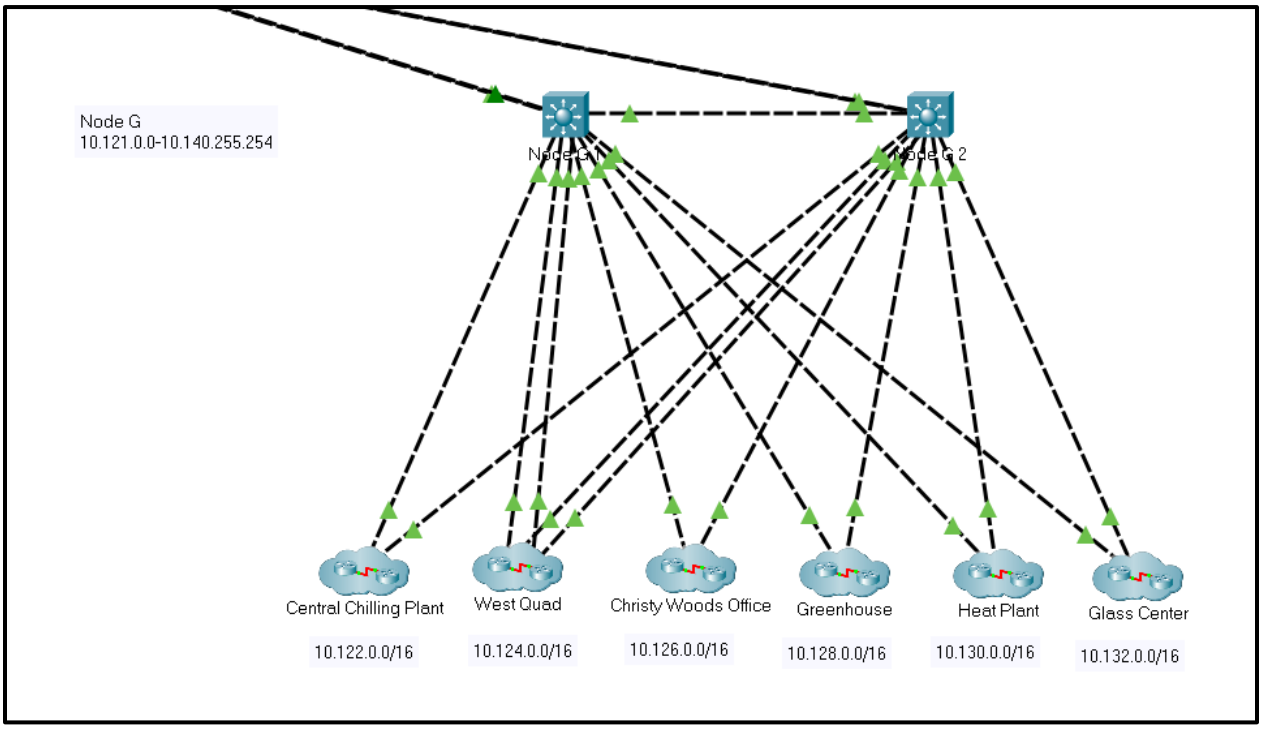
Node E:


Node E
10.81.0.0-10.100.255.254
Node E 1
Node E 2
Planetarium
10.82.0.0/16
Fine Arts Building
10.84.0.0/16
Cooper Life
10.86.0.0/16
Cooper Physical
10.88.0.0/16
Cooper Nursing
10.90.0.0/16
Ball Gym
10.92.0.0/16
Burkhardt
10.94.0.0/16

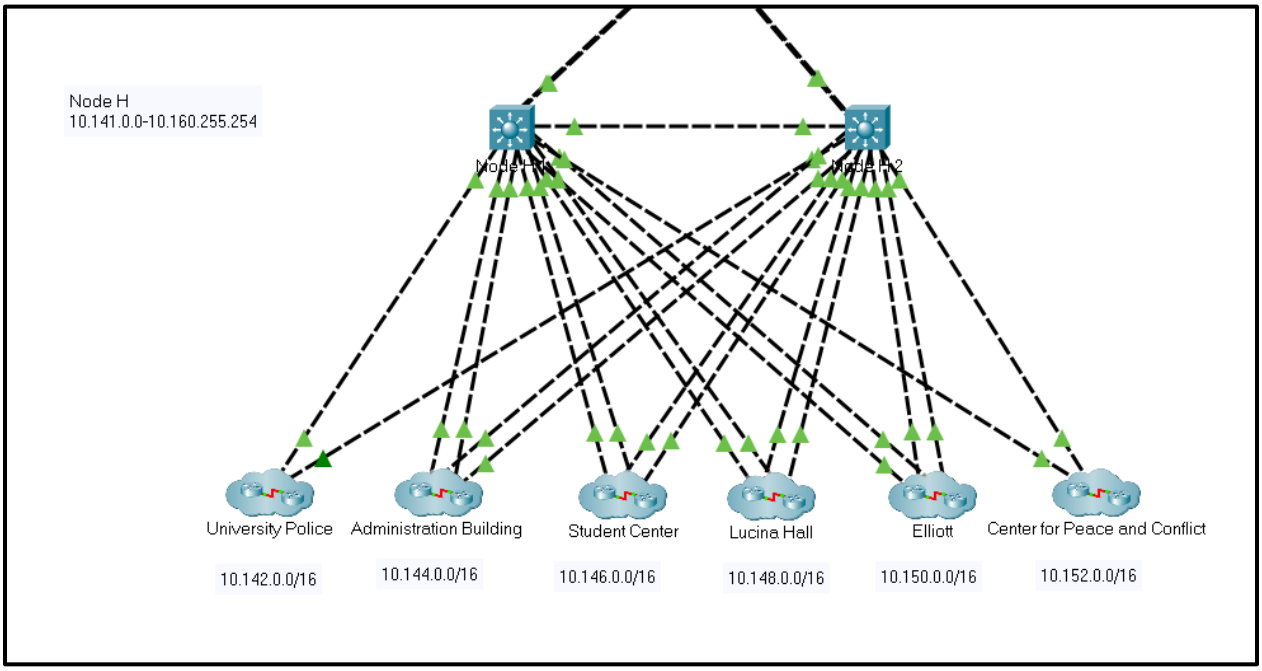
Node F:


Node F
10.101.0.0-10.120.255.254
Node F 1
Node F 2
Honors House
10.102.0.0/16
Music Building
10.104.0.0/16
Emens Auditorium
10.106.0.0/16
Music Instruction Building
10.108.0.0/16
Health Professions
10.110.0.0/16
North Quad
10.112.0.0/16
Arts and Communication
10.114.0.0/16

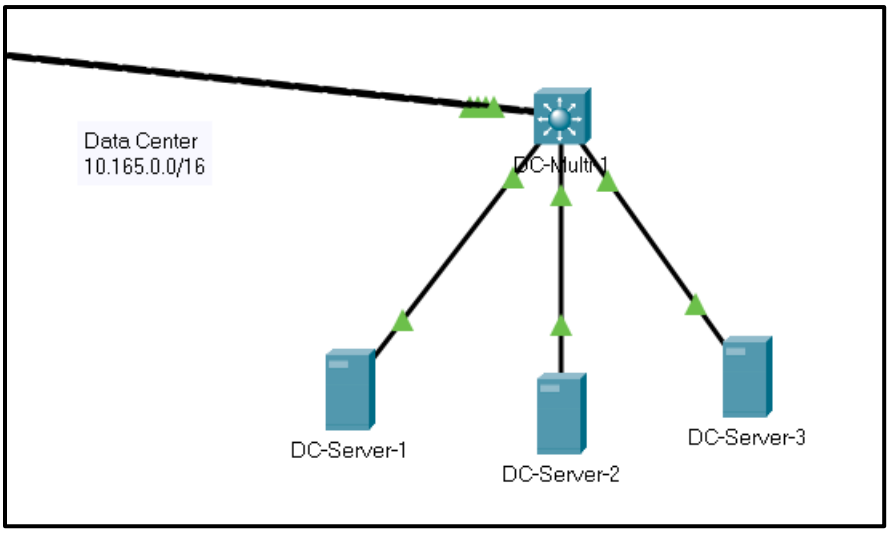
Node G:


Node G
10.121.0.0-10.140.255.254
Node G 1
Node G 2
Central Chilling Plant
10.122.0.0/16
West Quad
10.124.0.0/16
Christy Woods Office
10.126.0.0/16
Greenhouse
10.128.0.0/16
Heat Plant
10.130.0.0/16
Glass Center
10.132.0.0/16

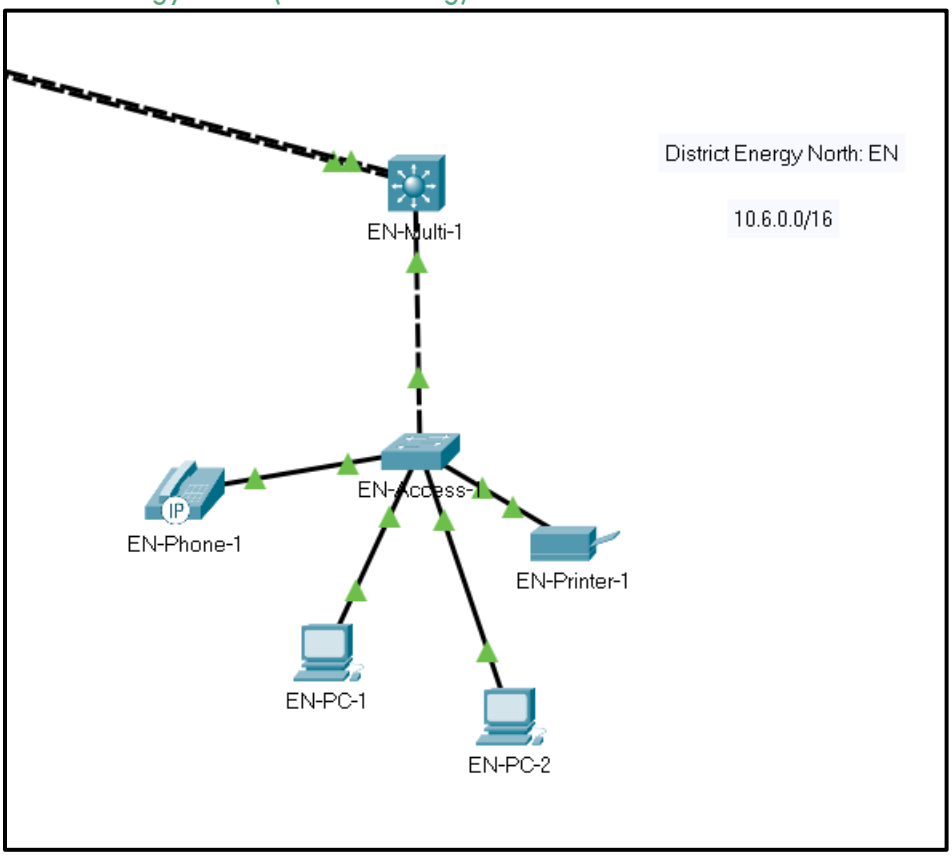
Node H:



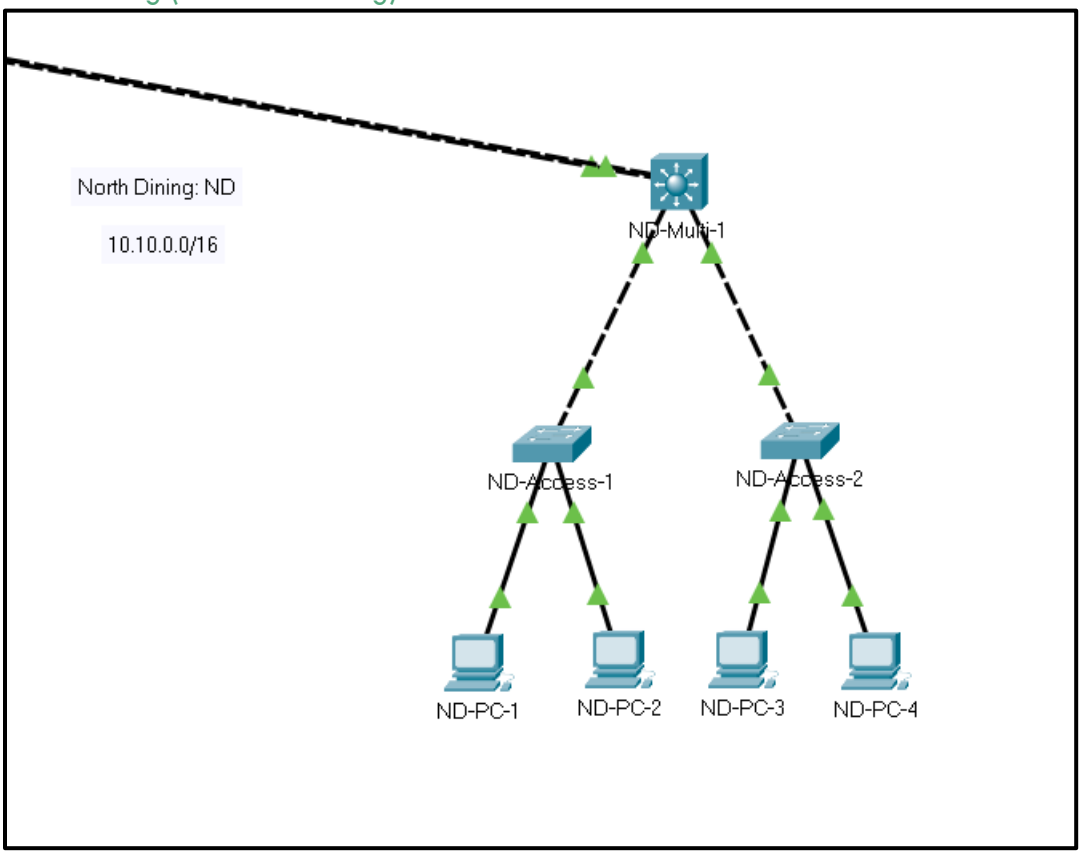
Data Center:



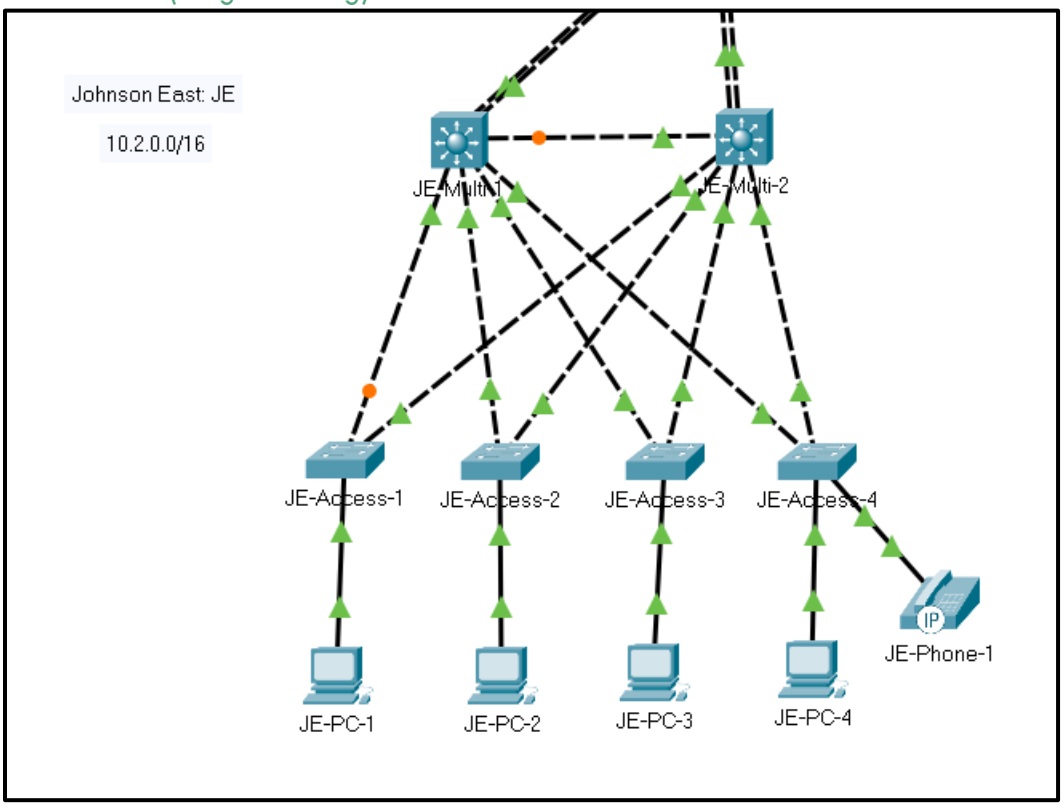
District Energy North (Small Building):



North Dining (Medium Building):



Johnson East (Large Building):



Appendix F: Switching Tables

Node-A-1							
Interface	**Connected Device**	**Connected Device Port**	**Port Type**	**IP Address**	**VLAN**	**Voice VLAN**	**Status**
Fa0/1	JE-Multi-1	Fa0/2	L3	10.20.255.1	-	Unassigned	Up
Fa0/2	JE-Multi-2	Fa0/2	L3	10.20.255.5	-	Unassigned	Up
Fa0/3	JW-Multi-1	Fa0/2	L3	10.20.255.17	-	Unassigned	Up
Fa0/4	JW-Multi-2	Fa0/2	L3	10.20.255.21	-	Unassigned	Up
Fa0/5	EN-Multi-1	Fa0/2	L3	10.20.255.33	-	Unassigned	Up
Fa0/6	NR-Multi-1	Fa0/5	L3	10.20.255.41	-	Unassigned	Up
Fa0/7	NR-Multi-2	Fa0/5	L3	10.20.255.45	-	Unassigned	Up
Fa0/8	ND-Multi-1	Fa0/3	L3	10.20.255.57	-	Unassigned	Up
Fa0/9	LP-Multi-1	Fa0/2	L3	10.20.255.65	-	Unassigned	Up
Fa0/10	WR-Multi-1	Fa0/3	L3	10.20.255.73	-	Unassigned	Up
Fa0/11	RC-Multi-1	Fa0/3	L3	10.20.255.81	-	Unassigned	Up
Fa0/12	PT-Multi-1	Fa0/3	L3	10.20.255.89	-	Unassigned	Up
Fa0/13	Node-A-2	Fa0/13	L3	10.20.255.97	-	Unassigned	Up
Fa0/14	Core-1	Fa0/4	L3	10.175.255.30	-	Unassigned	Up
Fa0/15	Core-2	Fa0/4	L3	10.175.255.46	-	Unassigned	Up
Fa0/16	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/17	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/18	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/19	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/20	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/21	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/22	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/23	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/24	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/1	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/2	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown

JE-Multi-1

Interface	Connected Device	Connected Device Port	Port Type	IP Address	VLAN	Voice VLAN	Status
Fa0/1	JE-Access-1	Fa0/2	Trunk	Unassigned	40	Unassigned	Up
Fa0/2	JE-Access-2	Fa0/2	Trunk	Unassigned	40	Unassigned	Up
Fa0/3	JE-Access-3	Fa0/2	Trunk	Unassigned	40	Unassigned	Up
Fa0/4	JE-Access-4	Fa0/2	Trunk	Unassigned	40	Unassigned	Up
Fa0/5	Node-A-1	Fa0/1	L3	10.20.255.2	-	Unassigned	Up
Fa0/6	Node-A-2	Fa0/1	L3	10.20.255.10	-	Unassigned	Up
Fa0/7	JE-Multi-2	Fa0/7	Trunk	Unassigned	40	Unassigned	Up
Fa0/8	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/9	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/10	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/11	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/12	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/13	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/14	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/15	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/16	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/17	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/18	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/19	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/20	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/21	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/22	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/23	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/24	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/1	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/2	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
VLAN 10	Unassigned	Unassigned	Unassigned	10.2.10.2	10	Unassigned	Up
VLAN 20	Unassigned	Unassigned	Unassigned	10.2.20.2	20	Unassigned	Up
VLAN 30	Unassigned	Unassigned	Unassigned	10.2.30.2	30	Unassigned	Up
VLAN 40	Unassigned	Unassigned	Unassigned	10.2.40.2	40	Unassigned	Up
VLAN 50	Unassigned	Unassigned	Unassigned	10.2.50.2	50	Unassigned	Up

JE-Access-1							
Ports	**Connected Device**	**Connected Device Port**	**Port Type**	**IP Address**	**Access VLAN**	**Voice VLAN**	**Status**
Fa0/1	JE-PC-1	FastEthernet	Unassigned	Unassigned	10	20	Up
Fa0/2	JE-Multi-1	Fa0/1	Unassigned	Unassigned	10	20	Up
Fa0/3	JE-Multi-2	Fa0/1	Unassigned	Unassigned	10	20	Up
Fa0/4	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/5	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/6	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/7	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/8	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/9	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/10	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/11	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/12	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/13	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/14	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/15	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/16	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/17	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/18	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/19	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/20	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/21	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/22	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/23	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
Fa0/24	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/1	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
G0/2	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Shutdown
VLAN 50	Unassigned	Unassigned	Unassigned	10.2.50.4	Unassigned	Unassigned	Up

Appendix G: IP Route

Example of the IP route with OSPF:

Core-3

10.0.0.0/8 is variably subnetted, 245 subnets, 3 masks

- 10.12.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.12.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.12.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.12.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.12.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.14.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.14.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.14.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.14.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.14.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.16.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.16.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.16.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.16.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.16.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11

- 10.18.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.18.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.18.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.18.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.18.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.8/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.12/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.24/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.28/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.32/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.36/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.48/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.52/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.60/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.64/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.68/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.72/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.76/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.80/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.84/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.88/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.92/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.20.255.96/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.28.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.28.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.28.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.28.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.28.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.30.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.30.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.30.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.30.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.30.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.34.8.0/22 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.34.20.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.34.30.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.34.40.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.34.50.0/24 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.0/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.12/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.24/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.36/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.40/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.44/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.52/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.56/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.64/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.72/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.88/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.92/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.96/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.100/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.112/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.40.255.120/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.42.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.42.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.42.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.42.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.42.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.44.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.44.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.44.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.44.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.44.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.46.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.46.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11

- 10.46.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.46.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.46.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.48.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.48.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.48.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.48.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.48.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.50.8.0/22 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.50.20.0/24 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.50.30.0/24 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.50.40.0/24 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.50.50.0/24 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.52.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.52.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.52.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.52.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.52.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.54.8.0/22 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.54.20.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.54.30.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.54.40.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.54.50.0/24 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.0/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.4/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.8/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.12/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.16/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.20/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.24/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.28/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.32/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.36/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.40/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.44/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.48/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.52/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.56/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.60/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.64/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.68/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.72/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.76/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.80/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.84/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.88/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.92/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.96/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.100/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.104/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.60.255.112/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.66.8.0/22 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.66.20.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.66.30.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.66.40.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.66.50.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.70.8.0/22 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.70.20.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.70.30.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.70.40.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.70.50.0/24 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.80.255.0/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.80.255.4/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.80.255.16/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.80.255.20/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
- 10.80.255.32/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11

O 10.80.255.36/30 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.80.255.40/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.80.255.44/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.80.255.56/30 [110/8] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.80.255.60/30 [110/9] via 10.175.255.138, 00:00:22, FastEthernet0/11
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O 10.142.20.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.142.30.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.142.40.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.142.50.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.144.8.0/22 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.144.20.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.144.30.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.144.40.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.144.50.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.146.8.0/22 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.146.20.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.146.30.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.146.40.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.146.50.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.148.8.0/22 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.148.20.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
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O 10.148.50.0/24 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
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O 10.150.50.0/24 [110/5] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.0/30 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.4/30 [110/2] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.8/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.12/30 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
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O 10.160.255.20/30 [110/2] via 10.175.255.138, 00:04:01, FastEthernet0/11
O 10.160.255.24/30 [110/3] via 10.175.255.138, 00:00:38, FastEthernet0/11
O 10.160.255.28/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.32/30 [110/2] via 10.175.255.138, 00:01:02, FastEthernet0/11
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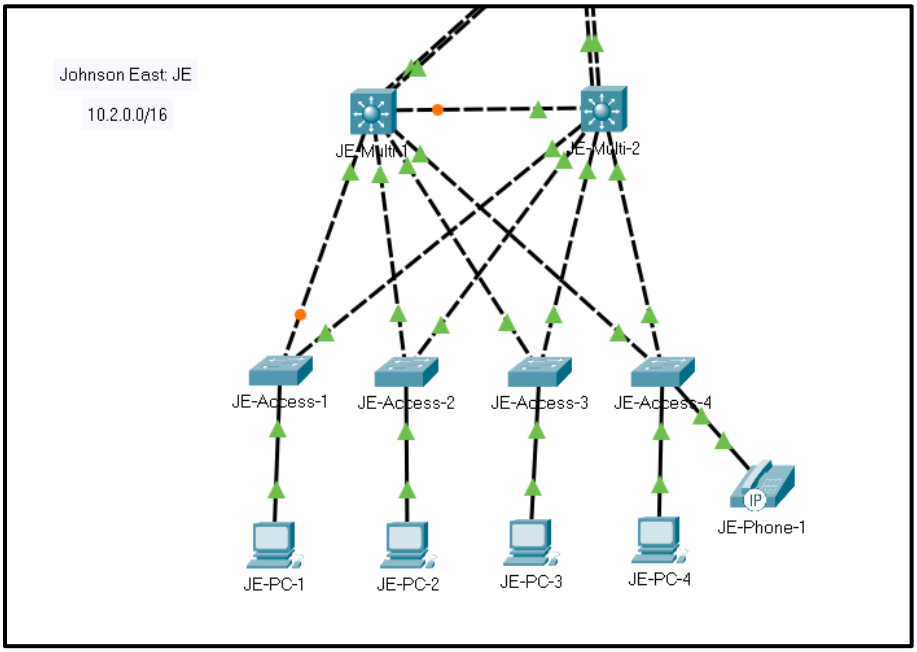
O 10.160.255.40/30 [110/3] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.44/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.48/30 [110/2] via 10.175.255.138, 00:04:01, FastEthernet0/11
O 10.160.255.52/30 [110/2] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.56/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.60/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.64/30 [110/2] via 10.175.255.138, 00:04:01, FastEthernet0/11
O 10.160.255.68/30 [110/5] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.72/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.76/30 [110/4] via 10.175.255.138, 00:01:02, FastEthernet0/11
O 10.160.255.80/30 [110/2] via 10.175.255.138, 00:04:01, FastEthernet0/11
O 10.160.255.84/30 [110/2] via 10.175.255.138, 00:04:01, FastEthernet0/11
O 10.165.30.0/24 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
C 10.175.255.0/30 is directly connected, FastEthernet0/1
O 10.175.255.4/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.8/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
C 10.175.255.12/30 is directly connected, FastEthernet0/2
O 10.175.255.16/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.20/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
C 10.175.255.24/30 is directly connected, FastEthernet0/3
O 10.175.255.28/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.32/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.36/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.40/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11

O 10.175.255.44/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.48/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.52/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.56/30 [110/6] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.60/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.64/30 [110/5] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.68/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.72/30 [110/7] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.76/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.80/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.84/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.88/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.92/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.96/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.100/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.104/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
C 10.175.255.108/30 is directly connected, FastEthernet0/4
C 10.175.255.112/30 is directly connected, FastEthernet0/5
C 10.175.255.116/30 is directly connected, FastEthernet0/6
C 10.175.255.120/30 is directly connected, FastEthernet0/7
C 10.175.255.124/30 is directly connected, FastEthernet0/8
C 10.175.255.128/30 is directly connected, FastEthernet0/9
C 10.175.255.132/30 is directly connected, FastEthernet0/10
C 10.175.255.136/30 is directly connected, FastEthernet0/11
O 10.175.255.140/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.144/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.148/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.152/30 [110/2] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.156/30 [110/3] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.160/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
O 10.175.255.164/30 [110/4] via 10.175.255.138, 00:00:22, FastEthernet0/11
C 10.175.255.168/30 is directly connected, FastEthernet0/12

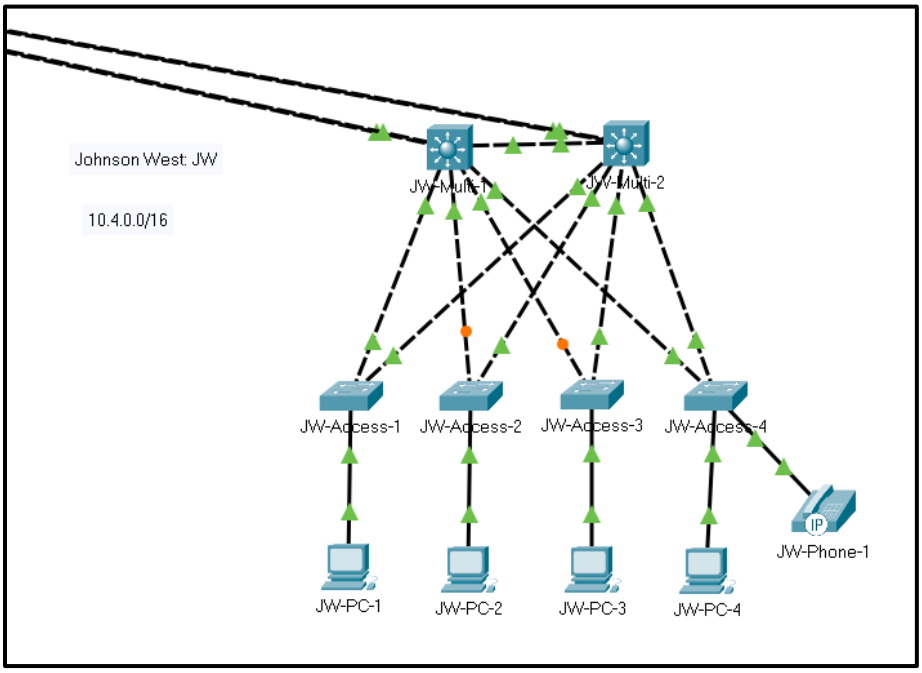
Appendix H: All Buildings

Node A:

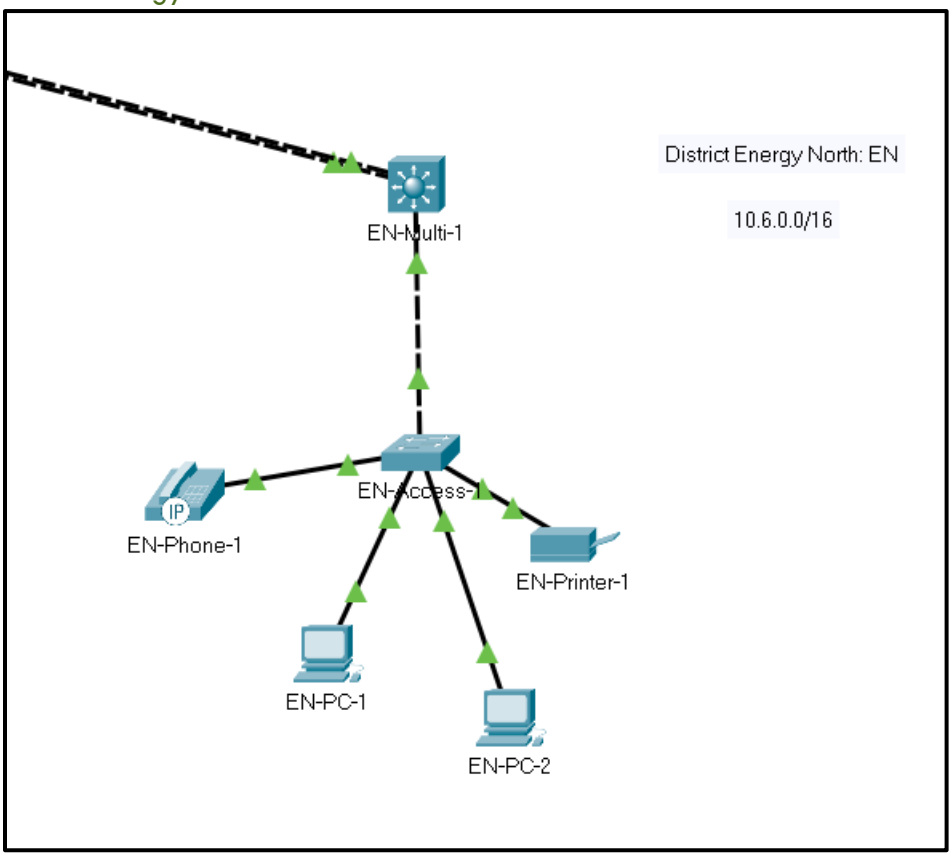
Johnson East:



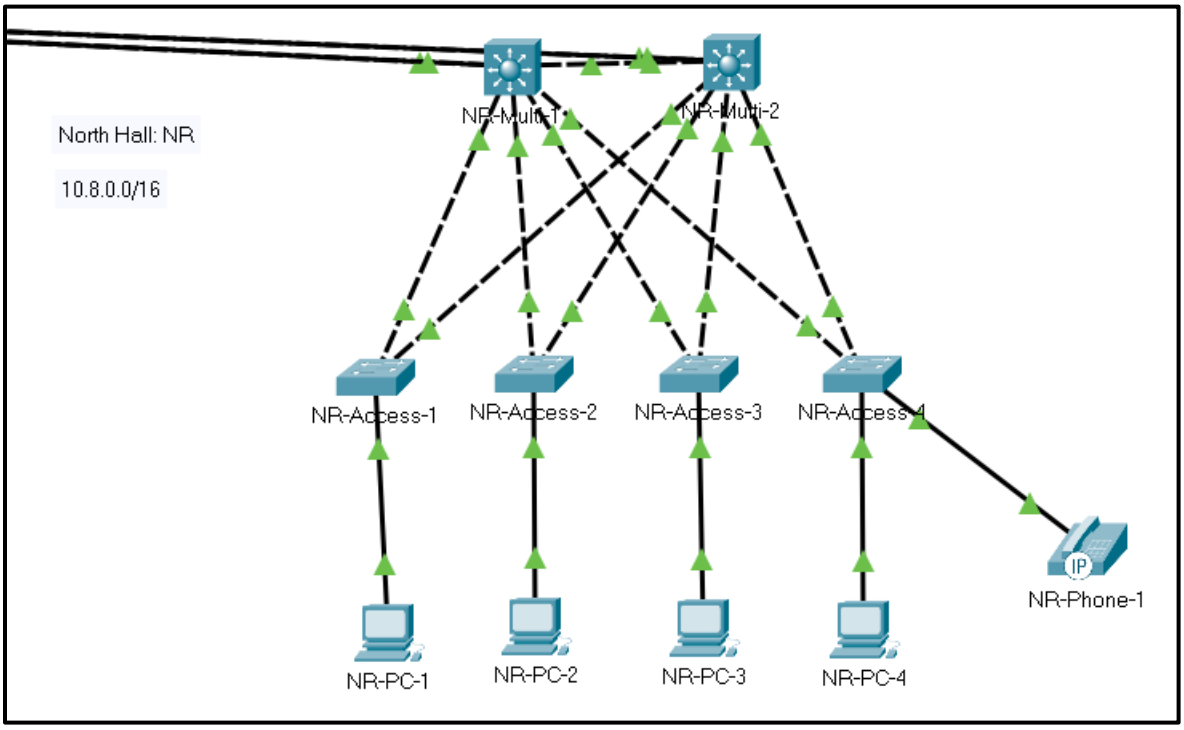
Johnson West:



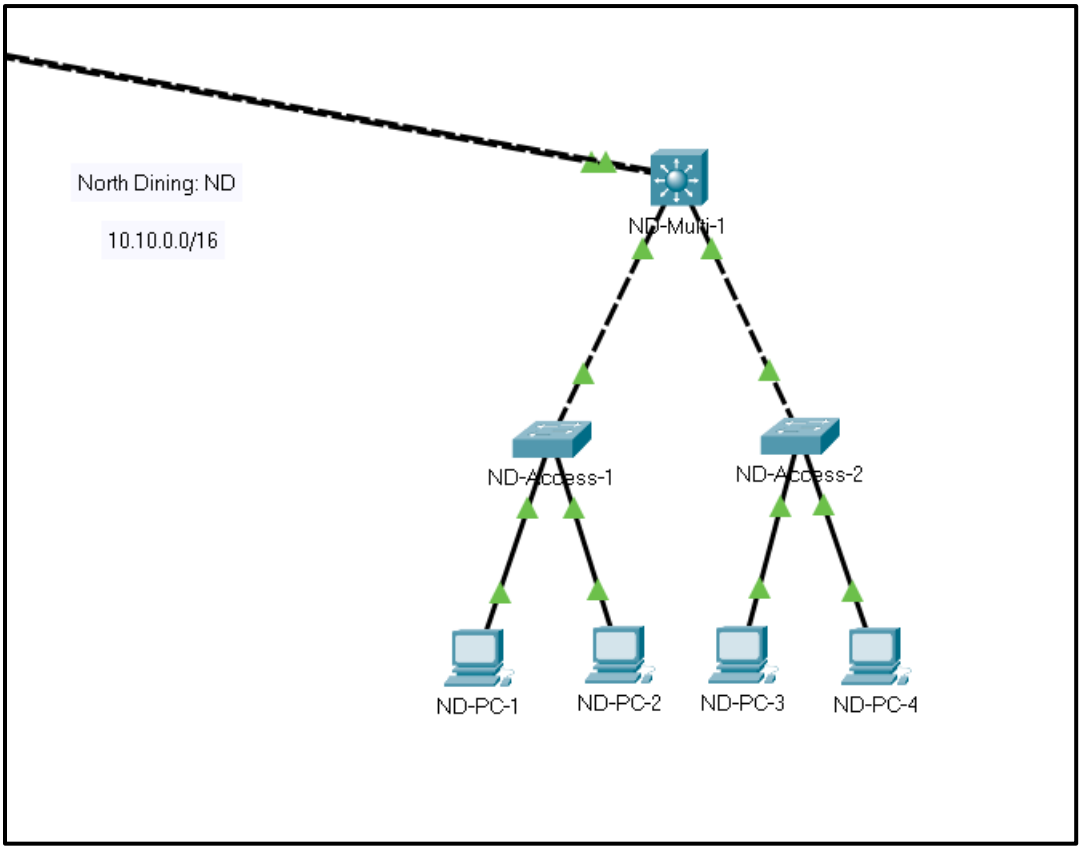
District Energy North:



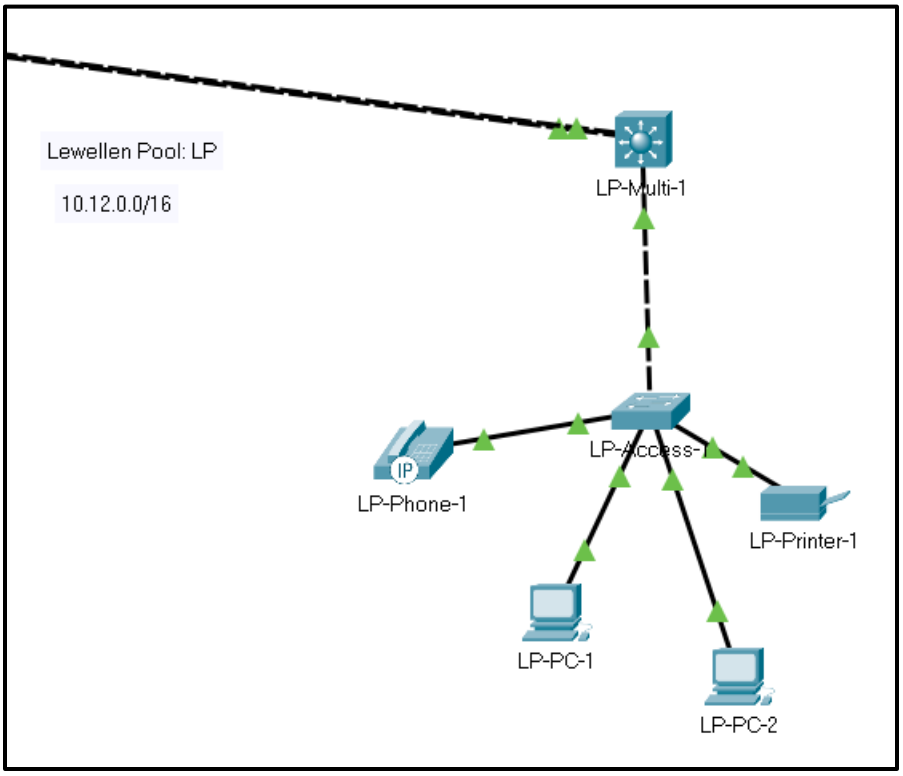
North Hall:



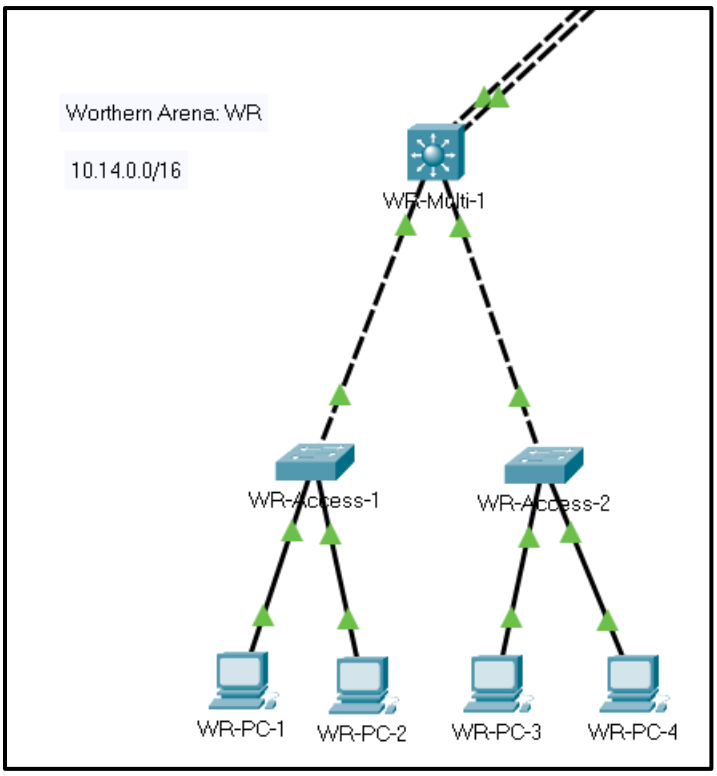
North Dining:



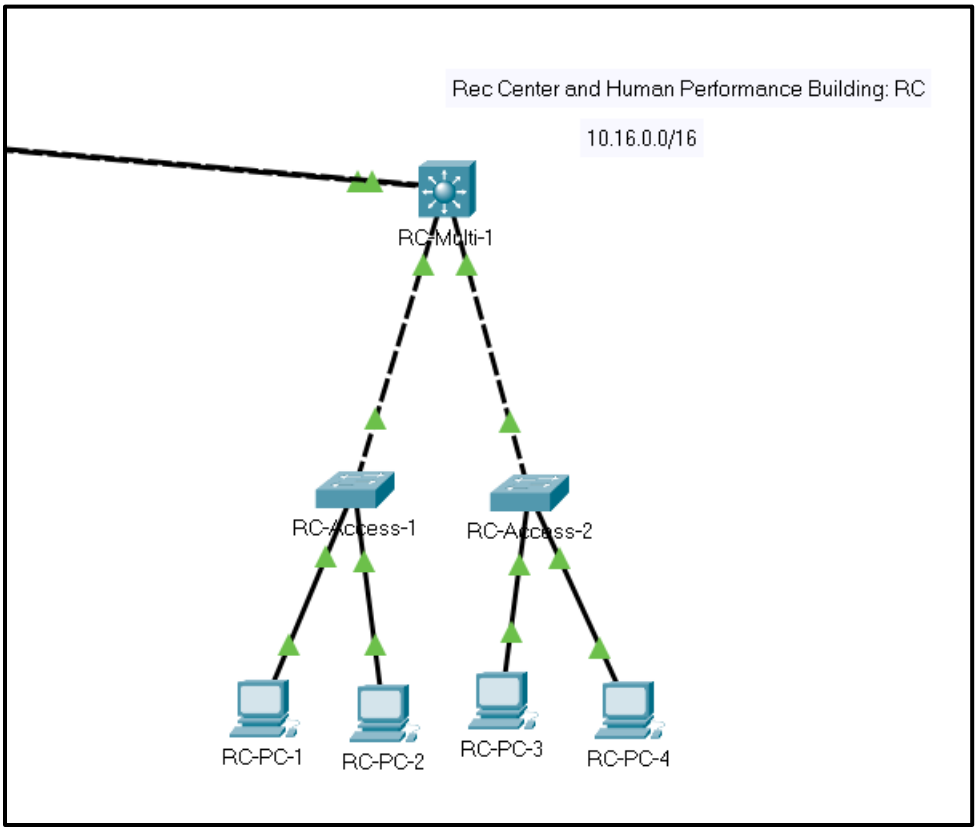
Lewellen Pool:



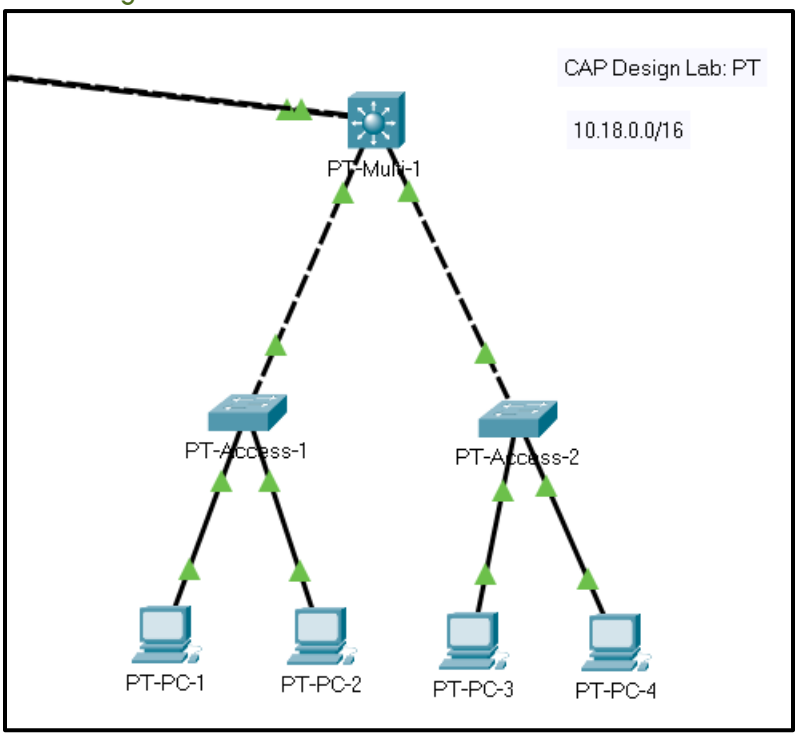
Worthern Arena:



Rec Center:

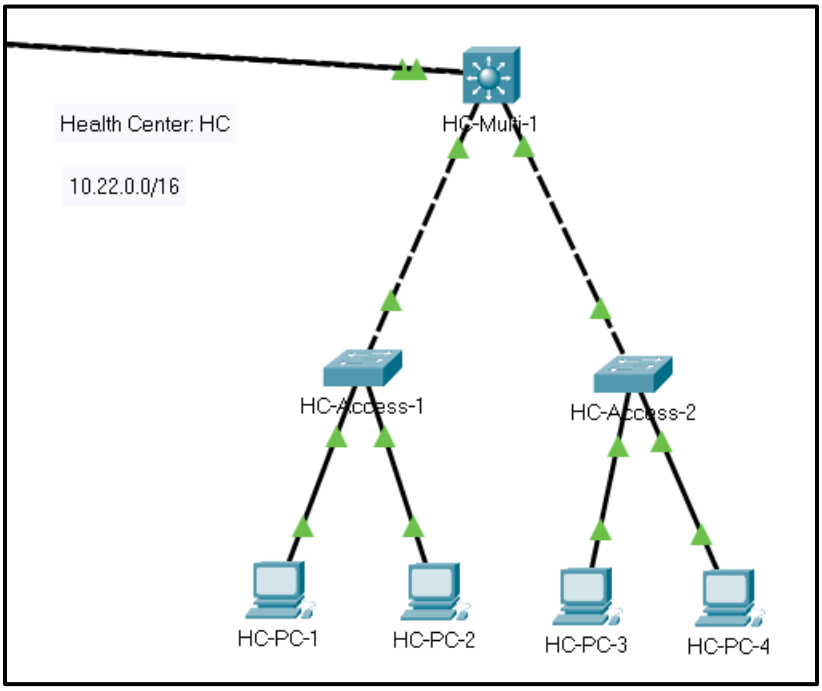


CAP Design Lab:

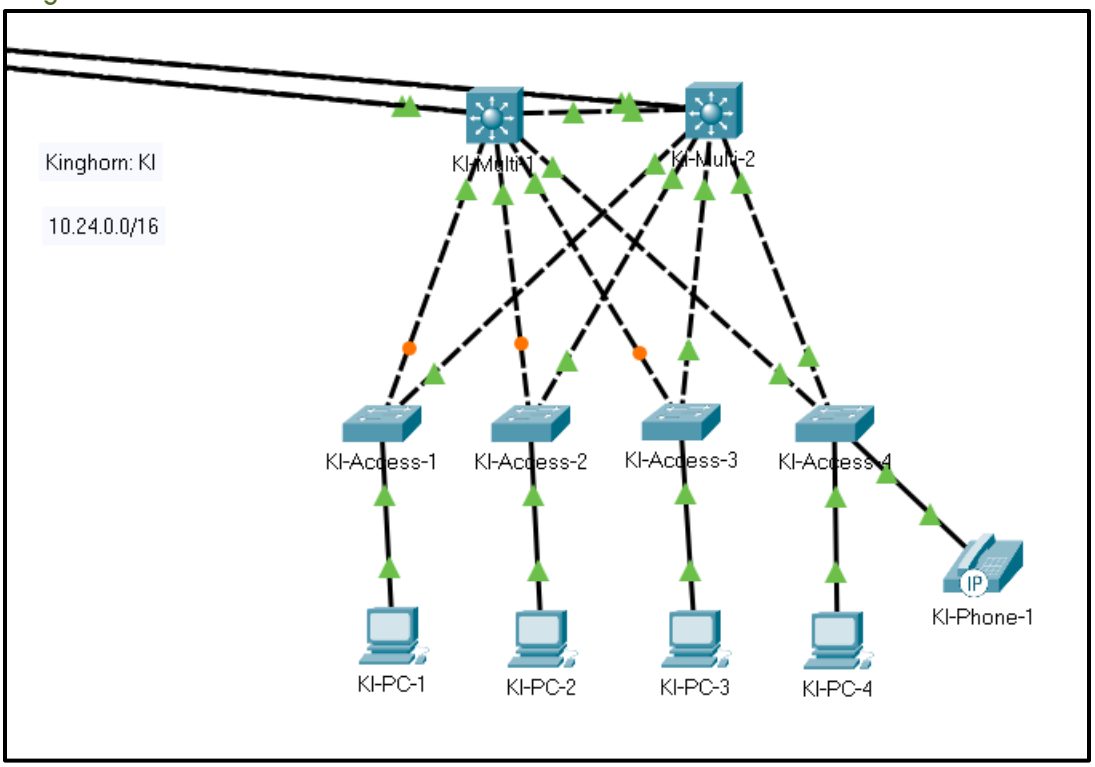


Node B:

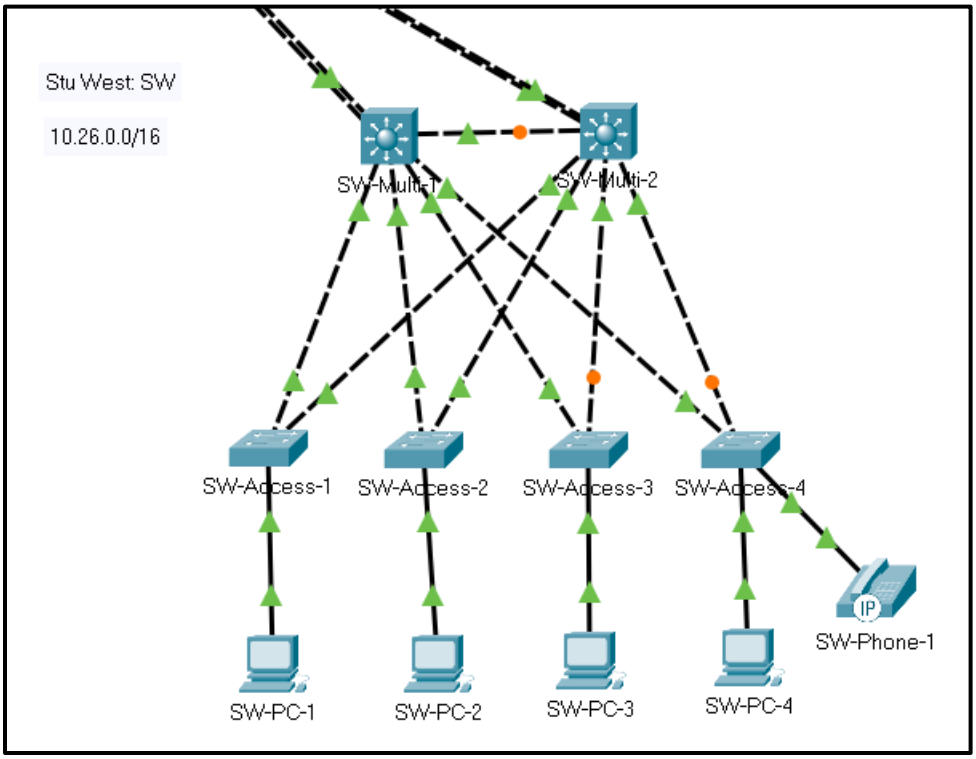
Health Center:



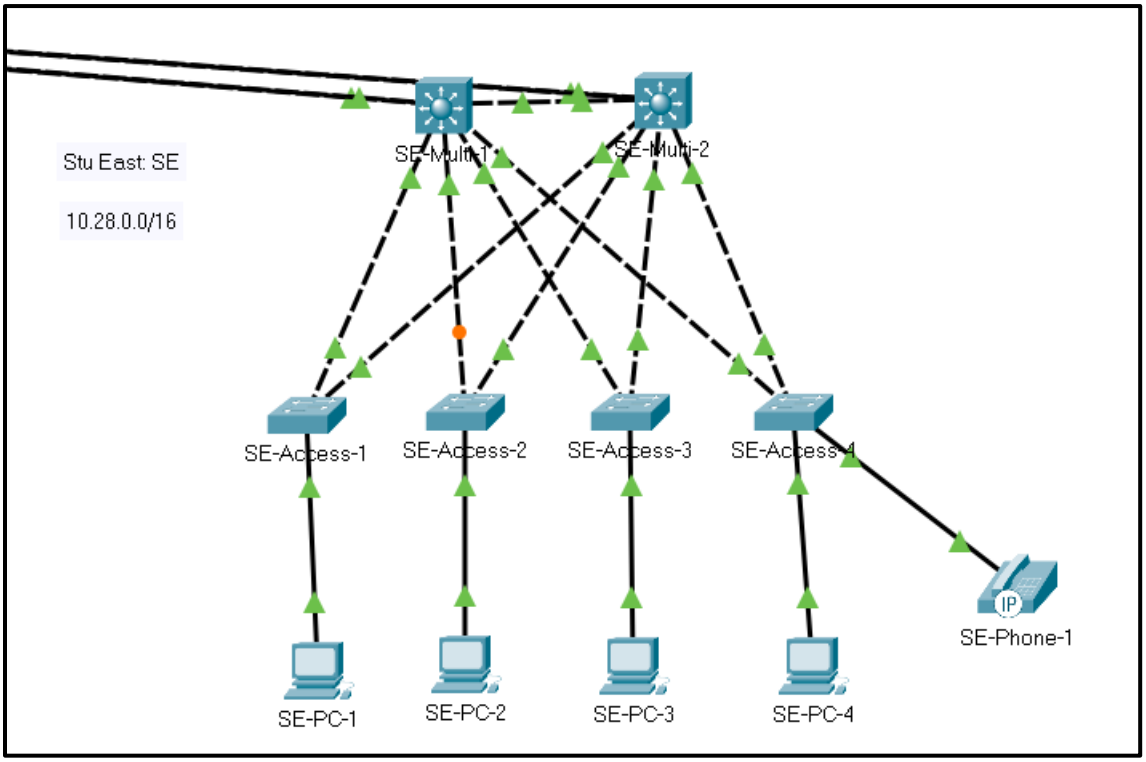
Kinghorn:



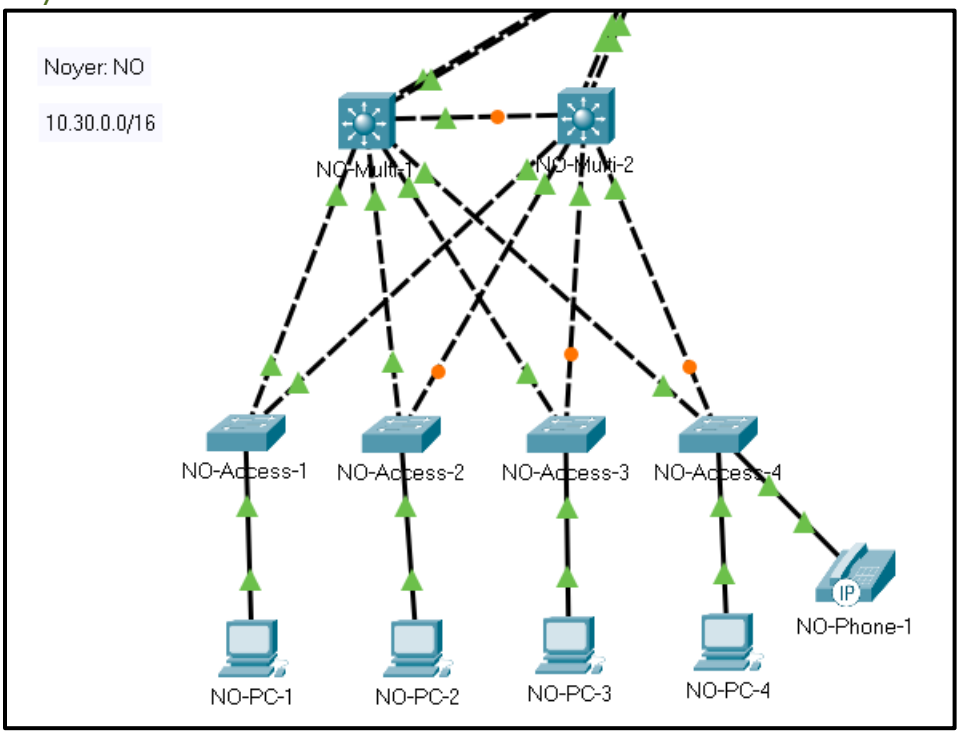
Studebaker West:



Studebaker East:



Noyer: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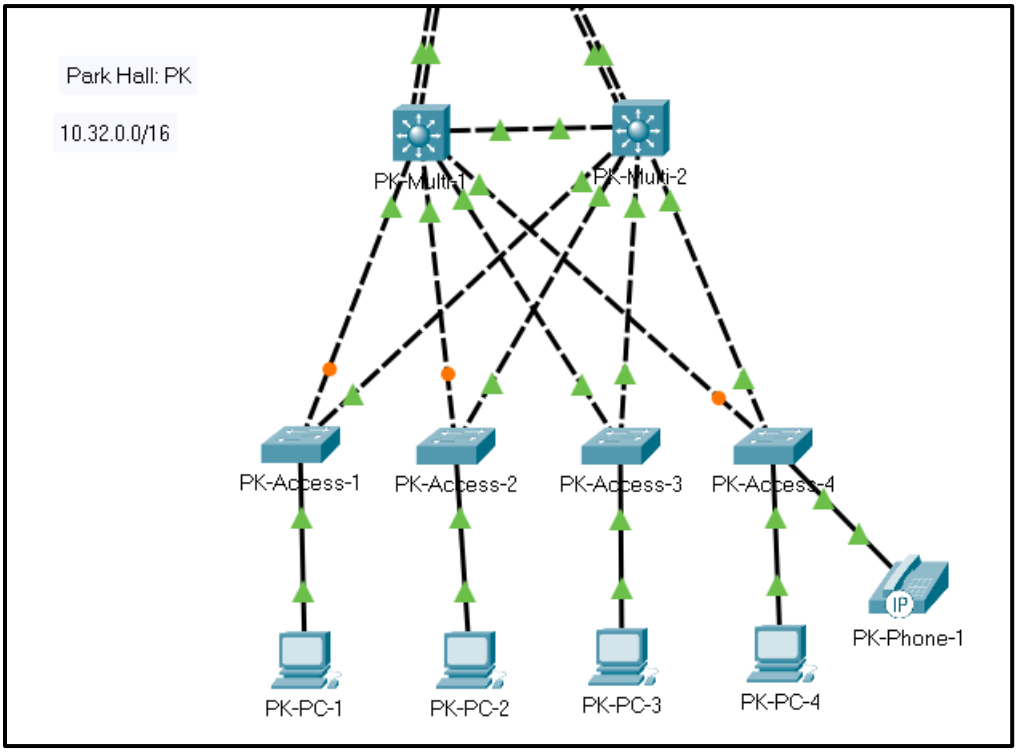
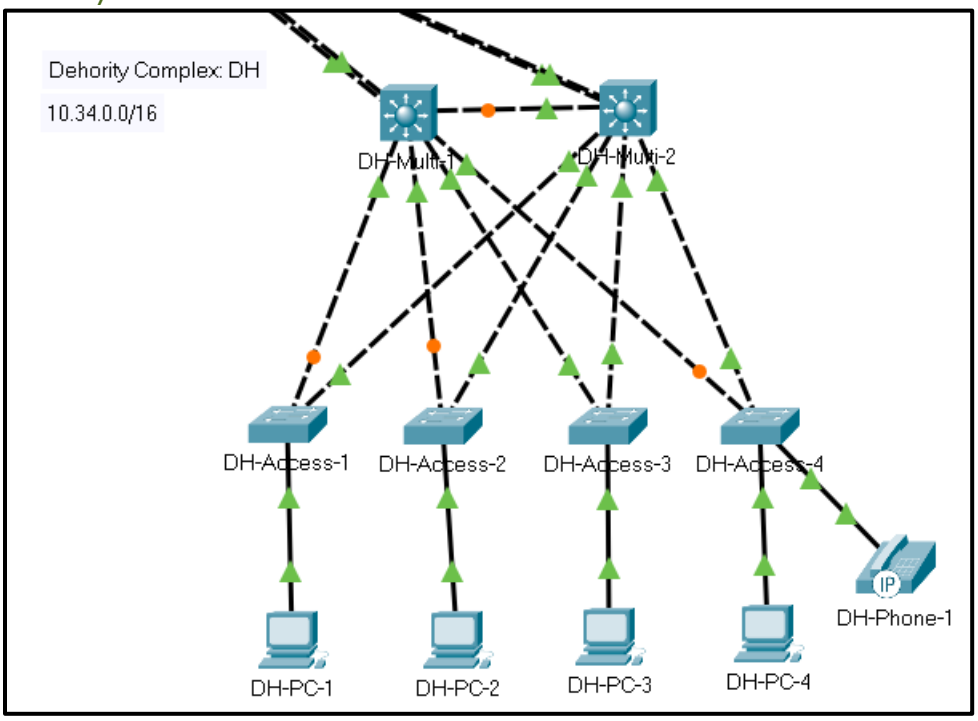
NO-Multi-2
NO-Access-1
NO-Access-2
NO-Access-3
NO-Access-4
NO-Phone-1
NO-PC-1
NO-PC-2
NO-PC-3
NO-PC-4

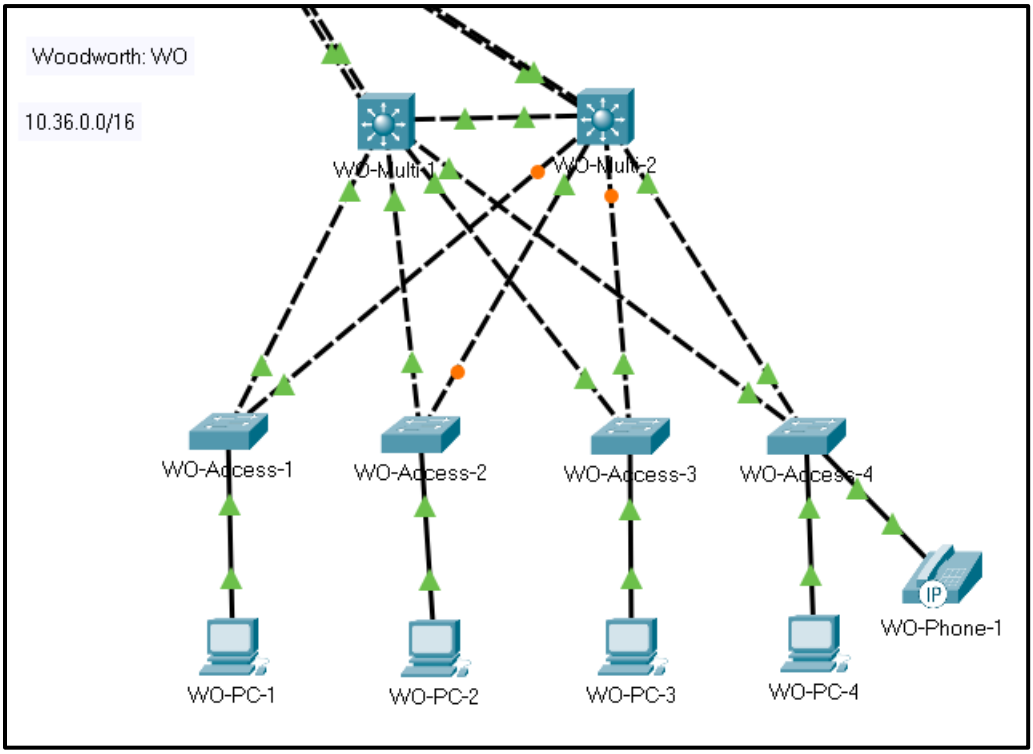
Park:


Park Hall: PK
10.32.0.0/16
PK-Multi-1
PK-Multi-2
PK-Access-1
PK-Access-2
PK-Access-3
PK-Access-4
PK-Phone-1
PK-PC-1
PK-PC-2
PK-PC-3
PK-PC-4

Dehority:

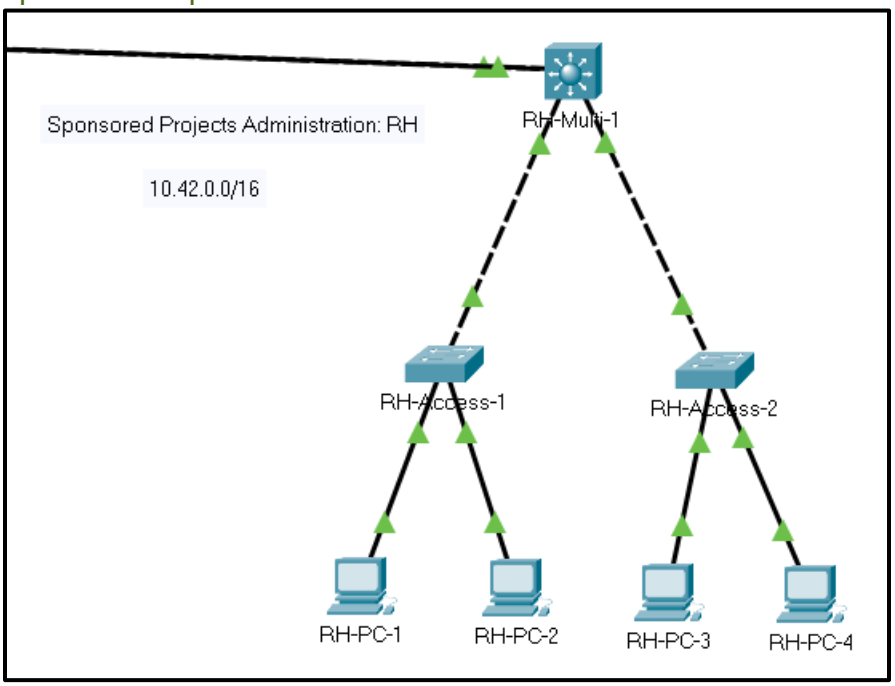


Woodworth:

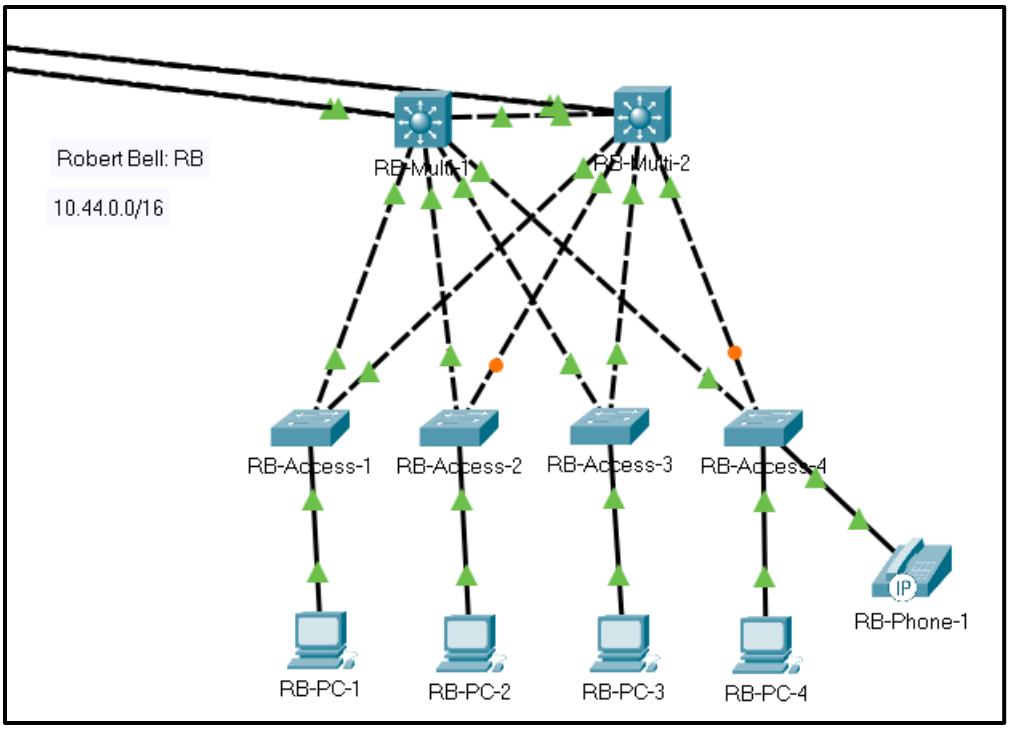


Node C:

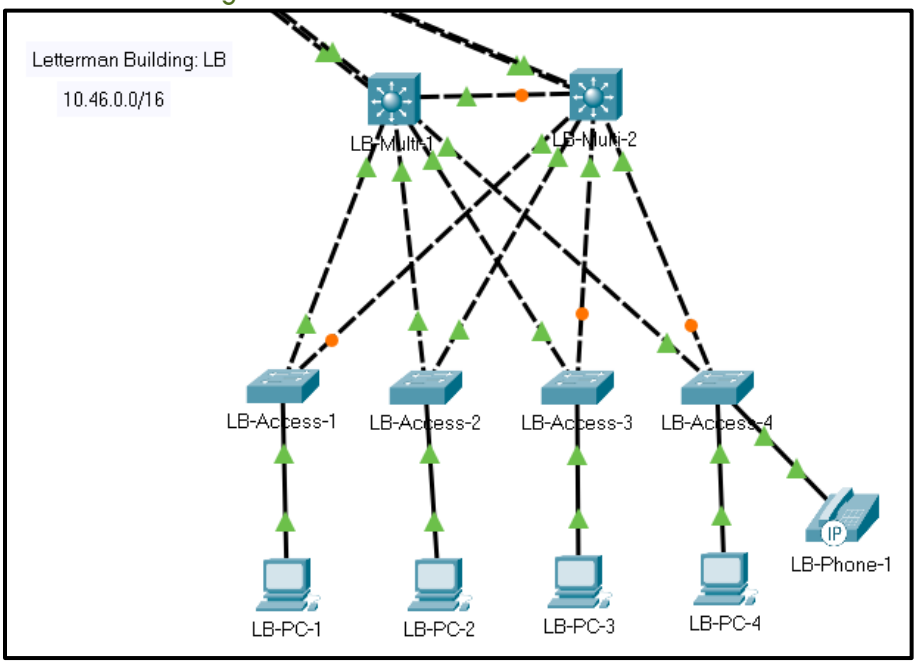
Sponsored Projects:



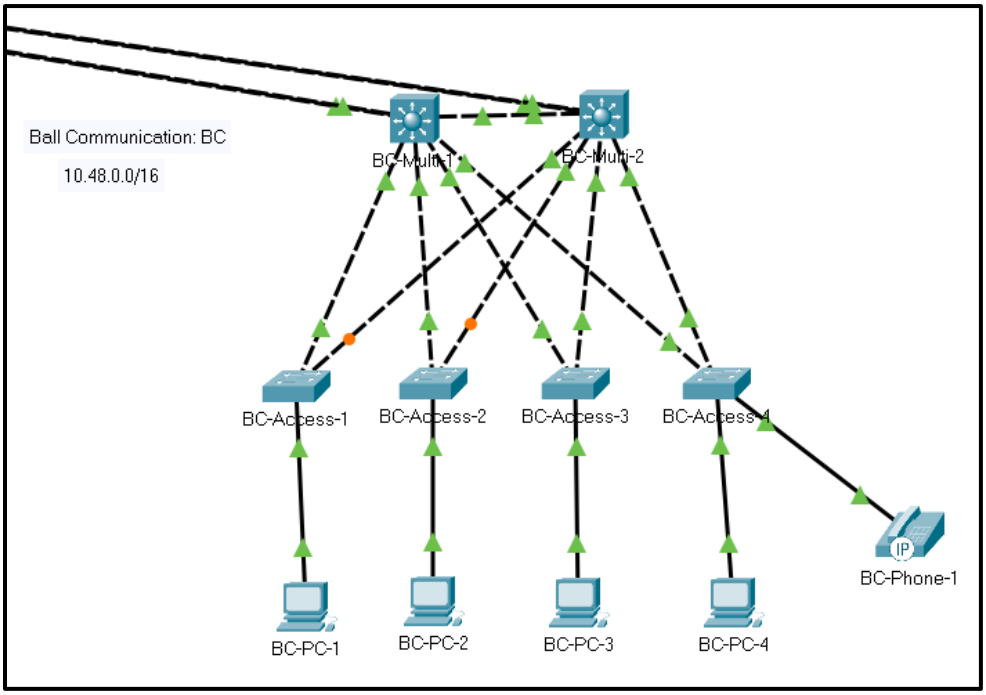
Robert Bell:



Letterman Building:



Ball Communication:



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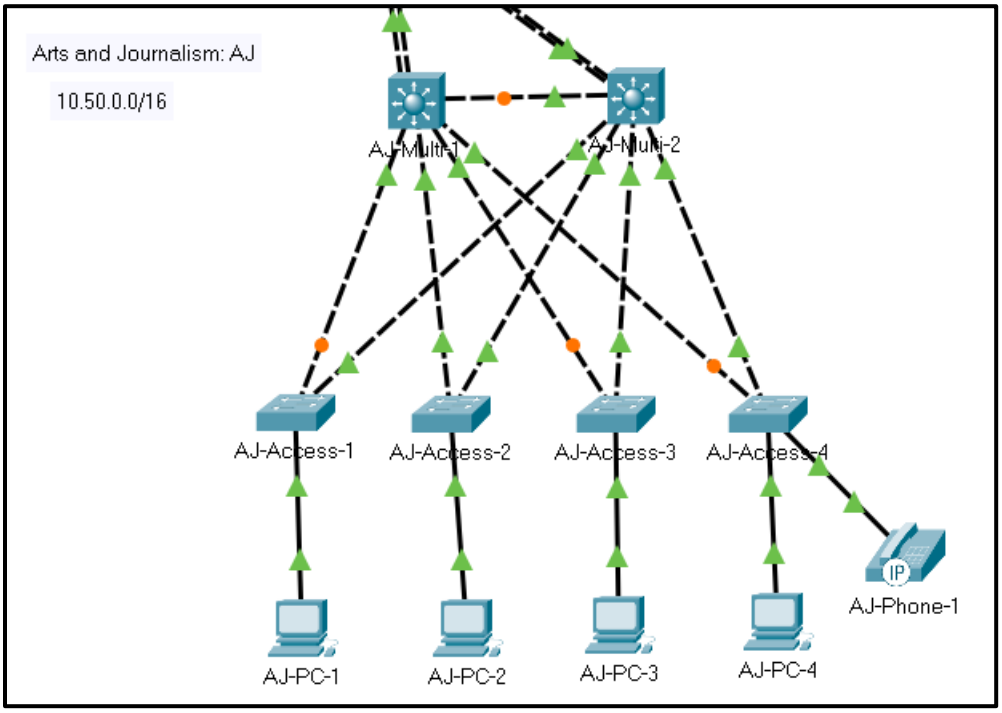

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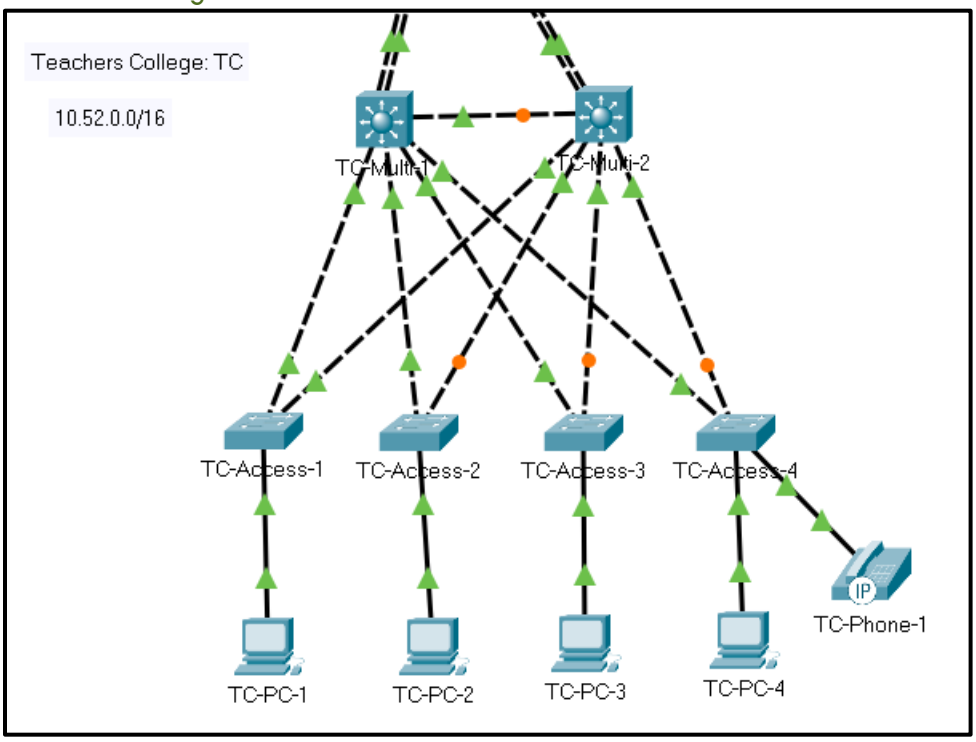

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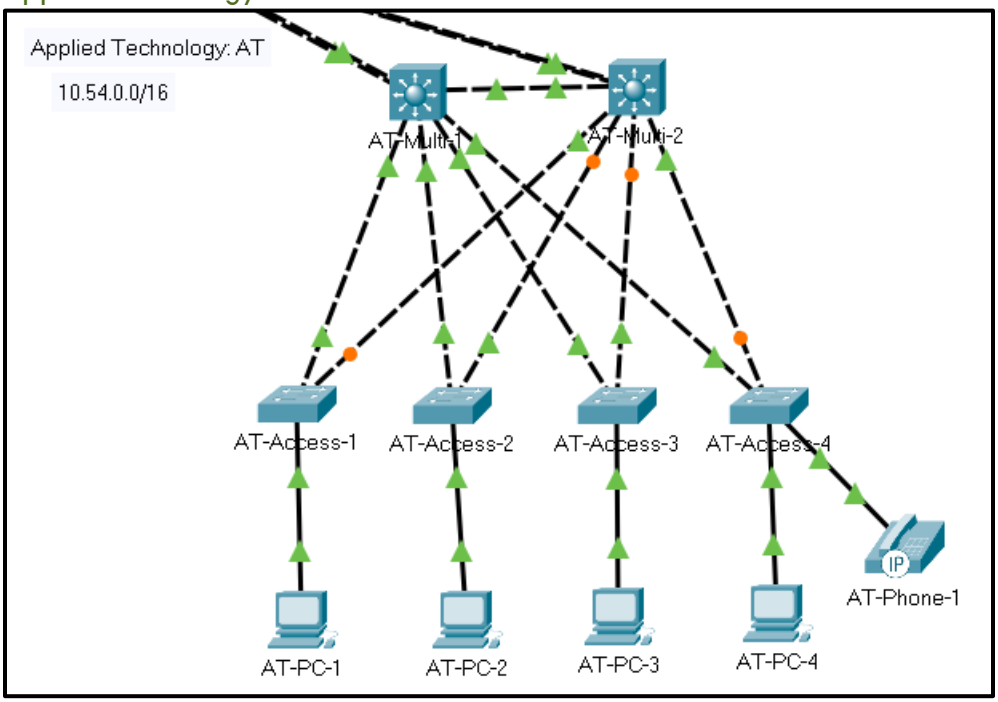

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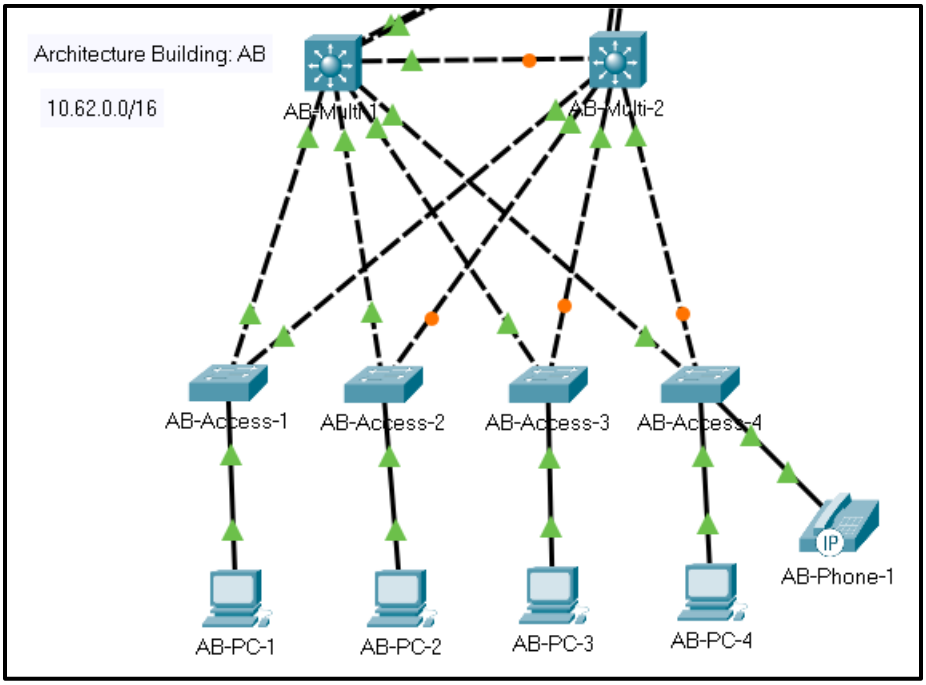

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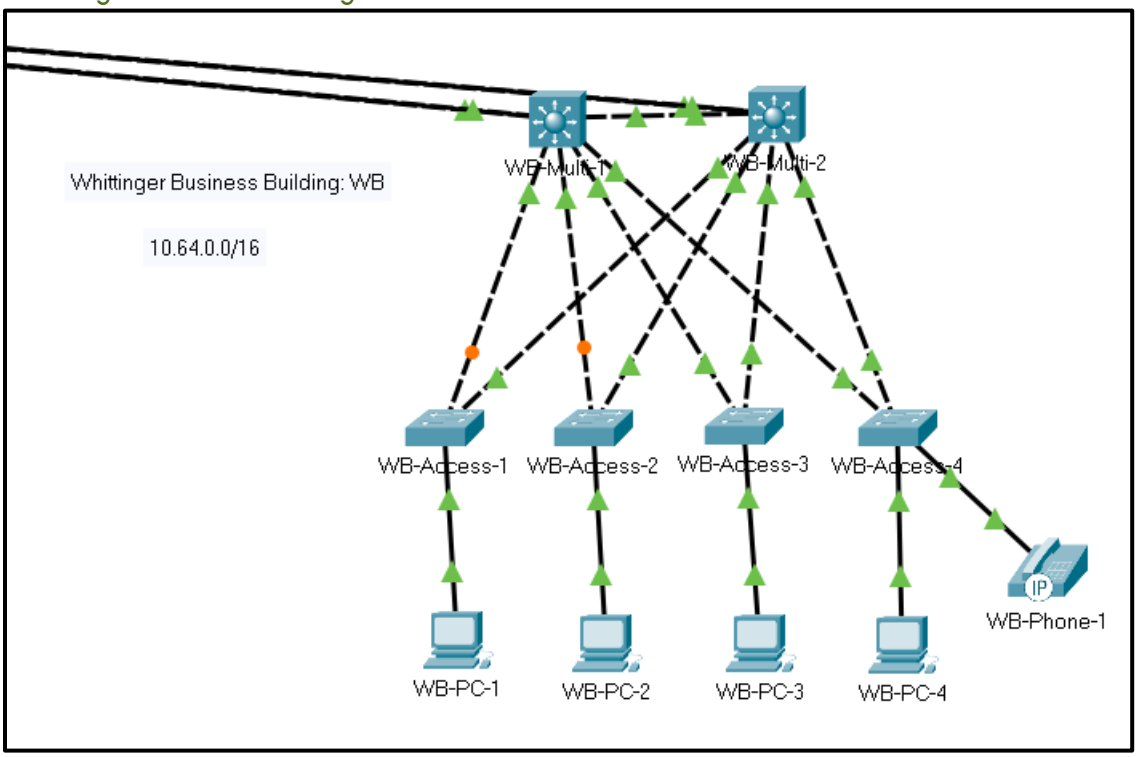

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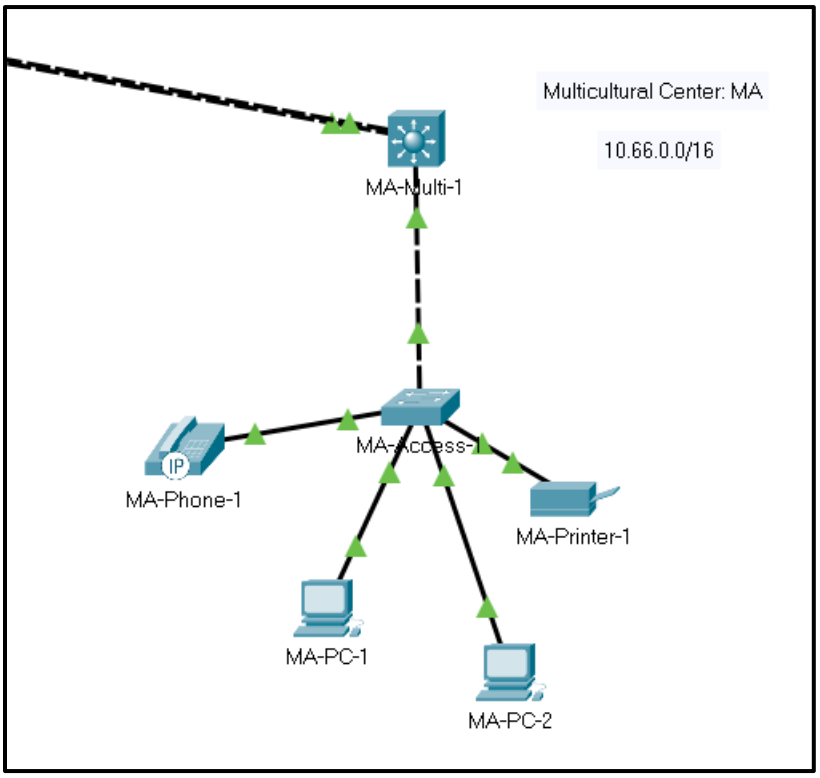

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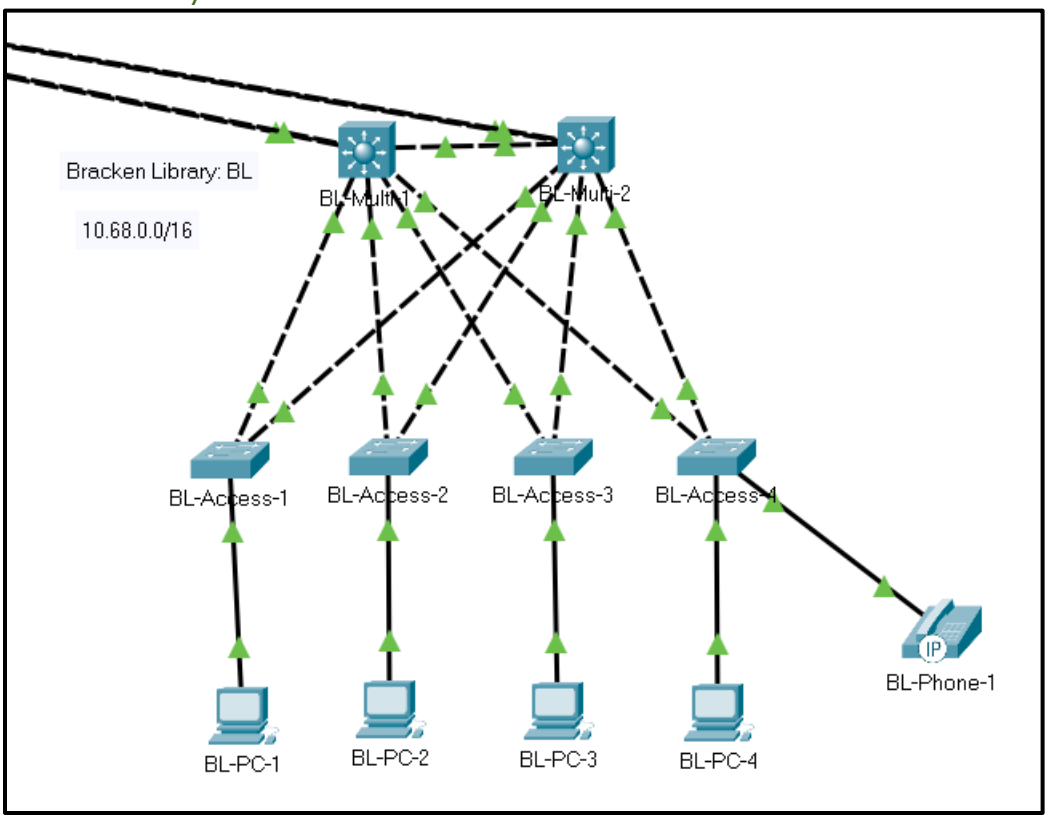

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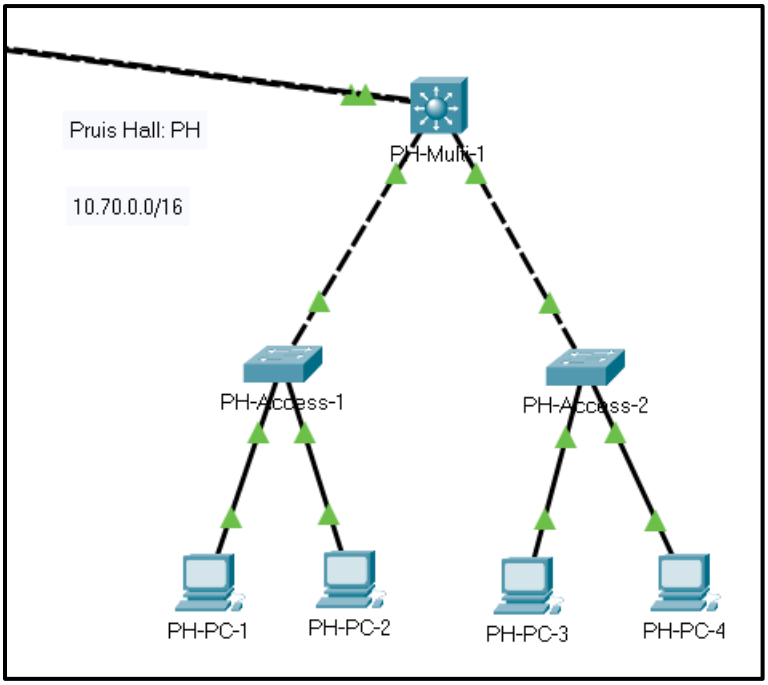

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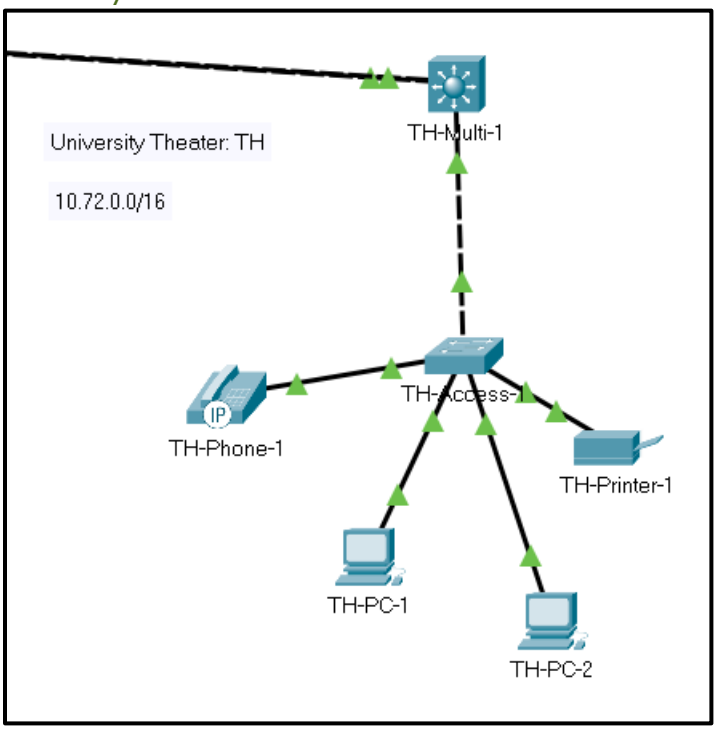

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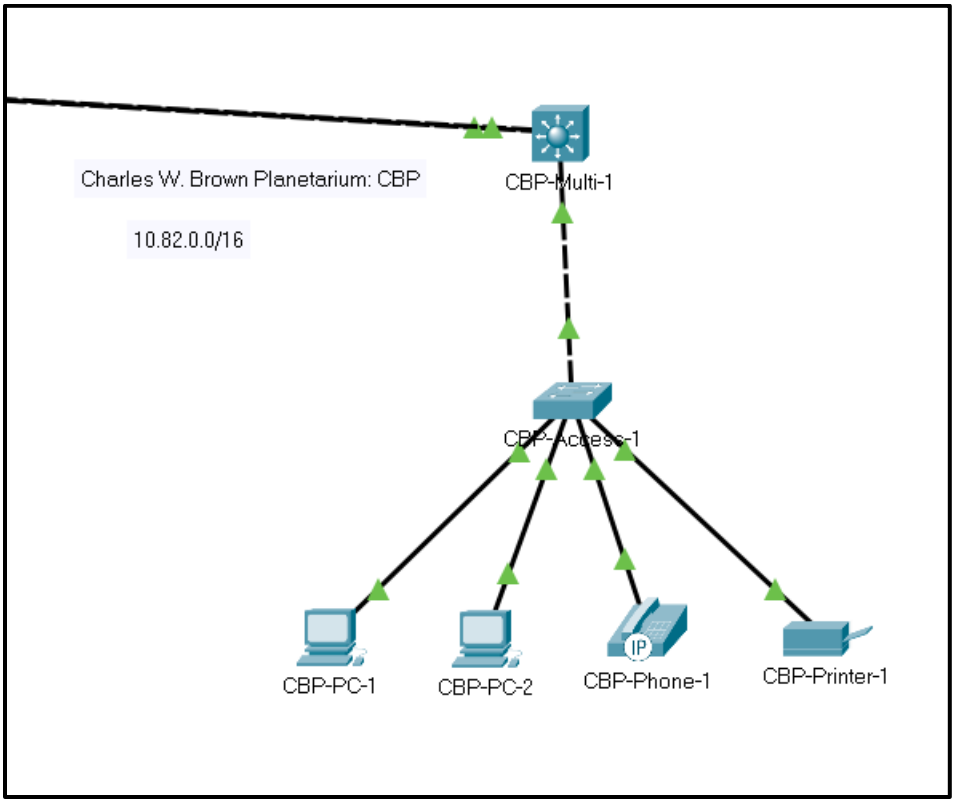

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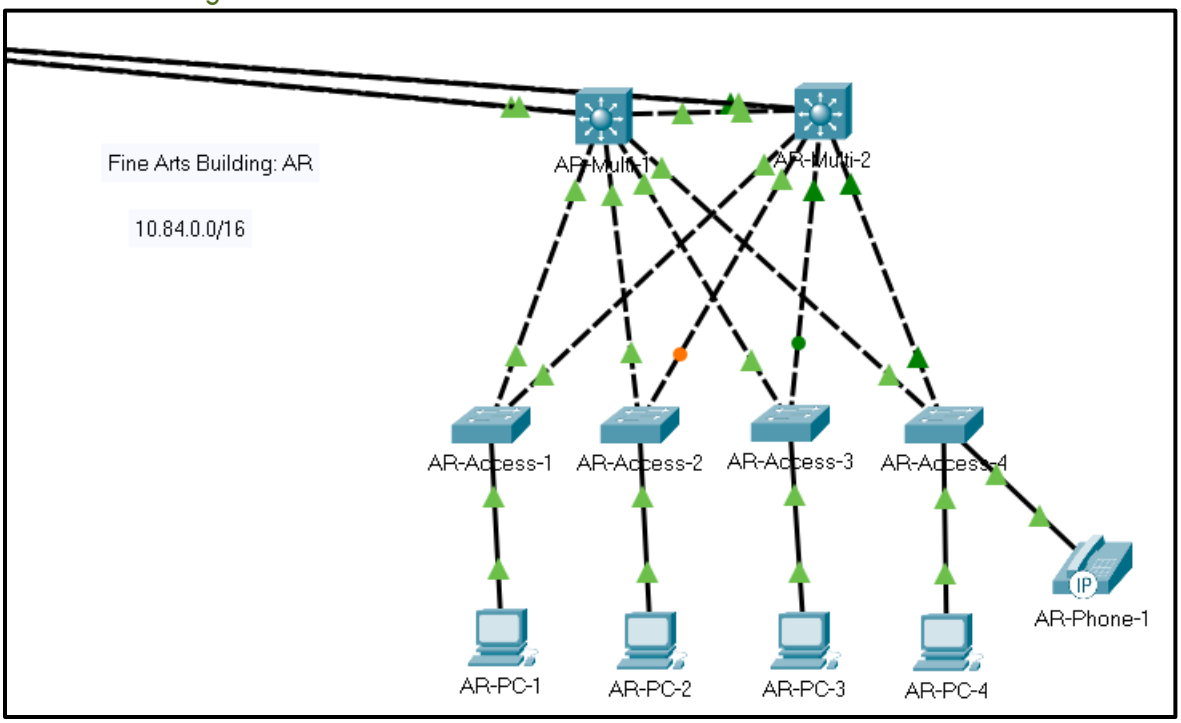
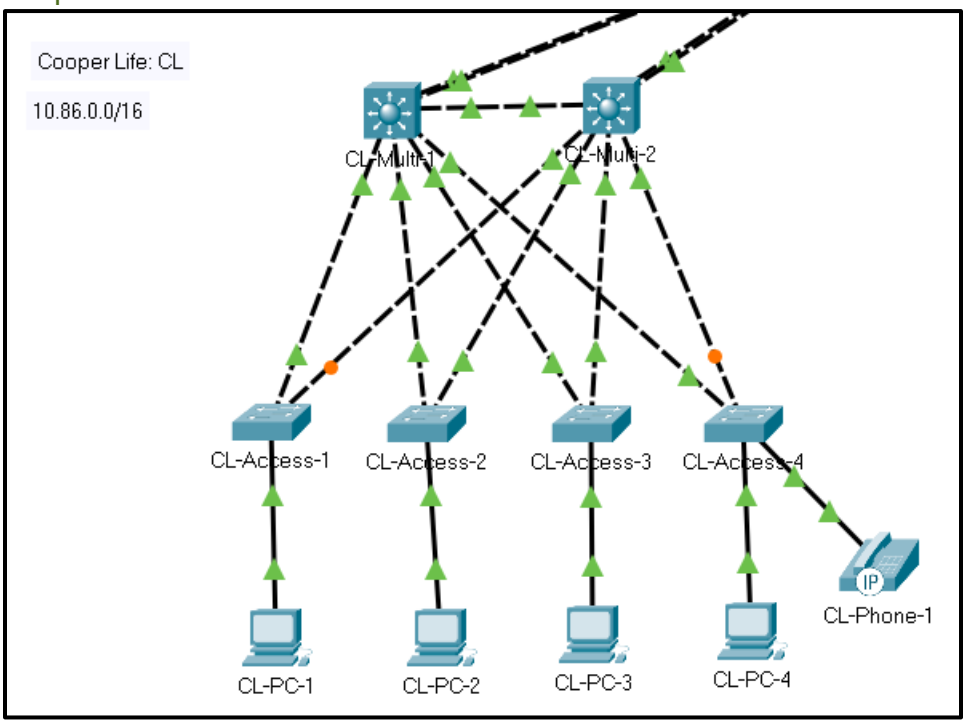


Cooper Life:



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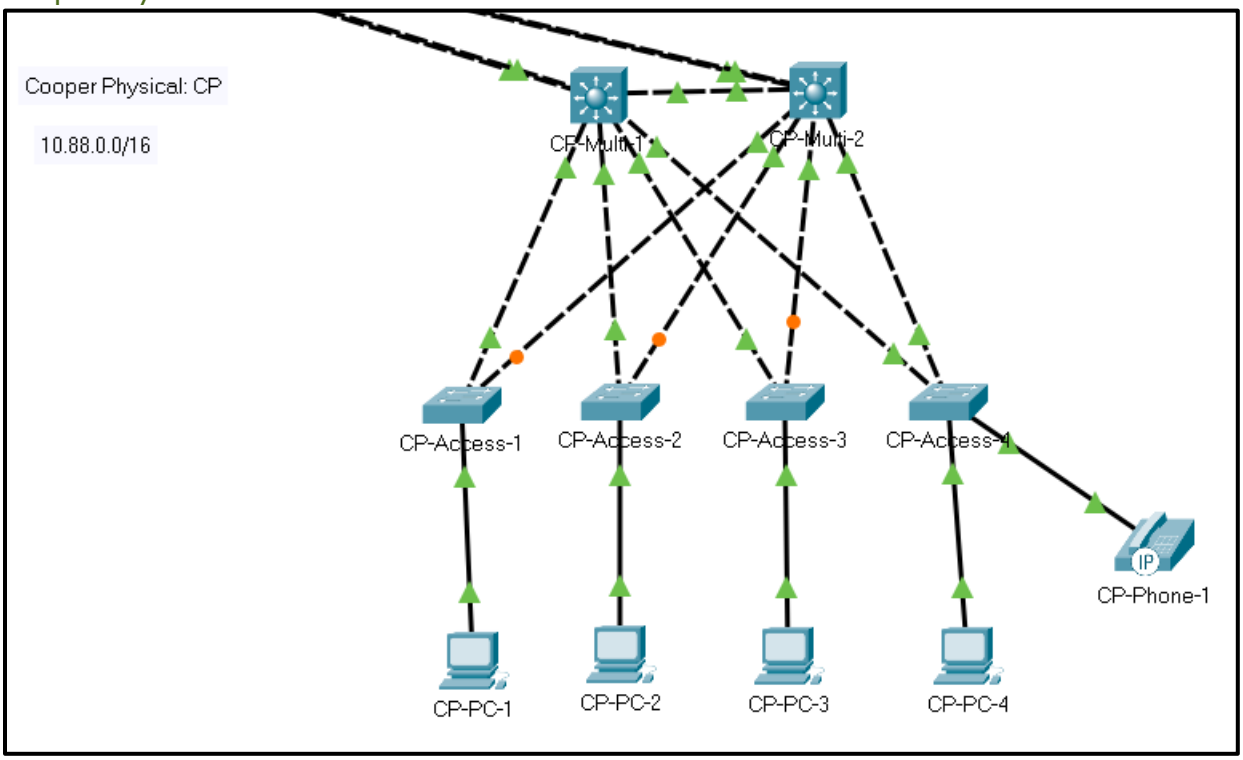

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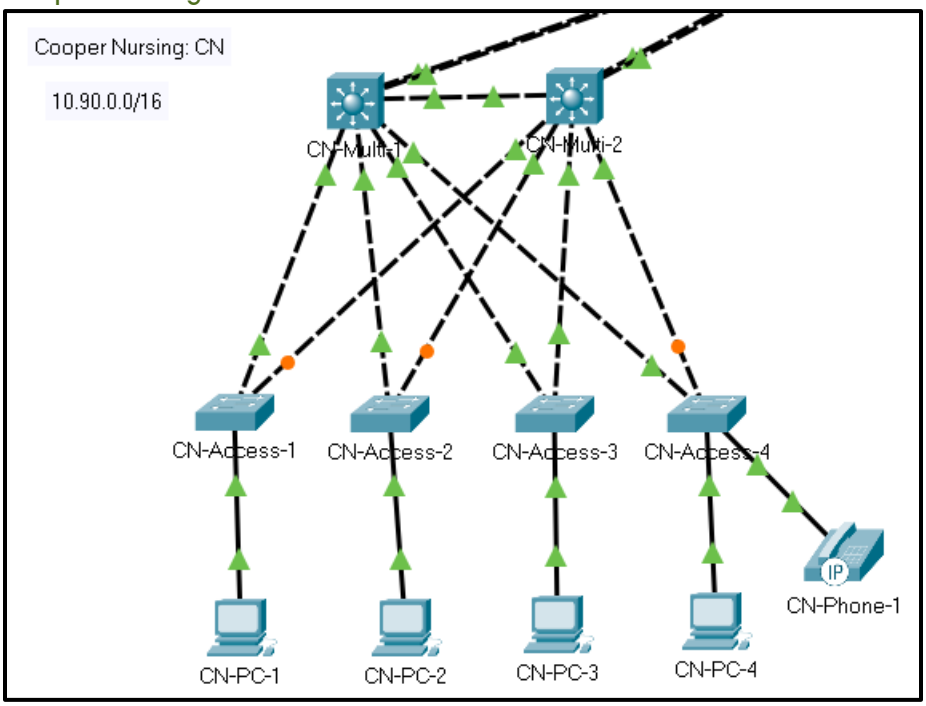

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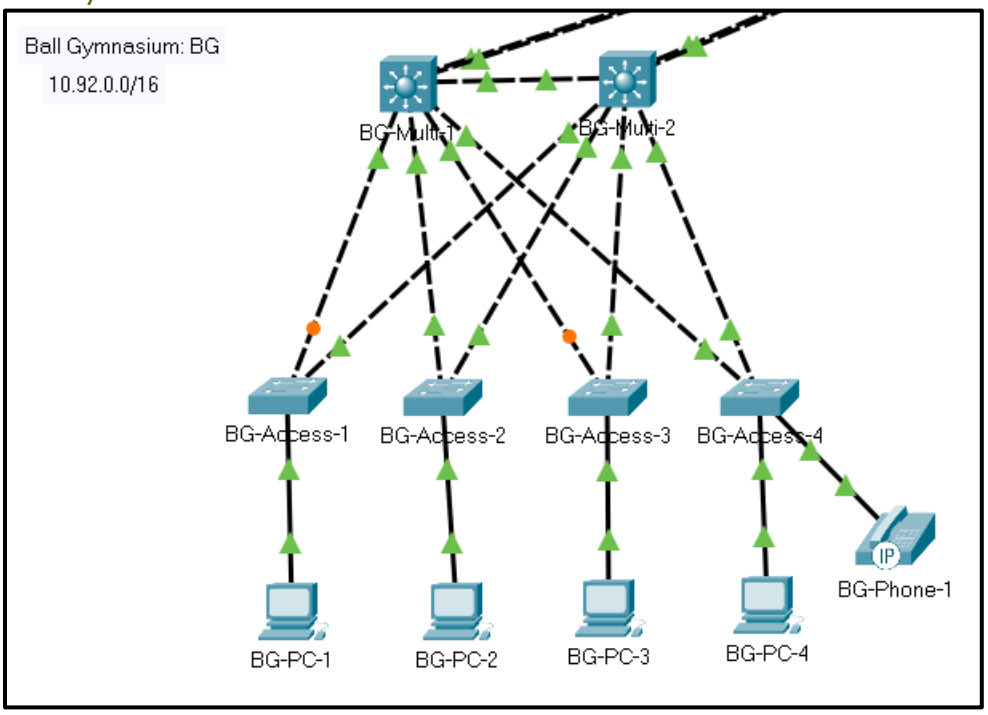

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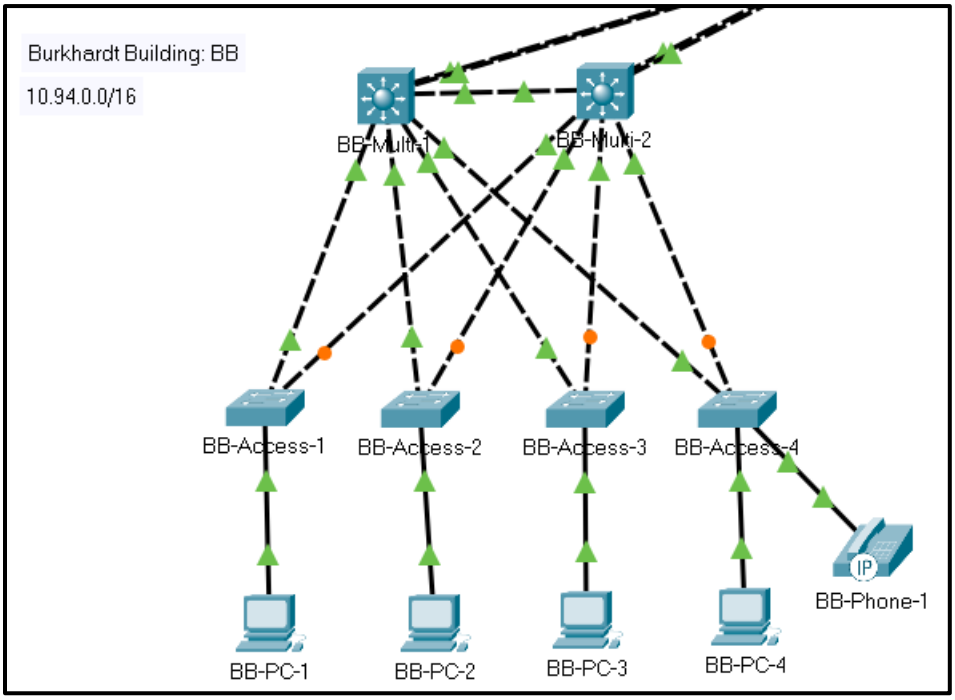

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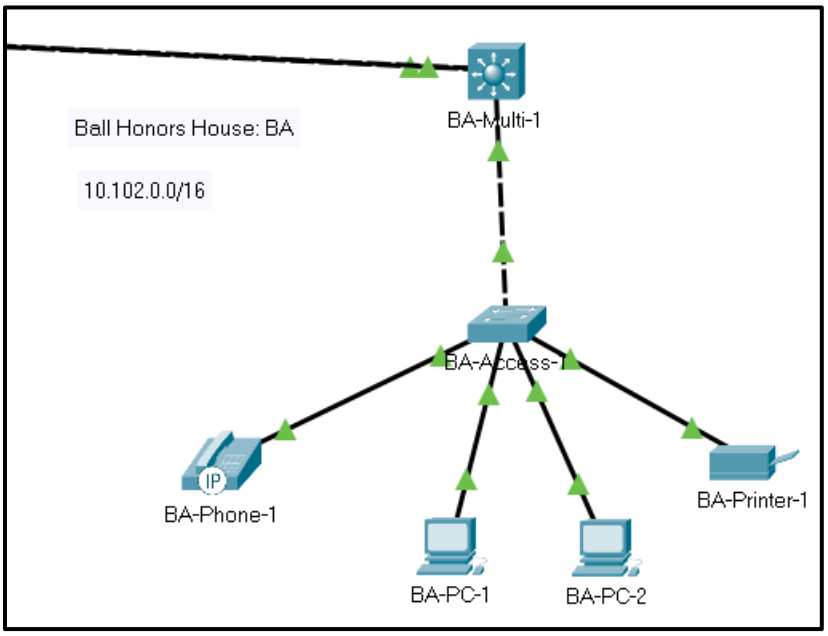
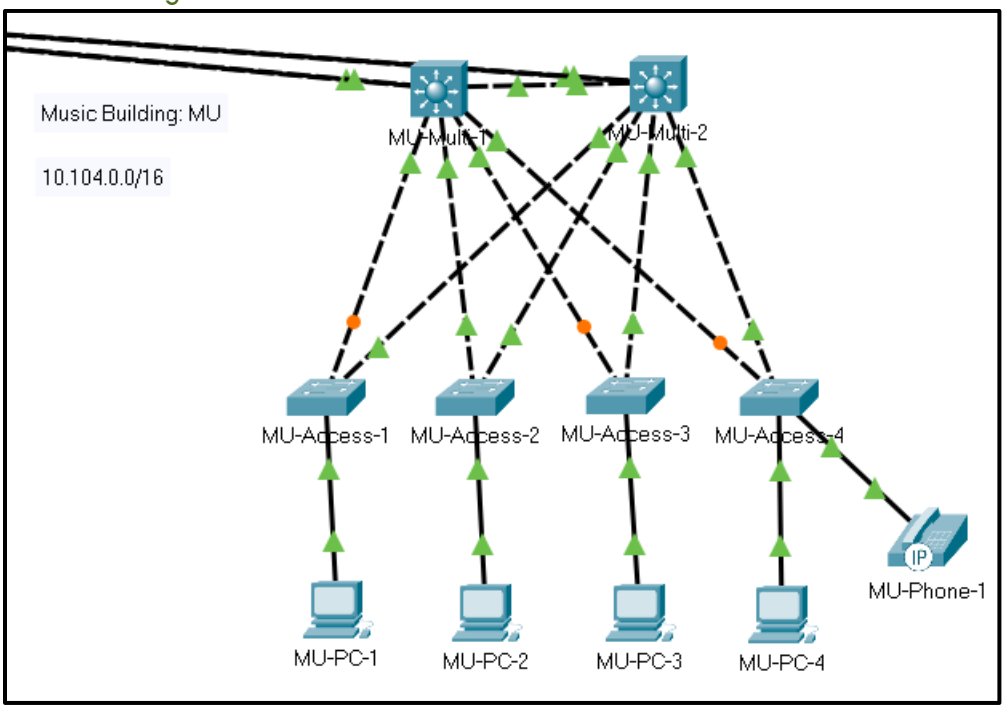
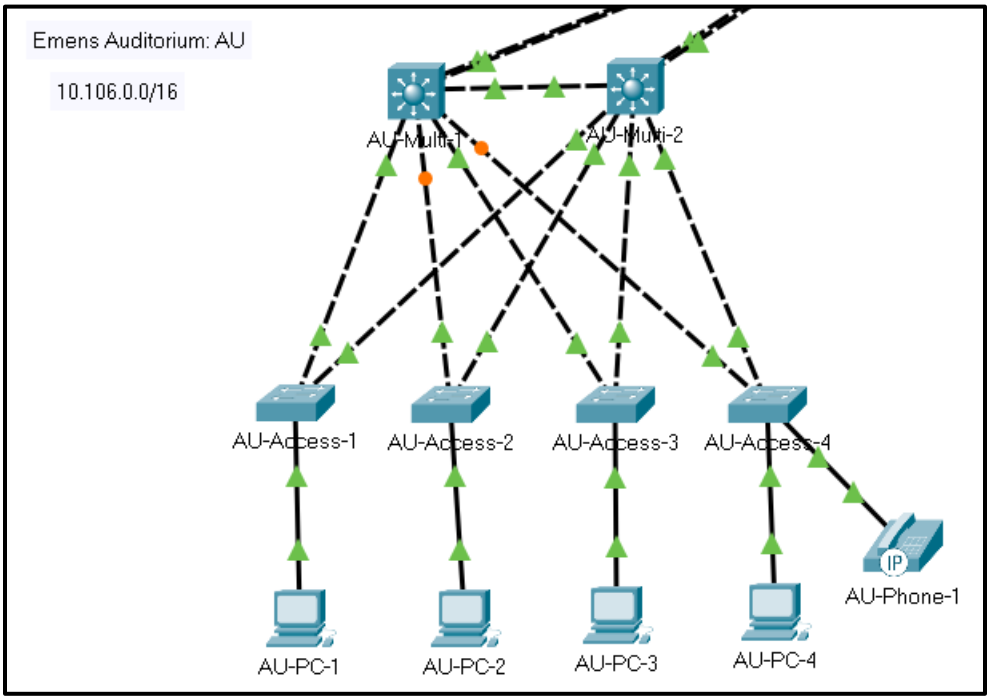
Honors House:



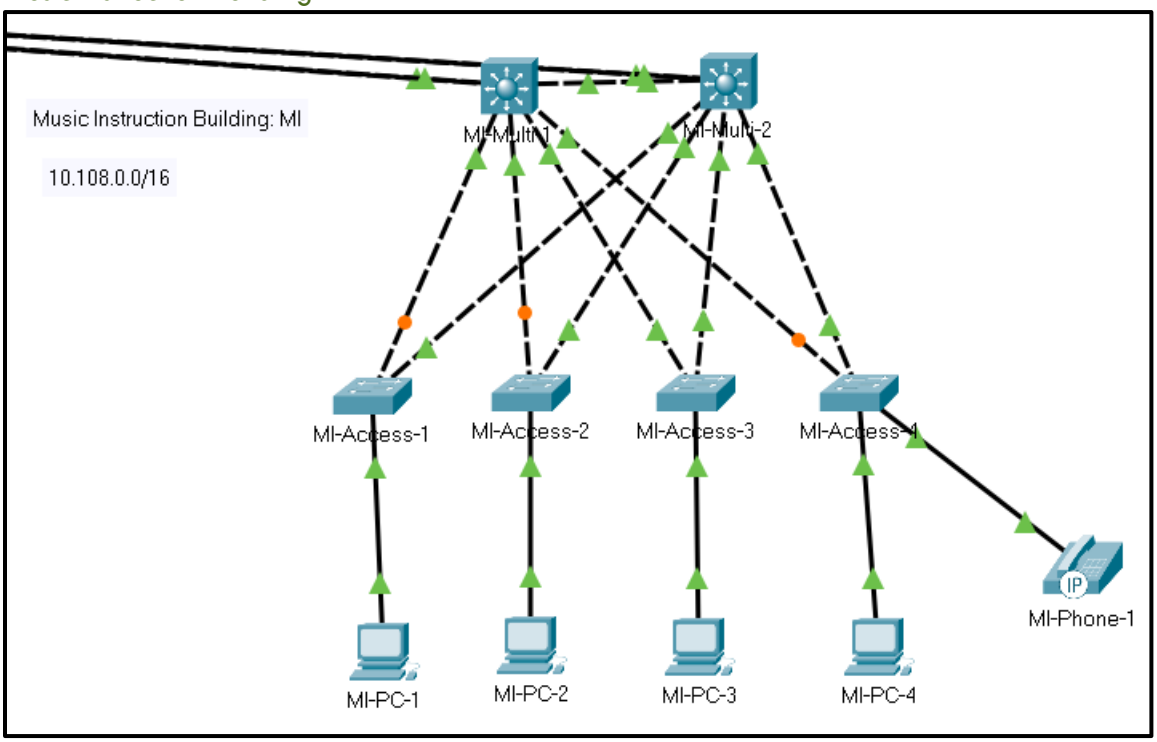
Music Building:



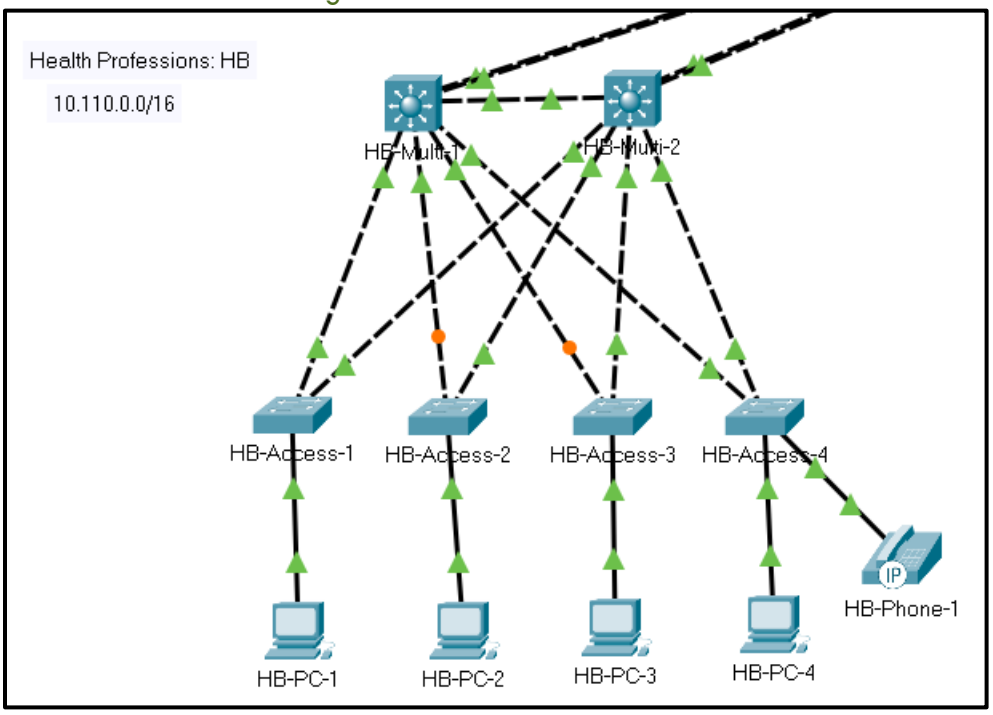
Emens Auditorium:



Music Instruction Building:



Health Professions Building:



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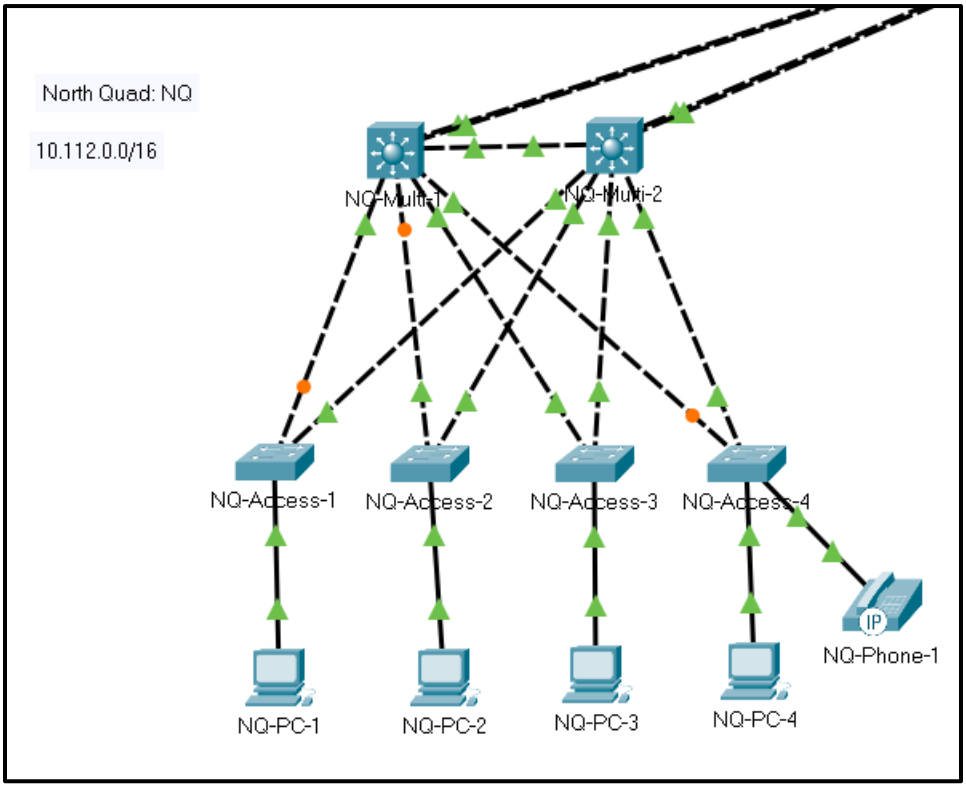

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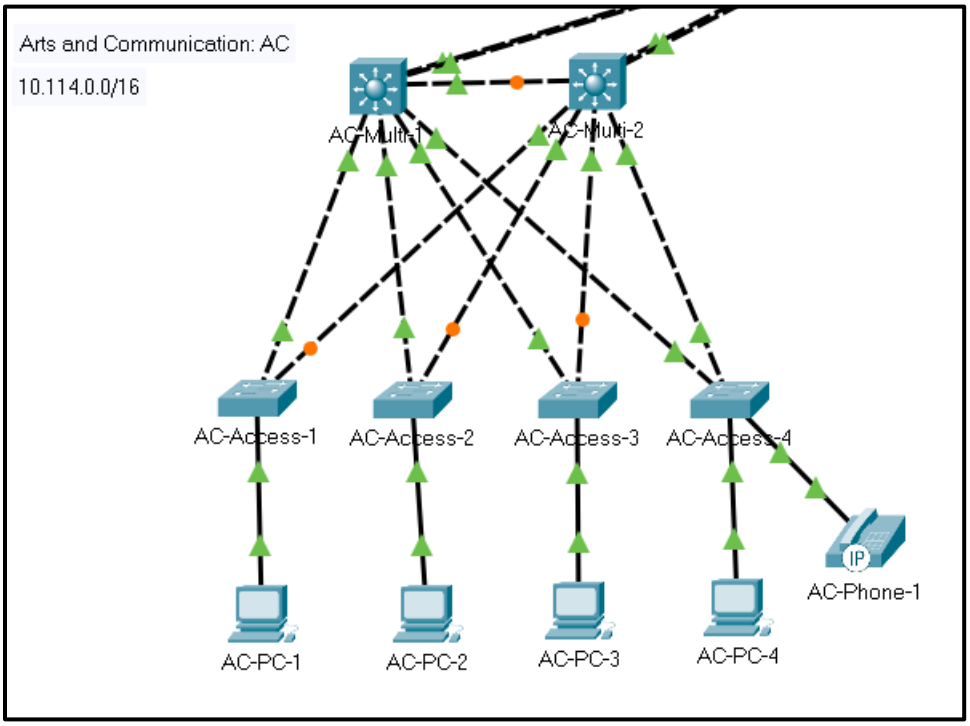
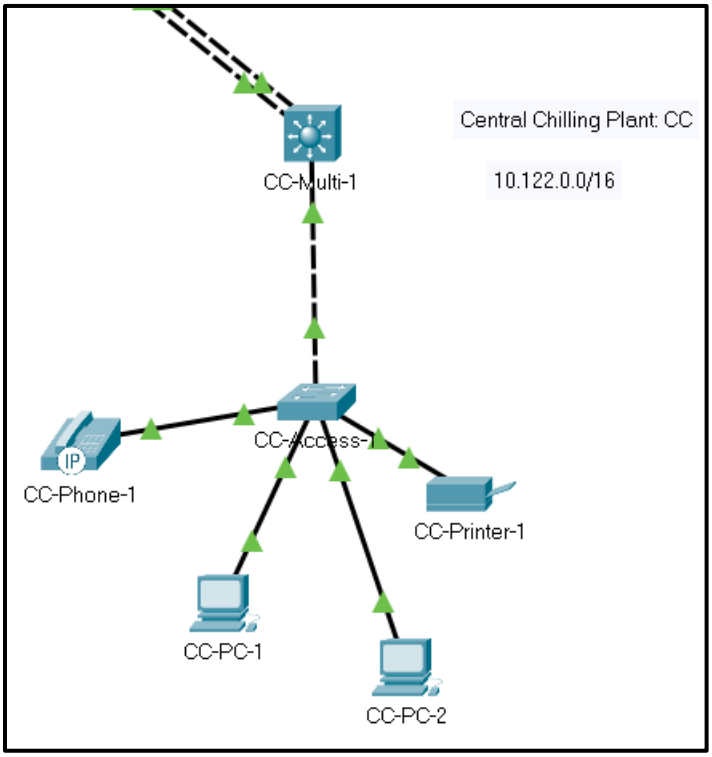
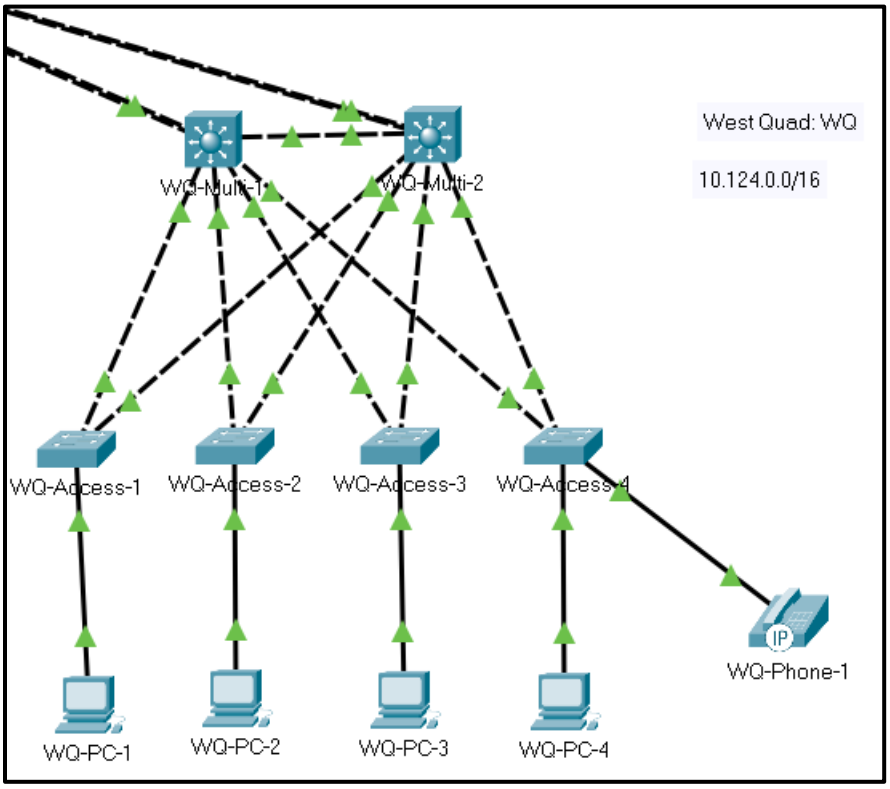


Node G:

Central Chilling Plant:



West Quad:



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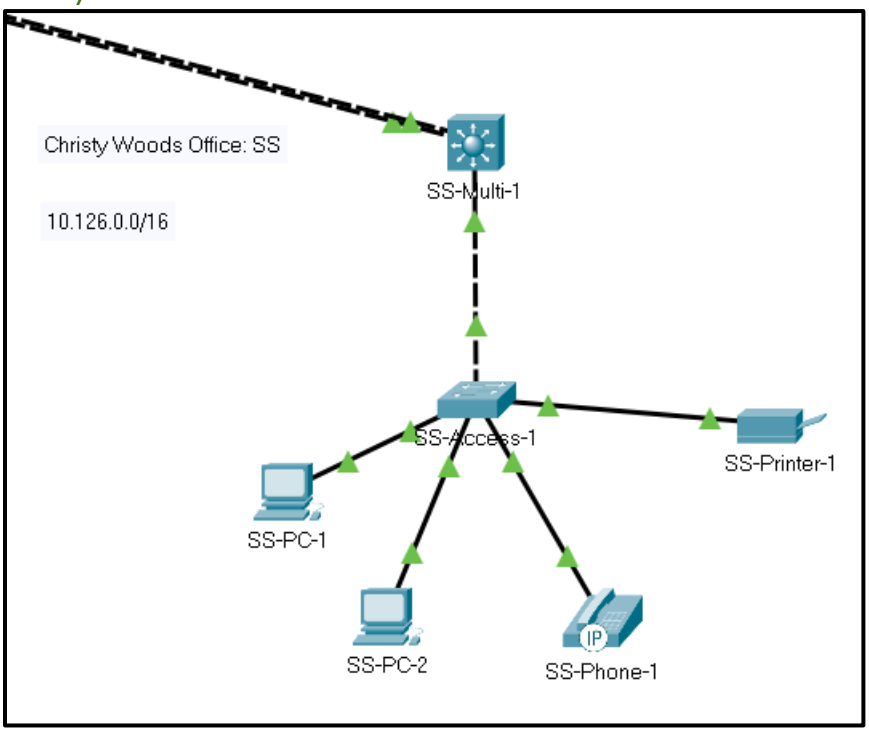
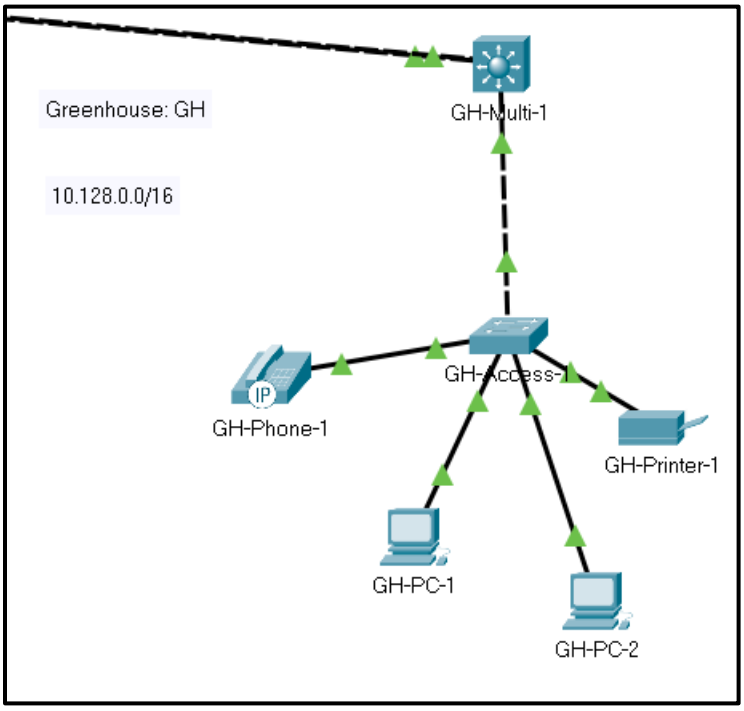
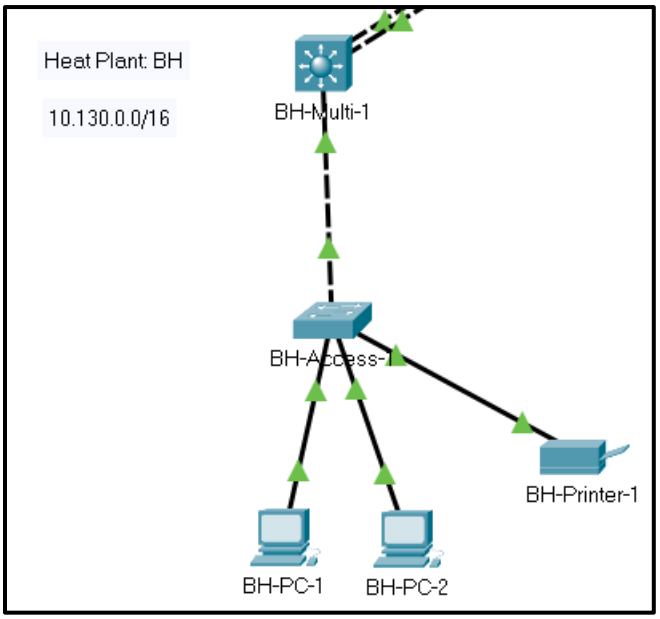


Greenhouse:



Heat Plant:



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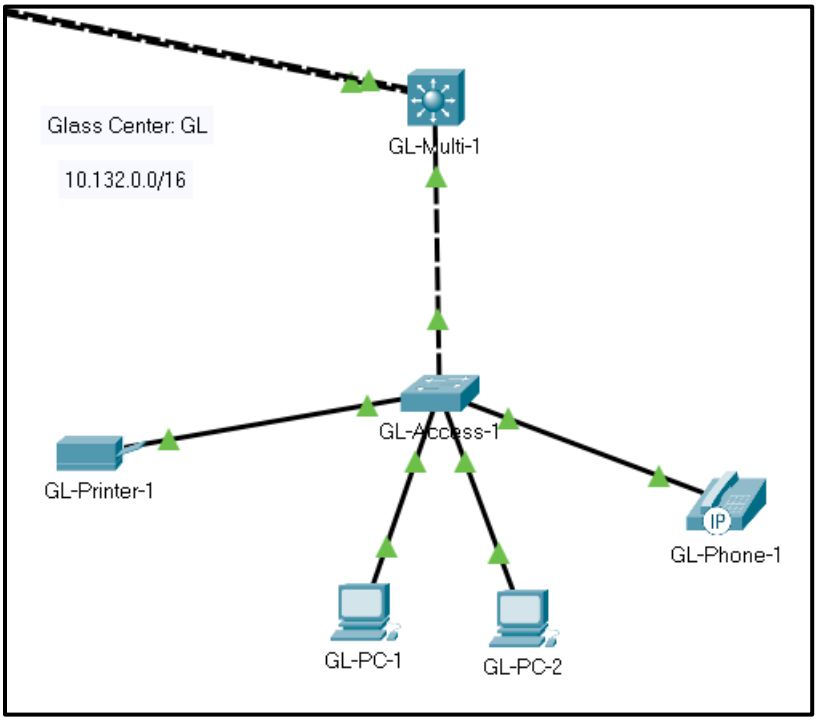
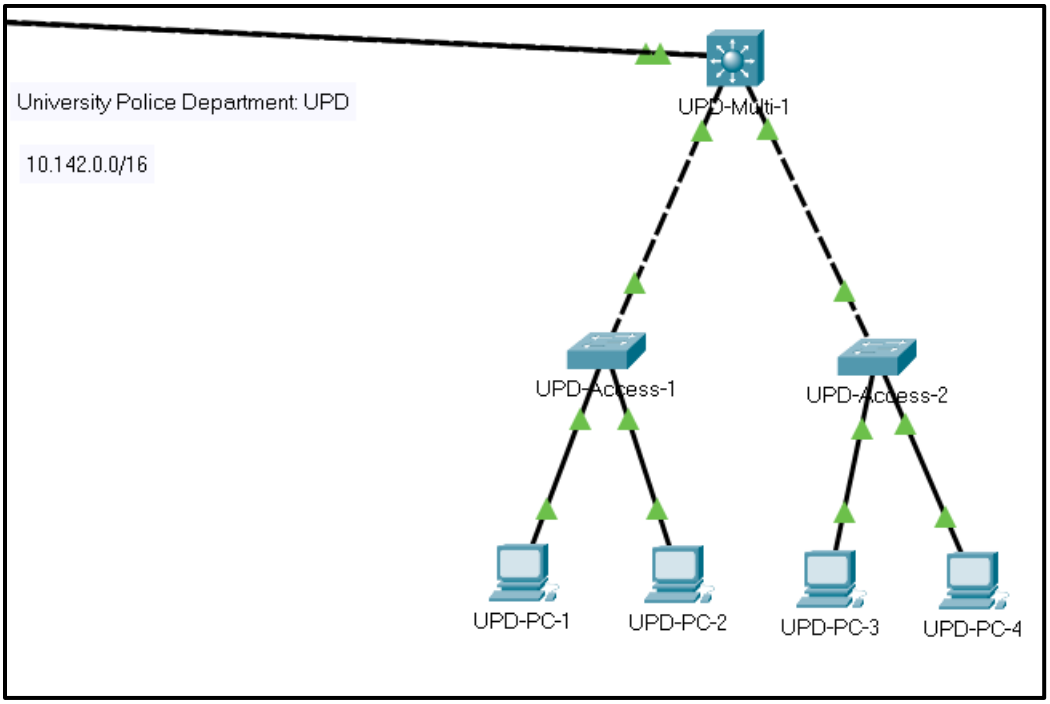
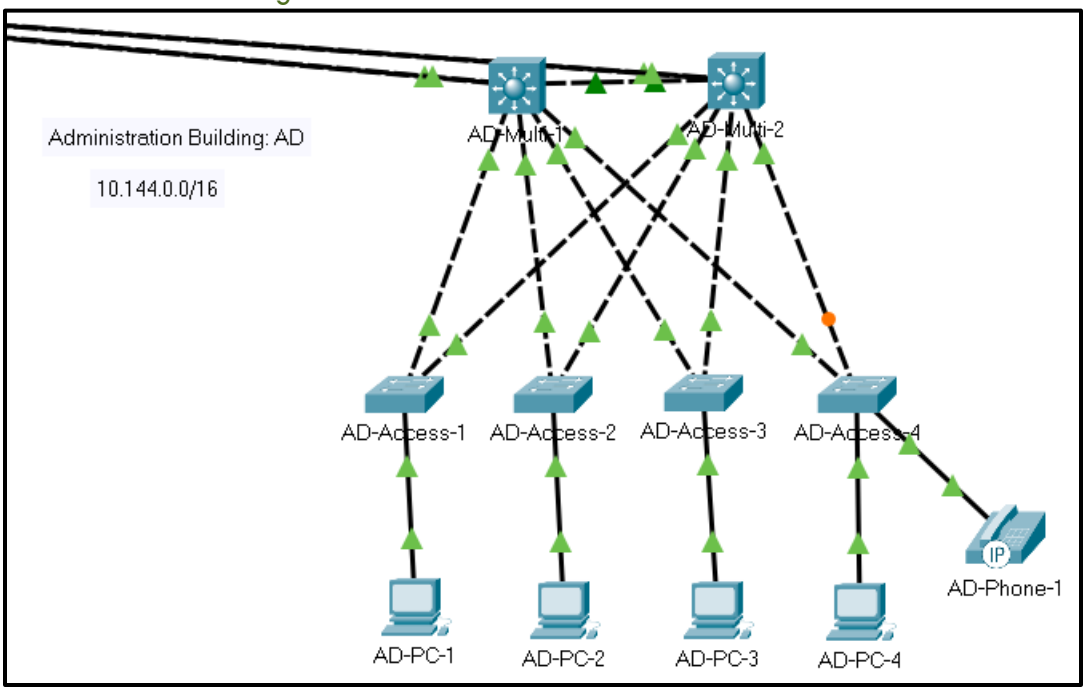


Node H:

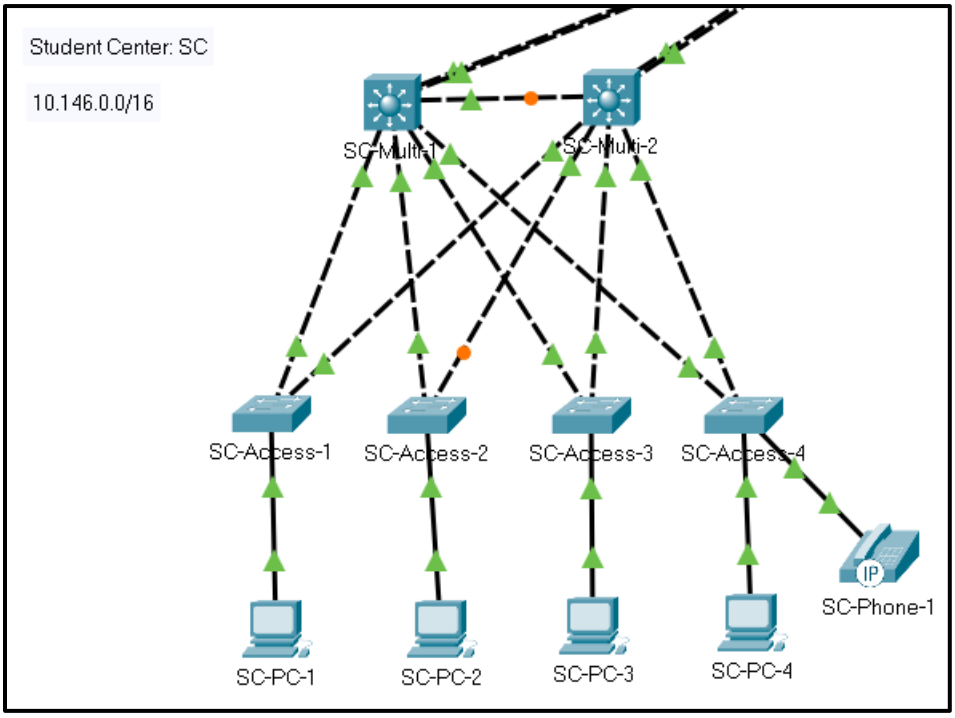
University Police:



Administration Building:



Student Center:



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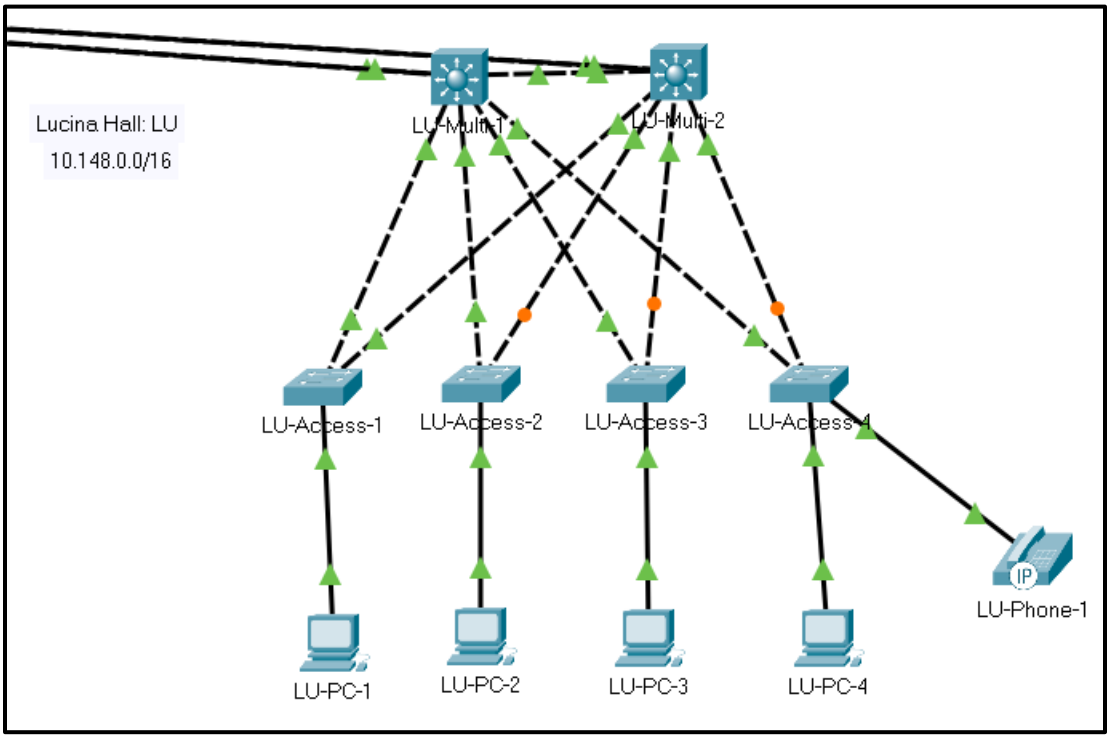

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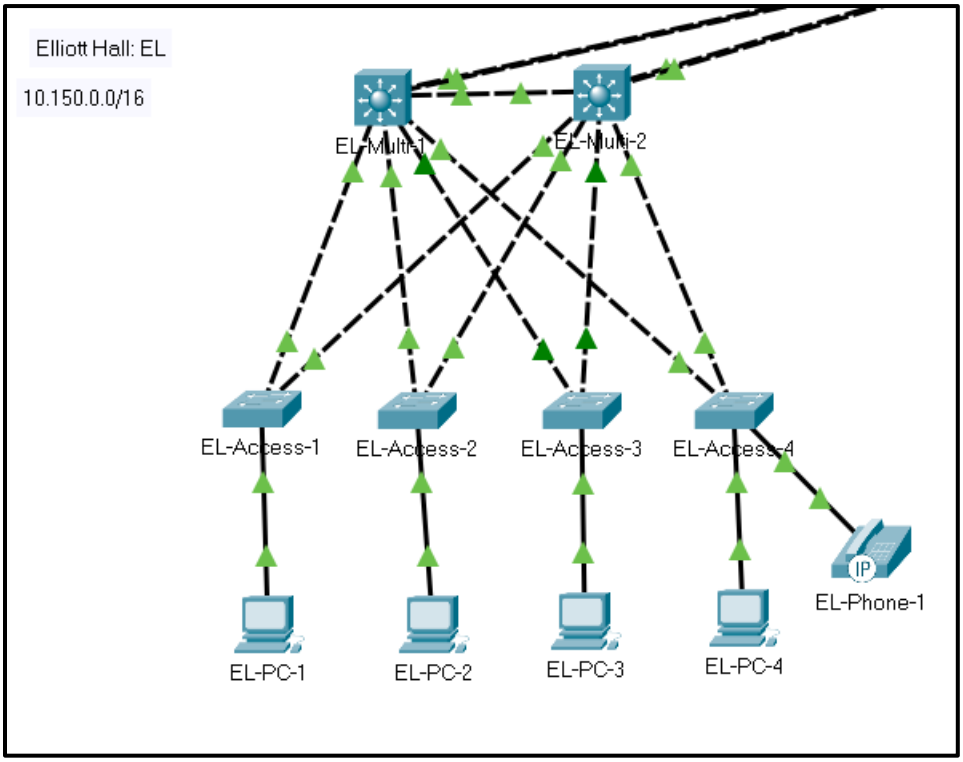

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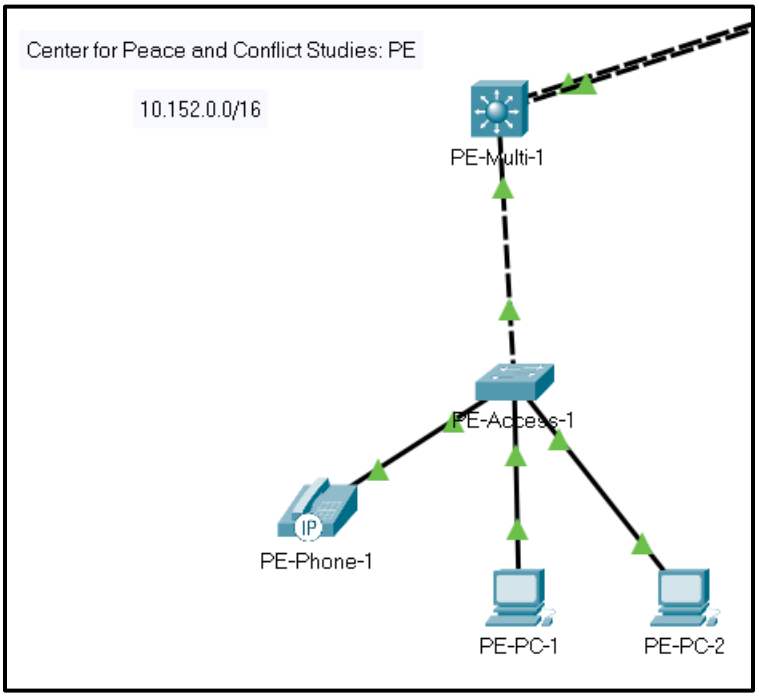

Appendix I: References

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