CONFIGURE THE NETWORK

CCNA LAB BOOK

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About the Author:

Welcome, my name is Shawn Moore and I'm the author of the lab series Configure the Network. I decided to create this eBook to help future CCNA's solidify their command, theory, and problem solving knowledge. I also created this eBook because I figured it would be plain fun to lab possible scenarios of different CCNA topics that may happen in the real world! My goal is to help you, the reader, think about what happens when you mix the world of networking and the world of business together.

I actually started my Cisco journey in high school where we practiced creating simple two router labs with real equipment. While we were able to successfully connect the two routers together with routing protocols such as RIP, I never understood the reasons why I would use a dedicated router over a simple DSL connection. As time went on I graduated from High School and started immediately in the world of IT thanks to an internship that had turned into a part time job. It wasn't until then that I realized that companies utilize a lot of data that needs to be not only reliable, but also fast and secure as well. This is when it all clicked that a dedicated router device would run circles around a simple DSL connection with a simple switch.

Like many IT professionals I didn't start off configuring Cisco devices, I dealt mainly with desktop and server support. I always liked Network Engineering ever since I had my first taste of it in high school. With this I decided to pursue my Network Engineering dreams and knew that the CCNA would be the path that would help guide me there. I am now currently CCNA certified working in the field of networking as I hoped. However like many other Network Engineers I'm constantly studying for the next certification. The CCNP is the next step for me and you can follow my current progress at http://shawnmoorecisco.blogspot.com

Contents:

Configure the Network Series

Configure the Network is a continuous work in progress that is designed to be an additional source to help aid your IT studies. This particular free lab eBook is designed for the CCNA ICND 1 (*Cisco Certified Network Associate – Interconnecting Cisco Networking Devices 1*). This lab isn't so much a study guide but rather it is used to help confirm the theory you have learned so far for the ICND 1 exam. I will have hopefully touched on most topics presented on the exam at least somewhat in this eBook.

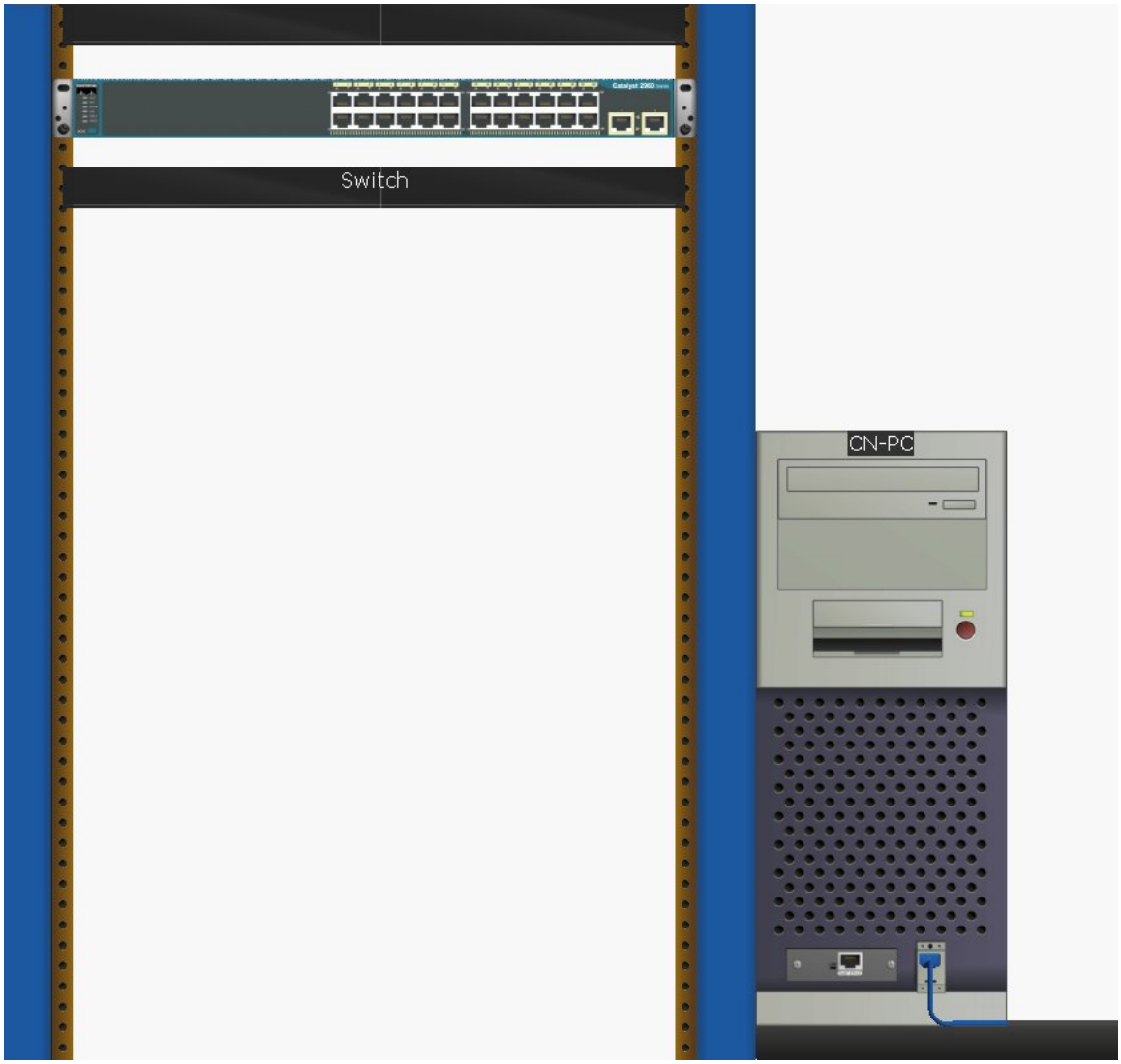
I have designed the Configure the Network Series in such a way that you aren't simply creating labs and lab examples given out of the book. The labs are presented as scenarios in which all aspects of the business should be looked at before configuring or designing the network. This includes thinking about the requirements, scalability, and overall goal of the network. Throughout this lab you will be working as a consultant for CN (Configure the Network) Technologies. Feel free to replicate the labs given with whatever equipment or software that is available to you.

CN Technologies

So you've finally landed that dream job, a network engineer with a very well respected IT Firm in your local area! The name of this company is called CN Technologies which provides IT consultation for over 300 businesses across the country and even across the world. After reviewing your impressive resume they have offered you a position as a network engineer consultant. Since this is a smaller sized business you are expected to wear many hats and will be assigned to do simple tasks from configuring a switch to developing a complete network. You will receive bigger projects over time as you demonstrate that you are capable to handle and complete assigned tasks given to you. Best of luck to you, this is a fast-paced environment so remember to work through the labs at a steady pace (very important for the CCNA exam).

CN Task 1 - Configure Client's Cisco Switch

Welcome to CN Technologies, we're a fast paced company so we'll cut right to the chase! We just landed the new client GFI early last week who requested that we setup a new Cisco 2960 Switch Device for them. This client does a lot of their IT work in house but due to a big server project going on they wanted to outsource this particular task. As you can see in the picture below We first need you to connect a console cable to this switch so we begin work:



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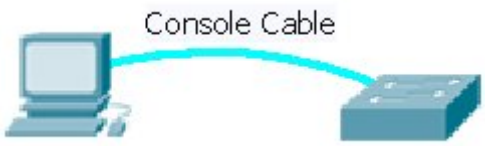
Now that you've physically connected your devices, we need you to configure the following:

(Logical Lab Reference)



A. Assign the switch the following hostname: **GFI_Switch** ☐

B. Create the enable password **EnSw1tch** ☐

C. Login and create the password **GF1Sw1** on the console port ☐

D. Create the ability to SSH into this switch using the following information:
username: GFI **password:** EnSw1tch
Domain name: gfidigital.com
Make sure that SSH version 2 is used ☐

E. Encrypt all passwords assigned to this switch ☐

F. The banner message **Unauthorized Access Prohibited!** is needed for access connections ☐

G. Configure **VLAN 1** with the IP address **10.10.10.1 /24** for remote management access ☐

H. Assign the Default-Gateway IP address **10.10.10.254 /24** ☐

I. Set the **GFI_Switch** Fast Ethernet interface 0/1 speed to **100 Mbps** ☐

J. The Fast Ethernet Interfaces 0/2 through 0/8 will need to be configured as strictly **access ports** ☐

K. The Fast Ethernet Interfaces 0/9 through 0/10 will need to be assigned for **VLAN 2** ☐

L. Save all changes to the startup configuration ☐

☛ (***Check out this Wiki link***: *Network Switch*)

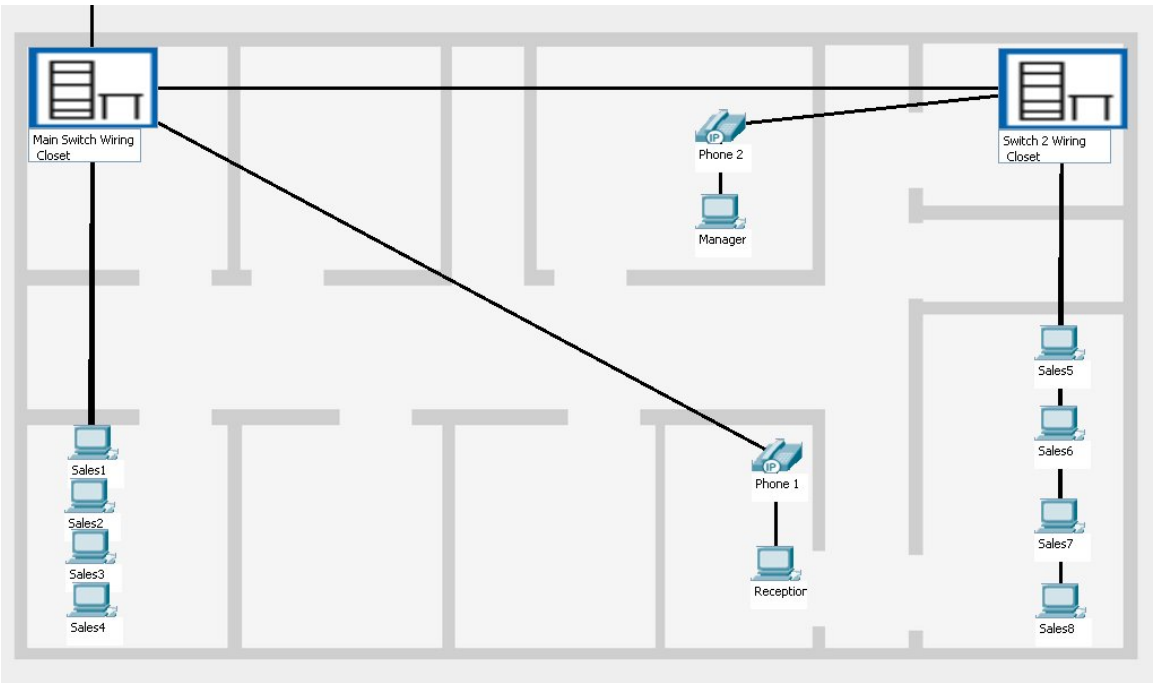
This task is complete when you have successfully assigned a hostname, setup and configured access passwords, created a banner login, assigned required IP addresses, configured interface settings, and have saved the running configuration to the startup configuration.

CN Task 2 - Design and Configure Client's SOHO Switch Network

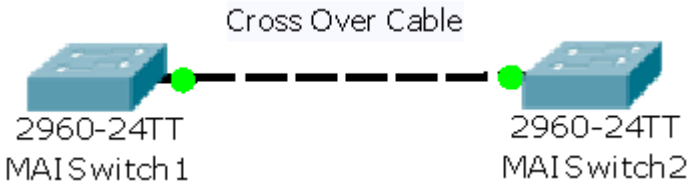
Good job on configuring the switch, GFI was very pleased to find that this switch was basically plug-and-play for them when they powered on their switch. Now we have another task for you. Our existing client Mid-America Insurance has a remote branch office that recently doubled in size. They are currently using DSL but now need two additional switches to support the new networking devices this client's just purchased. View the network diagram below and implement the following requests:

☛ (*Note: for your lab you only need to physically connect two Cisco Switches*)

Network Diagram



(Logical Lab Reference)



A. Connect the two switches together physically using the **fa0/8** port ☐

B. Assign one switch the hostname **MAISwitch1** and the other switch **MAISwitch2** ☐

C. Create the enable password **MAISecret** on both devices ☐

D. Configure the password **MAIAccess** for console access on both devices ☐

E. Configure the password **MAIAccess** for up to 5 telnet connections on both devices ☐

F. Encrypt all passwords on both switch devices ☐

G. Configure **MAISwitch1** with the VLAN1 IP address **192.168.1.10 /24** ☐

H. Configure **MAISwitch2** with the VLAN1 IP address **192.168.1.11 /24** ☐

I. Both switch devices will need to be assigned the Default-Gateway IP address **192.168.1.1 /24** ☐

J. Change the interfaces **fa0/2-fa0/7** on both Cisco devices to be strictly **access** ports ☐

Part 2 - Implement Security Measures

K. Assign interfaces **fa0/9-fa0/24** to the **VLAN 999** on both switches ☐

L. Administratively shutdown all unused interfaces fa0/9-fa0/24 on both Cisco switches ☐

M. On **MAISwitch1**, change the maximum allowed MAC addresses on **fa0/1** to **1** using **port-security**. ☐

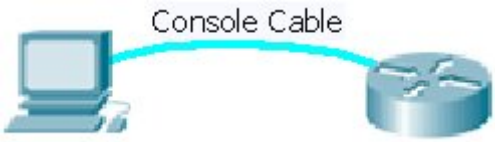
N. Save all running configuration to the start-up configuration ☐

This task complete when both switches have been configured with their correct hostnames, access passwords, IP address settings, security measures, and saved to the start-up configuration.

CN Task 3 – Configure Client's Cisco Router

Thanks to your timely effort, Mid-America Insurance was able increase their revenue by 30% just this month alone due to having more networking resources readily available to them! You next assignment is to configure a router the company Zanco Landscaping to prepare it for a new network deployment.

(Logical Lab Reference)



A. Console into this device and assign the hostname **Zanco** and encrypt all access passwords ☐

B. Create the enable password **Secret1!** ☐

C. Enable the console password **CONAccess** ☐

D. SSH version 2 needs to be configured on this router with the following information:

Username: admin **password:** Secret1!

Domain name: Zanco.com ☐

E. Assign the Loop-back interface 0 (**int lo0**) the IP address **172.16.1.1 255.255.255.255** for remote access to this device. ☐

F. Assign the first available serial interface (most likely **s0/0**) the IP address **72.31.254.2 /30** and **no shut** the interface for WAN access ☐

G. For the interface **fa0/0**, assign the IP address **192.168.1.254 /24** and **no shut** the interface ☐

H. Configure the static Default IP Address to go out through int **s0/0** ☐

I. Create the following static IP addresses and have them go out the **s0/0** interface:

10.1.2.0 255.255.255.0

10.1.3.0 255.255.255.0

10.1.4.0 255.255.255.0

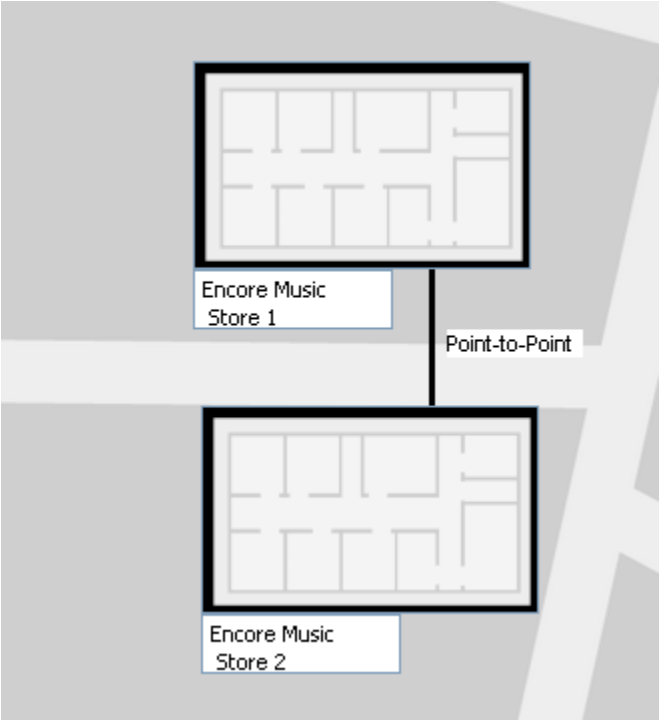
J. Save all changes to the startup configuration ☐

☛ (***Check out this Wiki link***: *Network Router*)

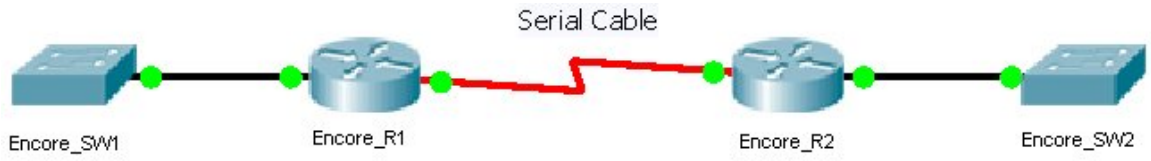
This task is complete when all access settings are configured, interfaces assigned, and static IP addresses have been allocated.

CN Task 4 - Configure Small Business Client's LAN Network

Good job on that router configuration it was another plug-and-play success for our customer. The next task for you is for another new client we recently landed, Encore Music Store. This is a small business located in two buildings adjacent to each other. They're nearly finished with reconstruction and are ready to now configure their network devices. The cabling, routers, and switches are already installed but needs to be configured still. Your task is to setup both routers/switches in the two buildings along with providing a point-to-point connection between the buildings. It's time to get to work, refer to the network diagram below and configure the required settings listed:



(Logical Lab Reference)



A. Assign the hostname **Encore_R1** to the first router and assign the hostname **Encore_R2** to the second router ☐

B. Assign the hostname **Encore_SW1** to the first switch and assign the hostname **Encore_SW2** to the second switch ☐

C. Create the enable passwords **3nc0r3** on both routers and switches ☐

D. Configure **Encore_R1**'s serial interface with the IP address **192.168.2.1 /30**
Configure **Encore_R2**'s serial interface with the IP address **192.168.2.2 /30** ☐

E. Set the serial interface with the DCE clock rate to **64000** ☐

F. Configure **Encore_R1**'s fast Ethernet connection to **Encore_SW1** with the IP address **192.168.1.1 /24**
Configure **Encore_R2**'s fast Ethernet connection to **Encore_SW2** with the IP address **192.168.3.1 /24** ☐

G. No Shut serial and fast Ethernet connections on both routers ☐

H. Create the IP address **10.10.10.10 /32** on **Encore_R1**'s **lo0** interface ☐
Create the IP address **20.20.20.20/32** on **Encore_R2**'s **lo0** interface ☐

I. Assign the IP address **192.168.1.254 /24** to VLAN 1 for management access on **Encore_SW1**. Assign the IP address **192.168.3.254 /24** to VLAN 1 on **Encore_SW2** for management access. ☐

J. Provide SSH access on all 4 devices; create and document usernames and passwords for access at your discretion ☐

K. Configure the default gateway on **Encore_SW1** to point towards **Encore_R1** Configure the default gateway on **Encore_SW2** to point towards **Encore_R1** ☐

☛ (*If you decide to complete part 2, then this will not be needed*)

L. Define static routes to allow for the store 1 LAN to reach the store 2 LAN ☐

Part 2 – Create DHCP Solution for the LAN Network (Optional)

M. Enable both routers as DHCP Servers; assign the address pool of **192.168.1.0 /24** for **Encore_R1**. Assign the address pool of **192.168.3.0 /24** for **Encore_R1** set each router as the default router as well ☐

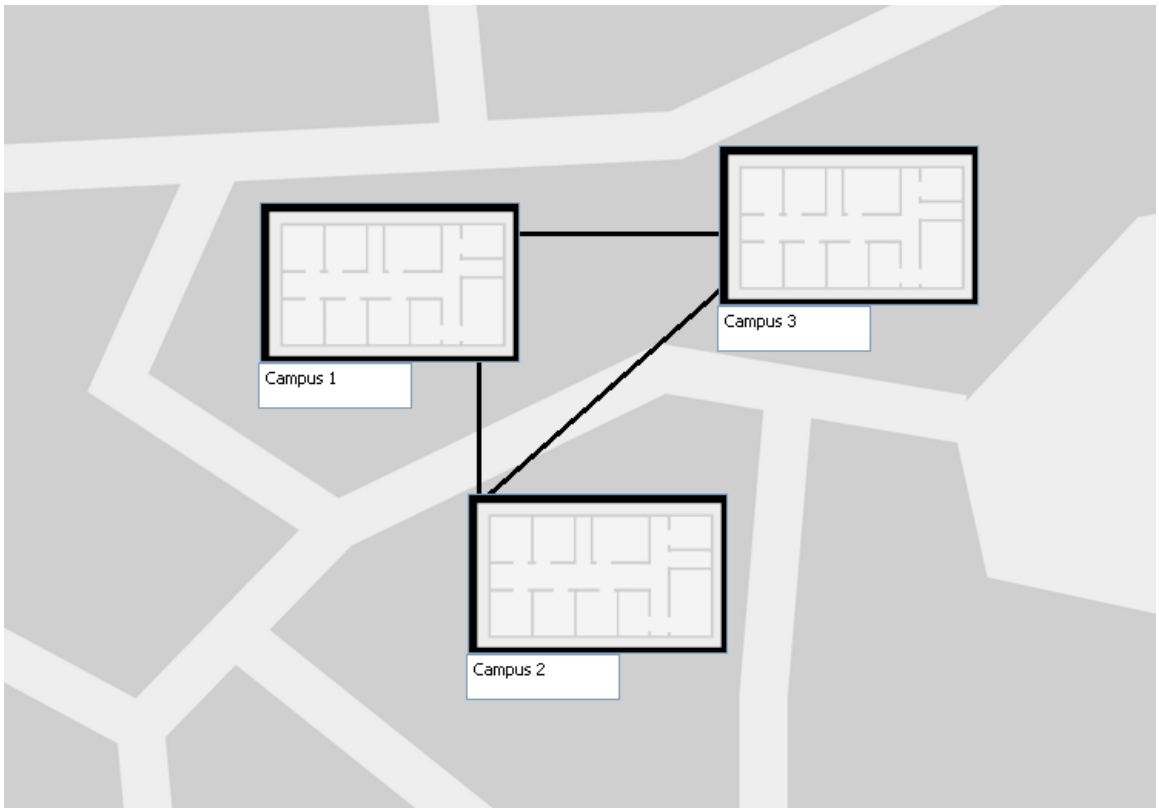
N. Exclude IP address assignment for both the routers and switches ☐

☛ (*Note: This section was optional, DHCP configuration is **NOT** apart of the CCNA exam requirements. However DHCP configuration is common on real networks.*)

This lab is complete once you are able to ping from **Encore_SW1** to **Encore_SW2** successfully.

CN Task 5 - Develop LAN Network for College Campus Buildings

Encore Music was able to establish connections between their two buildings successfully, great job! We think it's time to move you on to bigger projects. A local community college has increased the size of its network considerably in the past 4 months. The problem is that the 3 campus buildings for this college have strictly static routes configured redundantly between each other. Your next task is to redesign there network using the RIP protocol. The current network topology has been included below:



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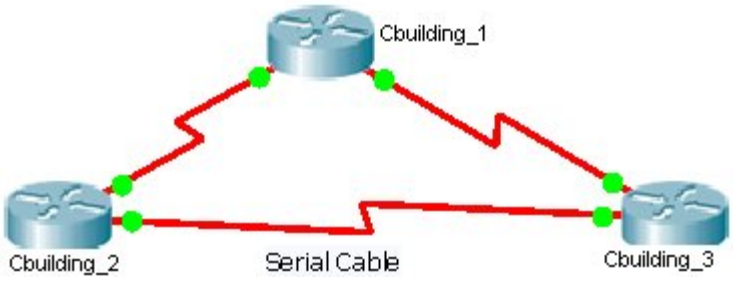
(Logical Lab Reference)



A. Connect all 3 routers together via serial cables ☐

B. Create the following hostnames on each router:

Router 1 hostname: **Cbuilding_1**

Router 2 hostname: **Cbuilding_2**

Router 3 hostname: **Cbuilding_3** ☐

C. Configure and document enable and console passwords for each device ☐

D. Assign IP addresses to the point-to-point connections based on the following IP addressing scheme:

Cbuilding_1 to **Cbuilding_2 –** IP Network **172.16.1.0 /30**

Cbuilding_2 to **Cbuilding_3 –** IP Network **172.16.1.4 /30**

Cbuilidng_3 to **Cbuilding_1 –** IP Network **172.16.1.8 /30** ☐

E. All DCE serial interfaces will need to be configured with the clock rate **64000**☐

F. Assign IP addresses to the LAN fast Ethernet interfaces based on the following IP addressing scheme:

Cbuilding_1 – IP Network **192.168.1.0 /24**

Cbuilding_2 – IP Network **192.168.2.0 /24**

Cbuilding_3 – IP Network **192.168.3.0 /24** ☐

Part 2 - Provide Access to other Campus Buildings Using RIP

G. Configure all three campus building routers to use the routing protocol **RIP** with the following preferences:
RIP Version 2 should be configured on all routers
RIP shouldn't automatically summarize IP networks ☐

H. Create the ability to **telnet** to all 3 routers, document and assign all username and password information ☐

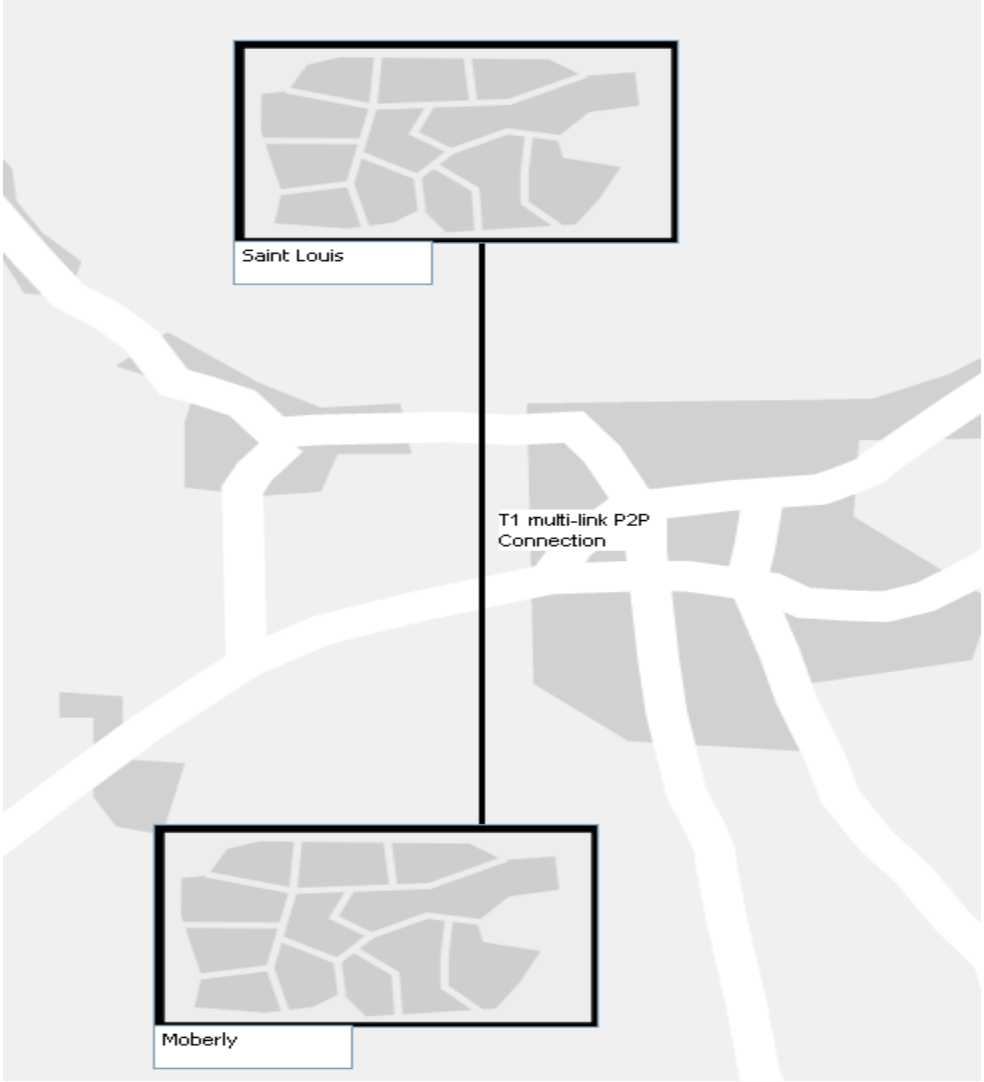
I. To provide quicker access flexibility the college network administrators would like the ability to telnet without having to type the IP address of the router they're trying to access. ☐

☛ (*Hint: use the **ip host** command to map names to IP addresses i.e. **ip host Cbuilding_1 172.16.1.1***)

This lab is complete when you are able to ping every other routers fast Ethernet interfaces and the ability to telnet to any router via their hostname has been configured.

CN Task 6 - Configure Client's T1 WAN Link

The community college has reported that their network is a lot more scalable and "hands off" since we introduced a routing protocol into their network. Your next task is to create a point-to-point T1 connection for the company Lexco Steelworks. They have two locations about 200 miles apart; however sharing important data between the two has been very difficult. We have been selected for the task to create a reliable solution for this company. Your next task is to install a redundant T1 connection between the two sites. A network diagram has been including below along with the following requirements:



(Logical Lab Reference)

A. Configure the hostnames **STL_LEX** and **MOB_LEX** per the lab reference ☐

B. Create and document **enable** and **console** passwords on each router ☐

C. Configure the ability to SSH into both routers, document usernames and passwords used ☐

D. Input the following descriptions on each of the routers 2 serial interfaces:
STL_LEX int s0/0 description – Multilink Channel 1 to **MOB_LEX**
STL_LEX int s0/1 description – Multilink Channel 2 to **MOB_LEX**
MOB_LEX int s0/0 description – Multilink Channel 1 to **STL_LEX**
MOB_LEX int s0/0 description – Multilink Channel 2 to **STL_LEX** ☐

Part 2 – Change WAN Link for Multi-Vendor Use

E. Configure all 4 serial interfaces to use the encapsulation of **PPP** ☐

F. Implement **PPP Authentication** for **CHAP** based on the username and password you have created for **SSH** ability ☐

☛ (*PPP authentication is an ICND2 topic for the CCNA exam*)

Part 3 - Install Multilink Connection for Redundancy (Optional)

G. Bundle the 2 serial interfaces on each router into the multilink group 1 ☐

H. Assign the following IP address to multilink group 1:

STL_LEX – 198.32.1.1 /**31**

MOB_LEX – 198.32.1.2 /**31**

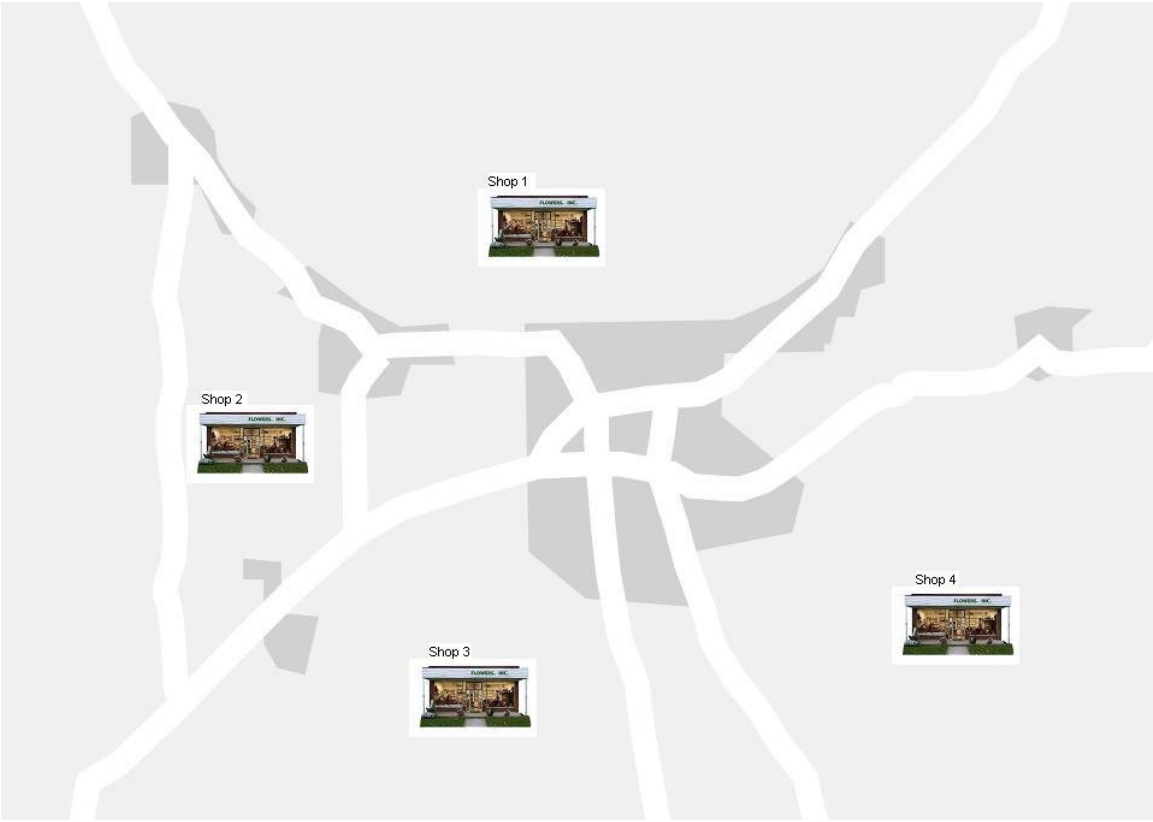
☛ (*While configuring PPP Multilink isn't a CCNA topic, knowing what a PPP multilink is something you should know for the exams*)

☛ (*Notice that the prefix /**31** or 255.255.255.254 is used, this is possible thanks to **CIDR** (Classless Inter Domain Routing. This is a common mask for point-to-point links in the real world*)

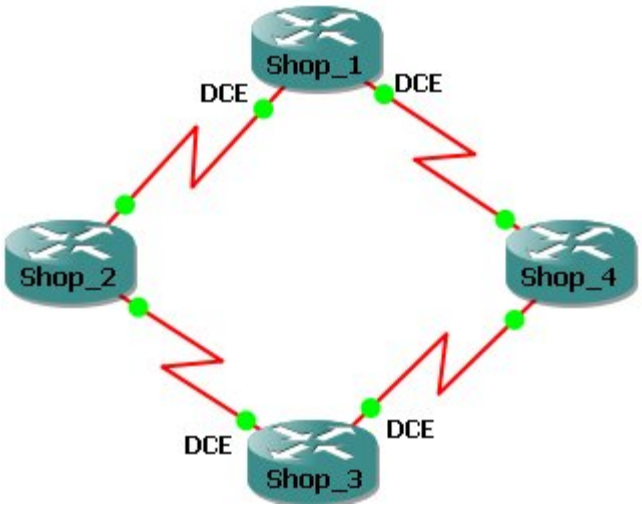
This lab is complete once you are able to ping across the PPP multilink connection.

CN Task 7 - Build Cisco Network for Medium Business Client

The PPP T1 connection that you've designed has been working perfectly for Lexco's needs, great job! We landed a new contract build out a new network for the growing florist company called the Flowers Inc. This business has 4 locations throughout the local area. While the customer has specific requirements, you are allowed to design the network anyway you would like. View the current location diagram of all 4 shops and the requirements below, design the network as you see fit:



(Logical Lab Reference)



Requirements:

A. Configure all 4 shop routers with hostnames, enable passwords, and console access credentials ☐

B. Flowers Inc. has an internal network administrator who will be responsible for the Cisco routers once the initial design is complete. The network administrator requested that he would like to have **SSH** access and prevent **telnet** access to all 4 routers. The network admin should be able to SSH into all 4 routers via hostname rather than having to remember each routers IP address. ☐

C. The local ISP has assigned Flowers Inc. with the public IP address **70.246.128.27 /24**. Create IP subnets for the 4 point-to-point connections between these four shops. ☐

☛ (*Hint: To accomplish this task you will need to break the given **/24** mask into smaller subnets*)

D. All serial connections should be configured to use **PPP** instead of the default **HDLC** protocol. ☐

E. This business would like to eliminate the need to administer these routers as much as possible. Instead of configuring static routes to each site, use a dynamic routing protocol to establish connections between all four sites. ☐

F. The main shop (**Shop 1**) will provide a gateway to a remote Flowers Inc. site that's not located in the current metro area (**163.45.4.1)**. Configure the **Shop 2, 3,** and **4** routers with a default route to **Shop 1**. Configure **Shop 1** with a **lo0** IP address **163.45.4.1 /24** (*this simulates the remote site location*) ☐

G. Configure the routers to use a Class C private IP address for all of its LAN interfaces. ☐

☛ *Note: remember that the following are private IP address ranges that aren't allowed to be routed over the internet:*

Class A: **10.0.0.0 – 10.255.255.255**

Class B: **172.16.0.0 – 172.31.255.255**

Class C: **192.168.0.0 – 192.168.255.255**

H. Ensure that the proper security measures have been addressed:

1. All access passwords should be encrypted

2. All routing protocols and **SSH** connections should be configured to use the latest version

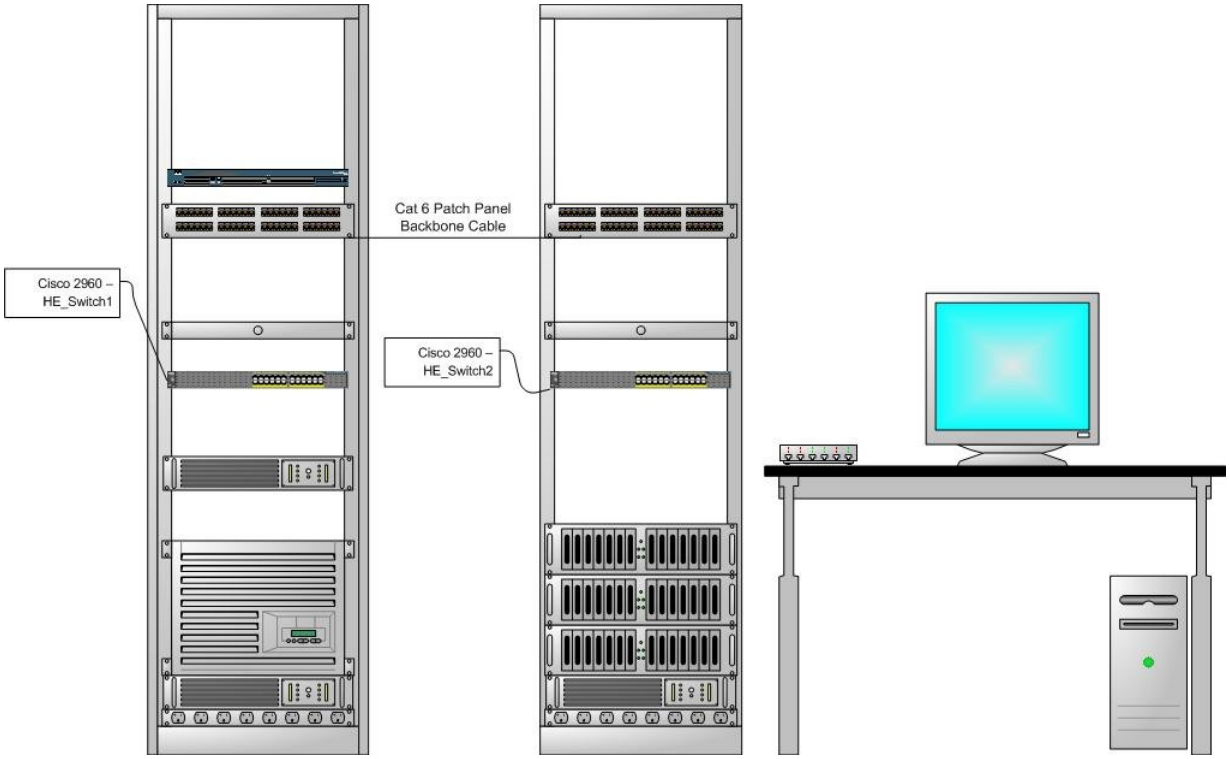
3. Create password authentication for the **PPP** interface connections (***optional***)

4. Login banners should be created that specifically states that only authorized access is permitted ☐

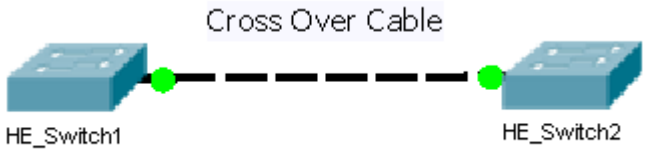
This lab is complete once all shops can communicate via a dynamic routing protocol, all routers can ping the remote Flowers Inc. location, and all security measures have been implemented (***PPP authentication is optional***).

CN Task 8 - Implement Customer's VLAN Network

Due to your overwhelming success and rave reviews with our customers, we have decided to promote you to senior network engineer consultant. From this point forward you will be expected to decide and document how access credentials should be configured for each business. The established small business Herbert Electric is currently restructuring their internal departments and would like to configure the two Cisco switches that they have to reflect these changes. View the company's network diagram below and implement the desired changes:



(Logical Lab Reference)



A. Configure both switches with hostnames, enable passwords, console, and **telnet** access ☐

B. Connect both switches together using a cross over cable on the interface **fa0/1** ☐

C. Both Switches will need to be configured to specifically **trunk** on their **fa0/1** interfaces ☐

D. Implement the **802.1Q** IEEE-standard encapsulation type on both of the switches **fa0/1** interfaces ☐

☛ (*Most recently developed Cisco Switches only support the 802.1Q standard)*

E. Herbert Electric wants to break up their company into three departments. All three departments will have network devices on both switches. Create 3 VLANs on both switches with the following names:

VLAN 2 – **Administration**

VLAN 3 – **Sales**

VLAN 4 – **Electricians** ☐

F. Assign both switches the following VLANs on their respective interfaces:

VLAN 2 – **fa0/2 to fa0/4**

VLAN 3 – **fa0/5 to fa0/12**

VLAN 4 – **fa0/13 to fa0/24** ☐

G. All switch ports that are configured in any of the three VLANs should be configured with the switch port mode of **access** only ☐

Part 2 - Create Scalable VLAN Administration Solution

H. Herbert Electric's network administrator would like for a way to perform changes on VLANs when needed. Enable **HE_Switch1** as a **VTP Server**; configure **HE_Switch2** as a **VTP Client** ☐

I. The **VTP Server** needs to be configured with the following domain information:
VTP Domain Name – **HE_Domain**
VTP Password – **VTPAccess**
VTP Version – **Version 2** ☐

☛ (*The VTP client switch will need to be configured with the same VTP domain information in order for VTP to synchronize between each other*)

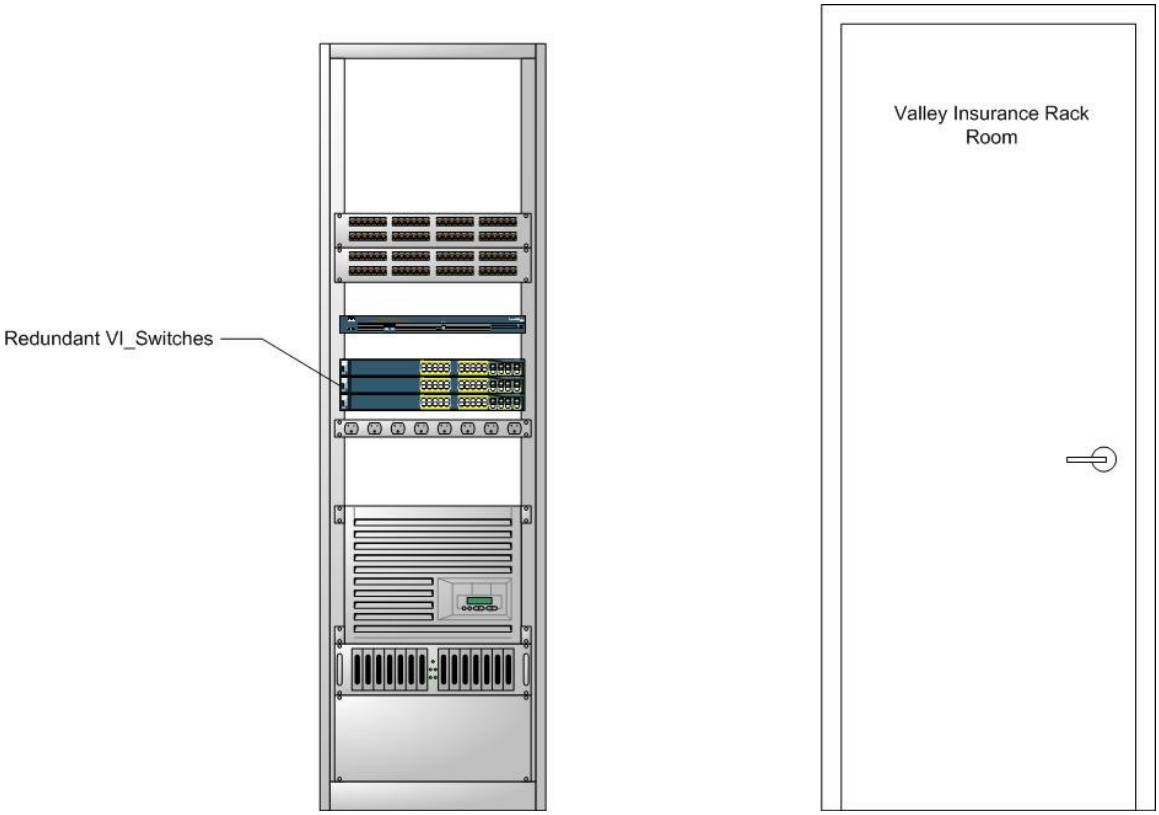
☛ (*VTP isn't recommended in most real world environments due to the possibility of easily configuring wrong VLAN settings on a switch that could propagate throughout the entire network!)*

This lab is complete once all VLAN configurations have been made and VTP domain credentials have been implemented.

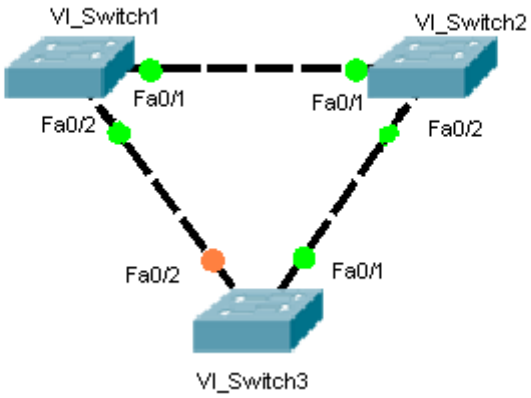
☛ (***Check out this Wiki link***: *Virtual LAN*)

CN Task 9 – Tune Client's Local Network

The network administrator for Herbert Electric reported that she has been able to administer her LAN network very efficiently with the configurations we've put in place. Valley Insurance contacted us last week about replacing their old current vendor switches with Cisco switches due to many issues with their switch ports not working correctly. Valley Insurance just received their 3 switches along with installing them in their rack room. View the network diagram below and determine the configuration needed based on their requirements:



(Logical Lab Reference)



A. Configure all switches with hostnames, enable passwords, console, and **SSH** access ☐

B. Connect each switch together using the suggested switch ports in the logical lab reference ☐

C. VI_Switch2 will be the switch for controlling STP updates. Configure this device so that it is the root switch ☐

☛ (*Remember that the root switch is determined by picking the switch with the lowest numeric value for the bridge ID)*

D. The **VI_Switch3** device will have the least data going through it. Assign this switch's port **Fa0/2** so that it is in a *blocking* state. Make sure that port **Fa0/1** is the root port on this device ☐

☛ (*Only one port on a switch can be configured as the root port, the root switch has all of its ports in a forwarding state however)*

E. Enable all access ports **Fa0/3 – Fa0/24** with the **PortFast** feature on all three switches ☐

Part 2 - Secure Redundant Switch Configuration

F. Since the **VI_Switch3** device will be seldom used, the customer would like to restrict possible physical access to this device. Assign the **BPDU Guard** feature on the ports **Fa0/7 – Fa0/24** ☐

G. For the time being, **VI_Switch3** will only use the ports **Fa0/3 – Fa0/6**. Manually shut down all other ports on this switch to prevent unauthorized connectivity ☐

(Optional STP Configuration)

H. Valley Insurance would like to cut down on as much STP convergence time as possible. CN Technologies would like for you to implement the following:

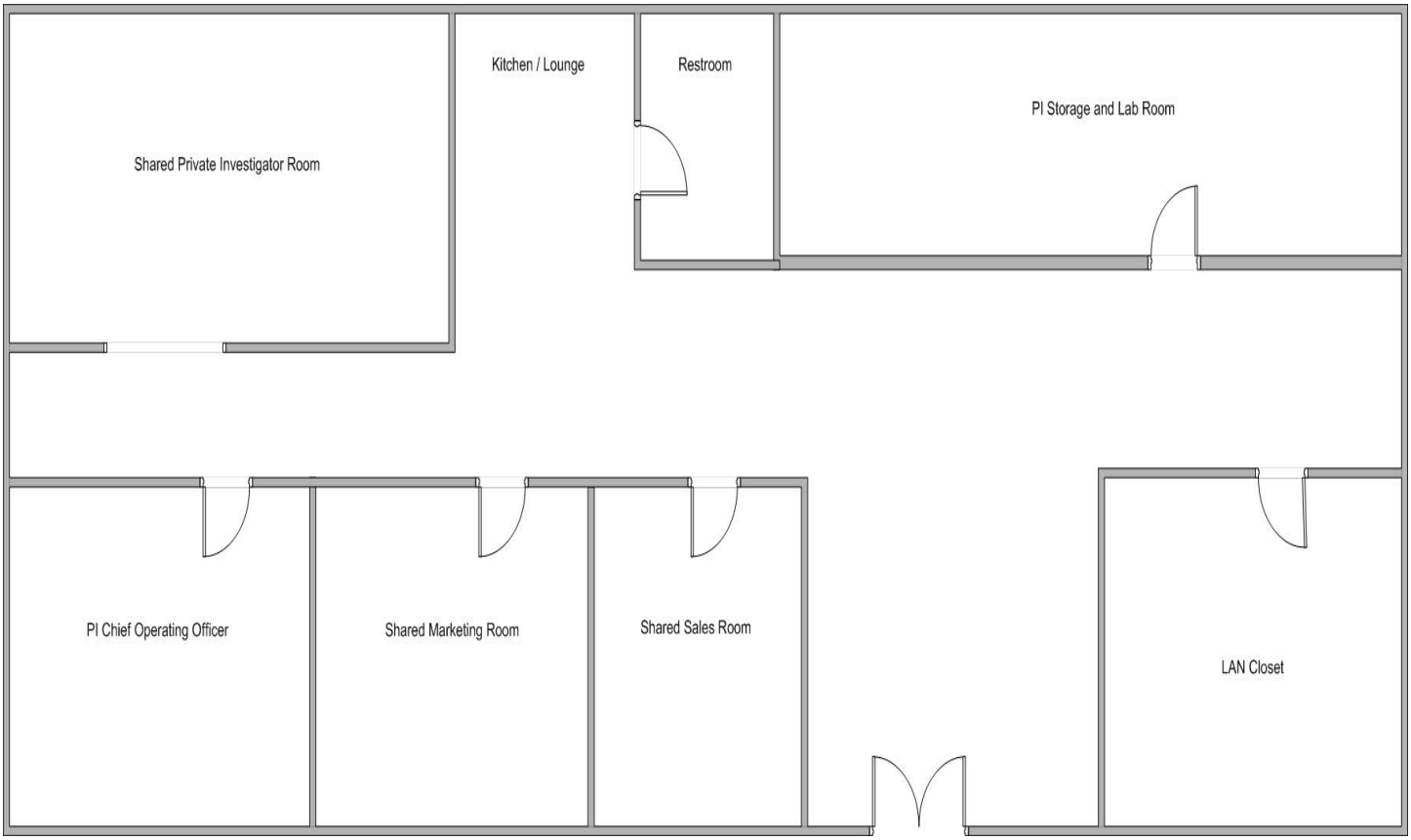
1. Create redundant link connections between each switch ☐
2. Bundle these redundant links into one channel by using **Etherchannel** ☐
3. Implement the **RSTP** on all three switches ☐

☛ (***Check out this Wiki link:*** *Spanning Tree Protocol*)

This lab is complete when all switches have been configured with their appropriate STP protocols and have been secured using the additional STP features.

CN Task 10 - Complete Multiple VLAN Design for New Customer

Great job on that LAN implementation for Valley Insurance, this company has noticed a 30% increase in bandwidth performance! Our long existing client P-1 Investigations is currently dividing their company into three departments. The system administrator would like for us to create three separate VLAN's however each VLAN should be able to communicate with each other. Due to the limited budget available for this project we will not be able to use a Layer 3 switch. Instead we will use their existing Cisco router to provide inter-connectivity between the 3 departments. Examine the current network diagram below and make the following changes:



(Logical Lab Reference)

A. Connect the router **P-1_Router** interface **fa0/0** to **P-1_Switch**'s **fa0/1** interface with a Ethernet cable ☐

B. Configure both devices with hostnames, enable passwords, console, and **SSH** access ☐

C. Create 3 VLAN's on the **P-1_Switch** with the following names:

VLAN 2 – **Investigators**

VLAN 3 – **Sales**

VLAN 4 – **Marketing** ☐

D. Assign the following **P-1_Switch** interfaces to their appropriate VLAN's as listed:

VLAN 2 – **Fa0/2 – Fa0/14**

VLAN 3 – **Fa0/15 – Fa0/18**

VLAN 4 – **Fa0/19** – **Fa0/24** ☐

E. Implement the Cisco trunking protocol **ISL** on the **P-1_Switch** - **Fa0/1** ☐

F. Install the following sub-interfaces on **P-1_Router**'s **Fa0/0** interface

Fa0/0.2 – **VLAN 2** IP address: **192.168.2.1 /24**

Fa0/0.3 – **VLAN 3** IP address: **192.168.3.1 /24**

Fa0/0.4 – **VLAN 4** IP address: **192.168.4.1 /24** ☐

G. Configure the encapsulation type on the sub-interfaces to must match the same type configured on the switch **P-1_Switch** ☐

☛ (*The **P-1_Router** interface **Fa0/0** shouldn't have an IP address, just the sub-interfaces. Don't forget to assign each sub-interface to the appropriate VLAN and **no shut** the interface!)*

☛ (*This specific network configuration is also known as Route-On-A-Stick, for additional help on configuration check out this link: RoAS*)

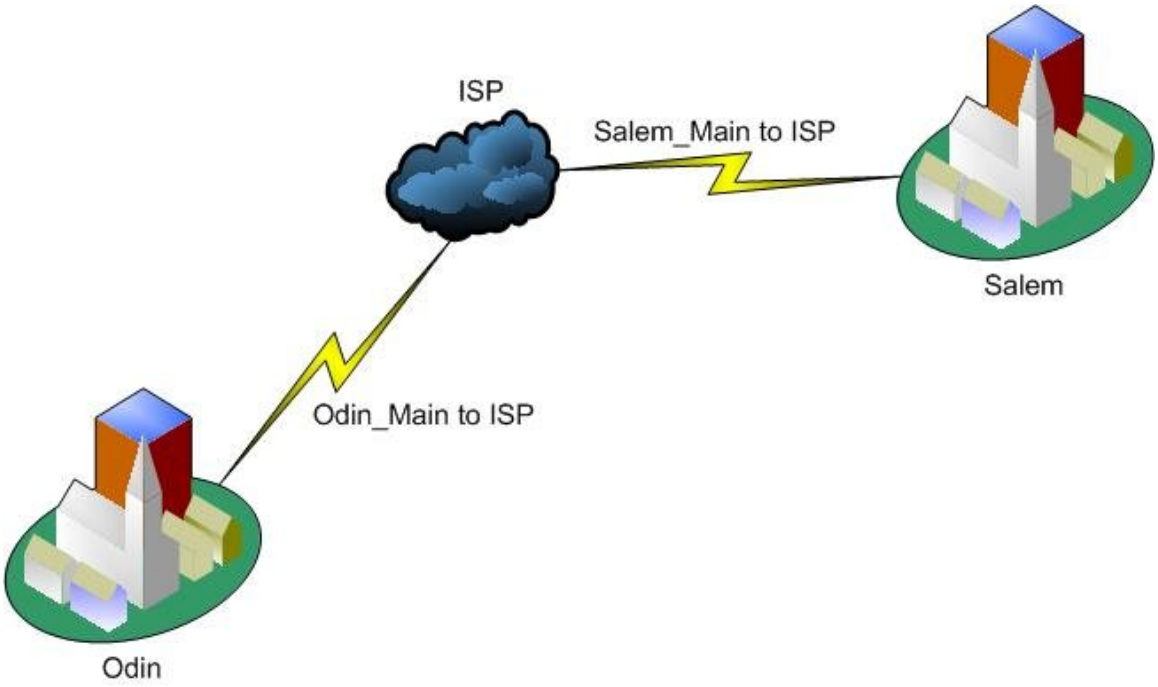
H. Enable **PortFast** on the ports **Fa0/2** – **Fa0/24** on the **P-1_Switch** device ☐

I. Configure **Switch Port-Security** on **P-1_Switch** interfaces **Fa0/15** – **Fa0/24** to only allow for one MAC address to be connected to per interface ☐

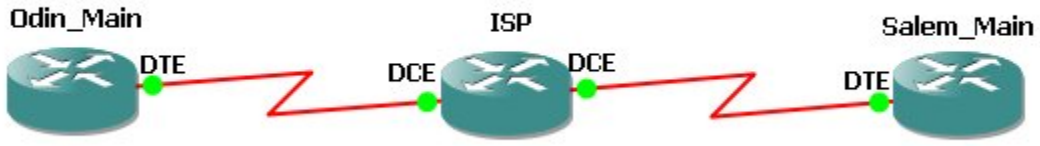
This lab is complete once all VLAN's are able to successfully reach other and **P-1_Switch**'s interfaces have properly been configured.

CN Task 11 - Perform Manual Subnet Summarization for Business Partner

You saved P-1 Investigations a great deal of capital by implementing RoAS instead of purchasing a Layer 3 switch. Fitz Car Care is growing at a rapid rate currently. This customer has half of its 8 locations in split evenly between the towns Odin and Salem. Each town has 4 store locations and each store has 1 IP subnet. As the company grows the network administrator is becoming worrisome about the increasing complexity due to the number of subnets currently (8). Luckily each town assigns IP addresses with similar subnet ranges that allows for Summarization. Redesign Fitz's IP Network so that Odin only knows about a particular subnet range in Salem and vice versa:



(Logical Lab Reference)



A. Configure the three routers with hostnames, enable passwords, console, and **SSH** access ☐

B. Connect the three devices with serial interfaces as shown in the logical lab reference, be sure to make the middle router (**ISP**) the DCE for the other two routers ☐

☛ (*In real world environments the ISP is typically the DCE and the customer router is the DTE*)

C. Implement IP addresses on the serial interfaces based on the following:
Odin_Main – **ISP:** 10.1.1.0 /30
Salem_Main – **ISP**: 10.1.1.4 /30 ☐

D. Create the following Loopback interfaces on **Odin_Main**:
Lo0 – 192.168.1.1 /24
Lo1 – 192.168.2.1 /24
Lo2 – 192.168.3.1 /24
Lo3 – 192.168.4.1 /24 ☐

E. Create the following Loopback interfaces on **Salem_Main**
Lo0 – 192.169.5.1 /24
Lo1 – 192.169.6.1 /24
Lo2 – 192.169.7.1 /24
Lo3 – 192.169.8.1 /24 ☐

F. Enable **RIP** on all three routers with the following information:

1. All interfaces and networks will need to be running **RIP**
2. **Version 2** should be the **RIP** version on all routers
3. Make sure that **RIP** isn't running **Auto Summary** ☐

☛ (*By default both RIP and EIGRP runs auto summary*)

G. Summarize **Odin_Main**'s Loopback Addresses into the smallest possible summary that will allow **Salem_Main** to still be able to reach the 192.168.0.0 block of addresses from its ☐

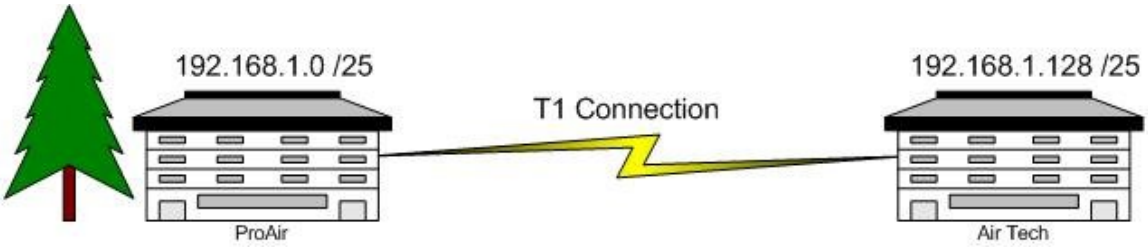
H. Summarize **Salem_Main**'s Loopback Addresses into the smallest possible summary that will allow **Odin_Main** to still be able to reach the 192.169.0.0 block of addresses from its location ☐

☛ (***Check out this Wiki link: VLSM***)

This task is complete once all class C IP addresses have been summarized and are able to ping from the **Odin_Main** router to the **Salem_Main** router.

CN Task 12 - Install Access List Security Features for Small Business Client

You created a very scalable solution for Fitz's Car Care; this will allow them to implement new network technologies in the future with less over head. ProAir Solutions is a customer that specializes in many different compressed air devices. ProAir recently merged with a similar business called Air Tech. While these two businesses will share resources they will still be separate business entities. Your job will be to limit specific network resources from communicating with each other company's network. View the current network topology and implement the requested changes:



(Logical Lab Reference)

A. Connect the two routers via a serial cable as shown in the Logical Lab Reference ☐

B. Configure the two routers with hostnames, enable passwords, console, and **SSH** access ☐

C. Assign the **ProAir** Cisco router with IP address **172.16.1.1 /30** on its serial interface ☐

D. Assign the **Air_Tech** Cisco router with the IP address **172.16.1.2 /30** on its serial interface ☐

E. Create the following Loopback interfaces:

ProAir – **Interface Lo0 IP:** 192.168.1.1 /25
Interface Lo1 IP: 10.1.1.1 /24
Interface Lo2 IP: 10.1.2.1 /24

Air_Tech – **Interface Lo0 IP:** 192.168.1.129 /25
Interface Lo1 IP: 11.1.1.1 /24
Interface Lo2 IP: 10.1.2.1 /24 ☐

F. Enable **RIP** on all three routers with the following information:

1. All interfaces and networks will need to be running **RIP**
2. **Version 2** should be the **RIP** version on all routers
3. Make sure that **RIP** isn't running **Auto Summary** ☐

G. Build a standard access-list that will deny **ProAir** from sending **10.1.1.0** traffic to **Air Tech** on the **ProAir** Router ☐

H. Build a standard access-list that will deny **Air Tech 11.1.1.0** traffic from entering **ProAir**'s Router on the **Air_Tech** Router ☐

☛ (*Don't forget the permit any statements at the end of your access-lists!*)

Part 2 - Disable Specific Networking Protocols

I. ProAir would like to prevent possible telnet sessions to its **ProAir** Router from **Air Tech**. Create an extended access-list that would prevent all telnetting requests from the **Air_Tech** Router ☐

☛ (*Telnet uses port 23)*

J. Air Tech has a FTP server that only its company and a specific **ProAir** networks should be able to access. Prevent **ProAir**'s **10.1.1.0 /24** and **10.1.2.0 /24** networks from sending any **FTP** requests to **Air Tech** ☐

☛ (*FTP uses port 20 and 21)*

K. ProAir uses a web server for certain proprietary online tools. Only **Air Tech**'s **192.168.2.128 /25** should be the only network able to send **HTTP** requests to **ProAir**. ☐

☛ (*HTTP uses port 80)*

☛ (*Check out this link for more information on access-lists: Cisco ACL's*)

This lab is complement once all networks with ProAir and Air Tech are configured with their proper security implications.

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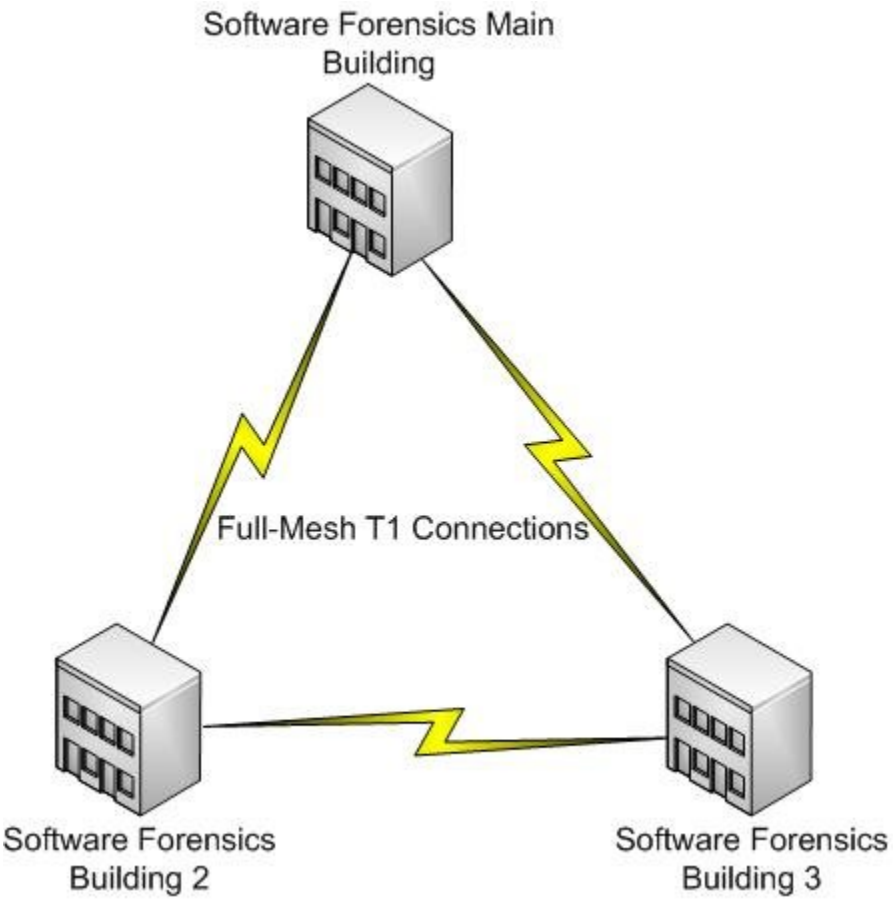
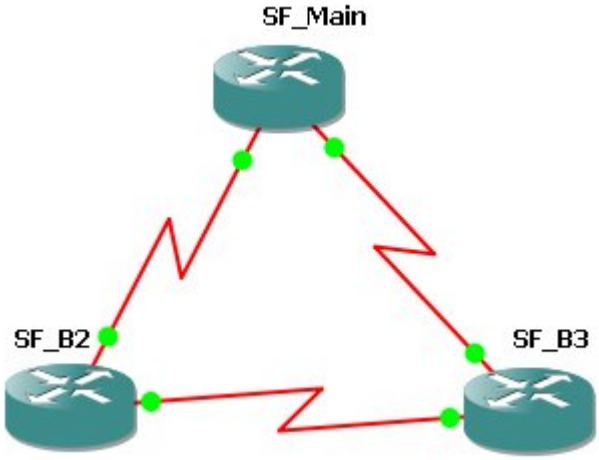
CN Task 13 - Design Customer's Network Using a Link-State Protocol

Now that we completed the security aspects of ProAir and Air Tech's network, their merger happened without a hitch! The company Software Forensics is out growing its slow converging routing protocol RIP. Your next task is to configure a Link-State protocol for the three locations this company has. Using the network diagram below as reference, design this customers network based on their requirements:



(Logical Lab Reference)



A. Connect all three routers with serial cables in a full mesh topology as depicted in the logical lab reference ☐

B. Configure the three routers with hostnames, enable passwords, console, and **SSH** access ☐

C. Assign IP addresses on the three routers Loopback0 interface based on the following information:

SF_Main int lo0: 192.168.1.1 /24

SF_B2 int lo0: 192.168.2.1 /24

SF_B3 int lo0: 192.168.3.1 /24 ☐

D. Assign IP addresses to the routers serial interfaces based on the following:

SF_Main to **SF_B2** Point-to-Point network: 172.16.0.0 /30

SF_Main to **SF_B3** Point-to-Point network: 172.16.0.4 /30

SF_B2 to **SF_B3** Point-to-Point network: 172.16.0.8 /30 ☐

E. The main Software Forensics building will be the backbone for all **OSPF** updates. Enable **OSPF** on **SF_Main** and configure the 192.168.1.0 network for **area 0**. ☐

Part 2 - Design Customer's Multi-Area OSPF Network

F. The other two buildings will need to be apart of the **OSPF area 1**. Configure all **SF_B2** and **SF_B3** networks with **area 1** using the **OSPF** protocol ☐

G. Configure **SF_Main**'s Point-to-Point connections with **OSPF** on **area 1** ☐

H. Test connectivity between all three devices using ping. All routers should be able to ping each others networks ☐

☛ (***Check out this Wiki Link***: *OSPF*)

Part 3 - Implement Routing Protocol Security

I Software Forensics would like easier to manage OSPF design before implementing protocol security. Create the following **OSPF Router ID**'s

SF_Main RID: 9.9.9.9

SF_B2 RID: 8.8.8.8

SF_B3 RID: 7.7.7.7 ☐

☛ (*Router ID is configured under the OSPF configuration mode*)

J. Clear the OSPF process in order for the new OSPF **Router ID** settings to take place ☐

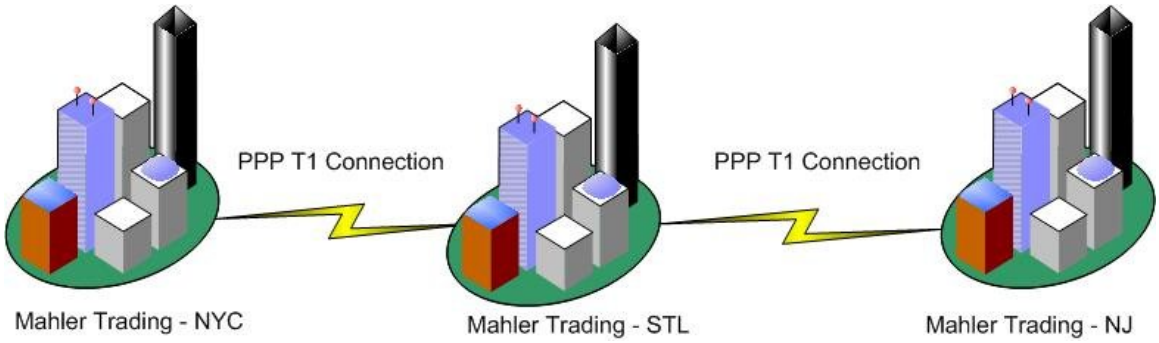
(*The enable command **clear ip ospf process** will solve this task*)

K. Implement **OSPF Authentication** on all 3 routers and verify connectivity between all 3 devices ☐

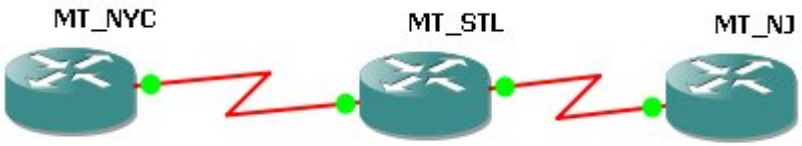
This lab is complete once all OSPF connections have been completed and verified.

CN Task 14 - Execute EIGRP Configuration for Local Business

Now that you've designed a WAN network for our previous customer, we have another task implementation using a different routing protocol. Mahler Trading Inc. uses Cisco vendor specific devices. This company would like to stray away from using their current routing protocol due the fast convergence times needed for their business. EIGRP provides the fastest convergence time out all the other IGP's (Interior Gateway Protocols). The headquarters is based in St. Louis, MO but the two branch locations are located in New York City and New Jersey. Implement EIGRP for this customer's network per the network diagram below:



(Logical Lab Reference)



A. Connect all three routers with serial cables in a Point-to-Point topology as depicted in the logical lab reference ☐

B. Configure the three routers with hostnames, enable passwords, console, and **SSH** access ☐

C. Change the serial encapsulation from **HDLC** to **PPP** on all Point-to-Point Links between the three routers ☐

☛ (*CN Task 6 also features PPP installation*)

D. Implement IP addresses based on the following subnet information:
MT_NYC to **MT_STL:** 10.2.4.0 /30
MT_NJ to **MT_STL**: 10.2.5.0 /30 ☐

E. Implement the following IP addresses based on the following information:
MT_STL int **Lo0**: 172.16.1.1 /24
MT_NYC int **Lo0**: 172.16.2.1 /24
MT_NJ int **Lo0**: 172.16.3.1 /24

F. Deploy the **EIGRP** protocol on all available subnets on all three routers. Also specifically **network** interface subnets rather than class full networks ☐

☛ (*To configure EIGRP **network** commands that's only a part of a particular interface's subnet requires the use of wildcard masks)*

Part 2 - Configure Protocol Authentication

G. Since this company deals with very important data that may jeopardize they're clients' revenue, they would like for us to configure security measures for them. We're using **PPP** for their encapsulation method, implement **Chap** authentication for both Point-to-Point Links ☐

H. Enable **EIGRP MD5 Authentication** on both Point-to-Point links ☐

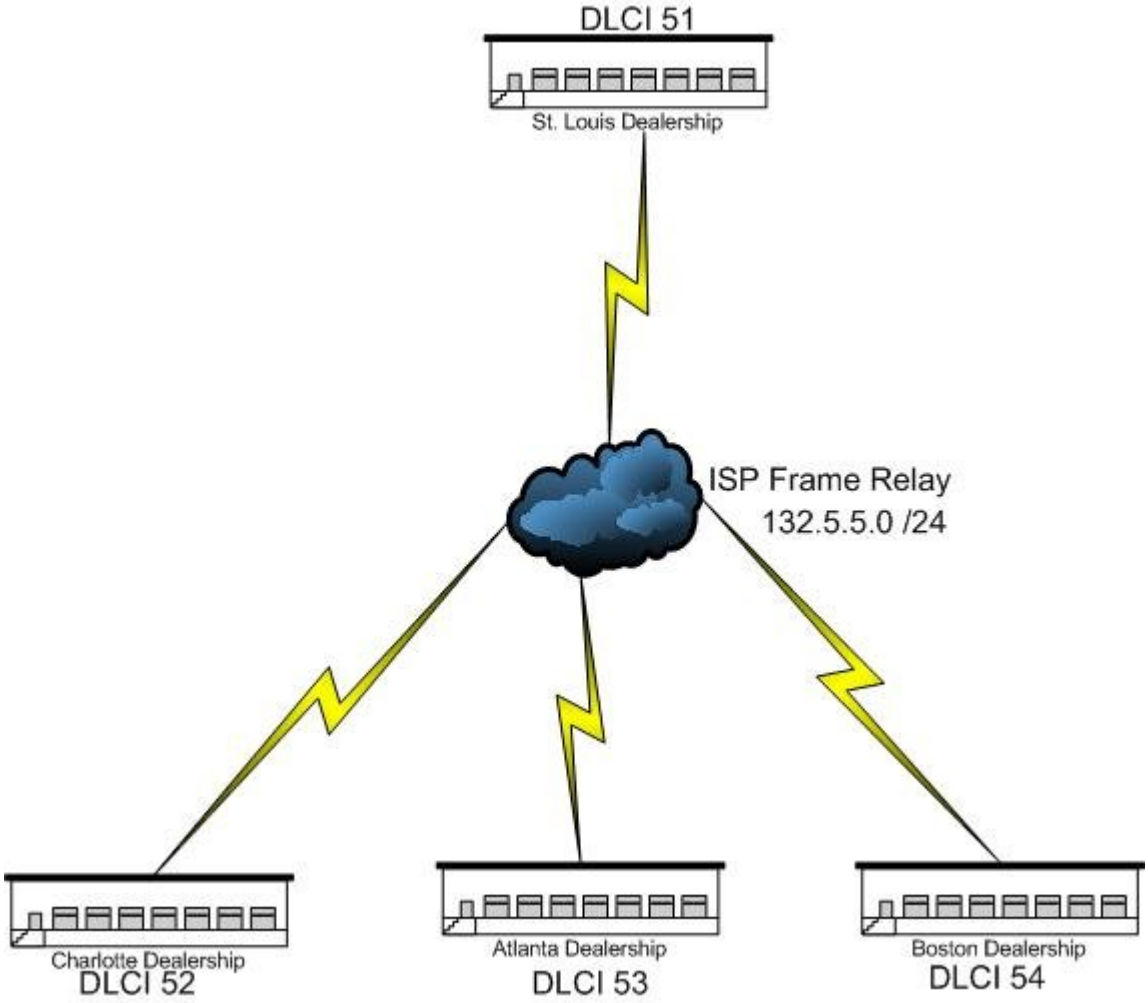
I. Create an extended access-list that prevents either the **MT_NYC** or the **MT_NJ** locations from being able to send **SMTP** requests to this router ☐

☛ (***Check out this Wiki Link***: *EIGRP*)

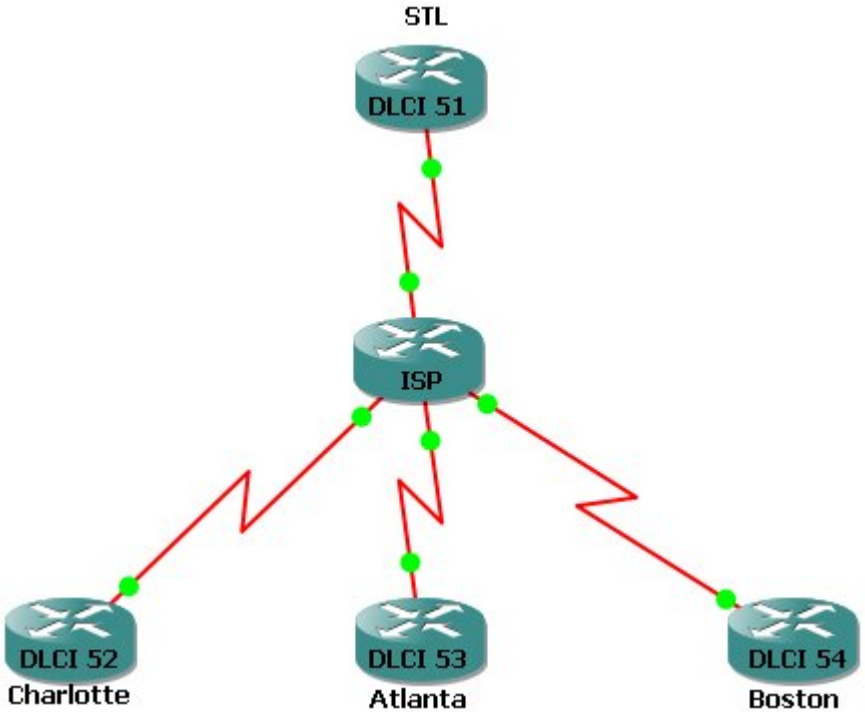
This lab is complete once all subnets can speak to one another and all security measures have been configured.

CN Task 15 - Enable Customer's WAN Network via Frame Relay

The EIGRP design we implemented for Mahler Trading is working flawlessly the customer reported. Butler's Car Dealership has 4 dealerships located throughout the Midwest region. Butler would like to enable connectivity between all four sites. Due to the customer's current budget, this dealership will use Frame Relay to create a full-mesh topology. Using the network diagram below, create a Frame Relay network for this business:



(Logical Lab Reference)



A. Connect all five routers with serial cables in a Point-to-Point topology as depicted in the logical lab reference ☐

B. Configure the three routers with hostnames, enable passwords, console, and **Telnet** access ☐

C. Implement Frame Relay on the **ISP** router based on the following DLCI numbers:

STL – **DLCI 51**

Charlotte – **DLCI 52**

Atlanta – **DLCI 53**

Boston – **DLCI 54** ☐

☛ (*For more information regarding setting up a Cisco router as a Frame Relay switch, check out the following web link: Cisco Frame Switch*)

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D. Assign IP addresses to all 4 routers serial interfaces based on the network 132.5.5.0 /24 ☐

E. Assign the following IP address to the 4 routers Fast Ethernet interfaces:

STL int **fa0/0:** 192.168.1.0 /24

Charlotte int **fa0/0:** 192.168.2.0 /24

Atlanta int **fa0/0:** 192.168.3.0 /24

Boston int **fa0/0:** 192.168.4.0 /24 ☐

F. Configure Frame Relay on all 4 routers based on the following information:

STL – **DLCI 51**

Charlotte – **DLCI 52**

Atlanta – **DLCI 53**

Boston – **DLCI 54** ☐

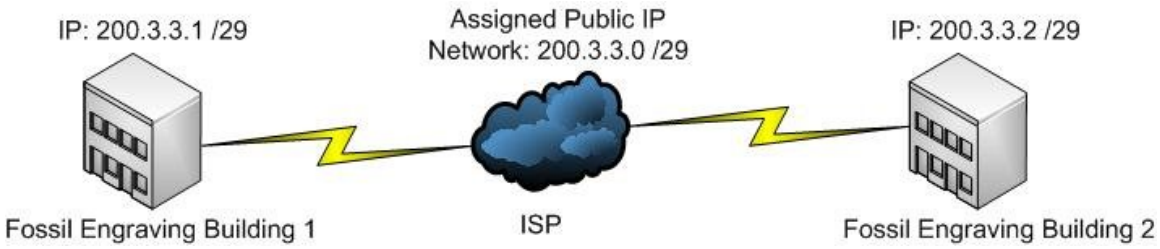
☛ (*For more information on Frame Relay and how to configure Frame Relay, check out the following link: Configuring Frame Relay*)

G. Enable EIGRP on the **132.5.5.0** and **192.168.0.0** networks ☐

This lab is complete once all routers are able to successfully ping each others Fast Ethernet interface.

CN Task 16 - Install Addressing Solution for Small Business

A new start up company called Fossil Engraving has recently setup a Cisco router for internet connectivity between its two sites. Due to the cost of purchasing public IP addresses, this business would like for us to create a solution that would allow for them to use their current public IP address for their internal network. Using the network diagram below, implement NAT (Network Address Configuration) for this existing customer's network:



(Logical Lab Reference)

A. Connect both routers with serial cables in a Point-to-Point topology as depicted in the logical lab reference ☐

B. Configure the two routers with hostnames, enable passwords, console, and **SSH** access ☐

C. Assign the following serial interface IP addresses:
FE_B1 int **s0/0:** 200.3.3.1 /29
FE_B2 int **s0/0:** 200.3.3.2 /29 ☐

D. Assign the following Fast Ethernet interface IP addresses:
FE_B1 int **fa0/0:** 192.168.1.0 /24
FE_B2 int **fa0/0:** 192.168.2.0 /24 ☐

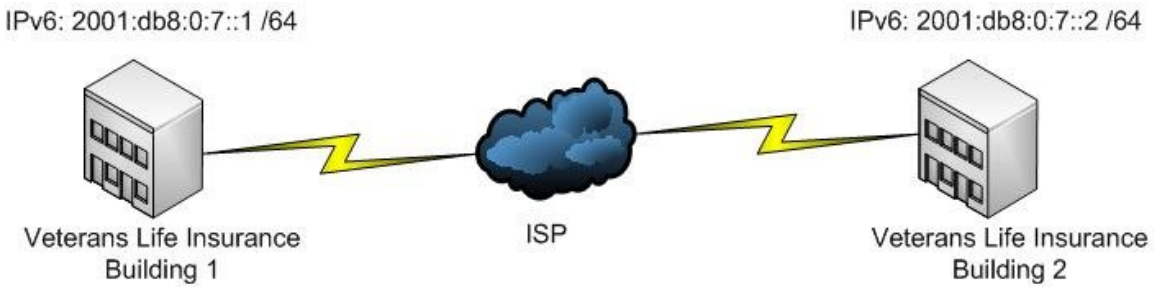
E. Create static routes on both the **FE_B1** and **FE_B2** routers that will allow both routers to ping and successfully reach each others Fast Ethernet interfaces ☐

F. Enable NAT **Overload (PAT)** on both routers that will allow communication between the two routers LAN interfaces using each routers public IP address ☐

☛ (*For more information on how to configure NAT, view the following web link: NAT Configuration*)

CN Task 17 - Configure IPv6 Router Connection for New Small Business WAN

Good job on setting up that NAT configuration for Fossil Engraving. Veterans Life Insurance is a government sponsored company that provides free life insurance to military families. Due to the recent requirement by the DoD (Department of Defense) all businesses that receives revenue from or for the government must use the newer IPv6 routing protocol. Setup this customers two building business with the ability to use IPv6 between the two buildings. A network diagram has been included below:



(Logical Lab Reference)

A. Connect both routers with serial cables in a Point-to-Point topology as depicted in the logical lab reference ☐

B. Configure the two routers with hostnames, enable passwords, console, and **SSH** access ☐

C. Enable **IPv6** routing on both routers ☐

D. Assign the following serial interface **IPv6** addresses:

VLI_R1 int **s0/0:** 2001:db8:0:7::1/64

VLI_R2 int **s0/0:** 2001:db8:0:7::2/64 ☐

E. Assign the following Fast Ethernet interface **IPv6** addresses:

VLI_R1 int **fa0/0:** 2001:db8:0:1::1/64

VLI_R2 int **fa0/0:** 2001:db8:0:2::1/64 ☐

F. Enable **RIPng** on all router interfaces ☐

G. Confirm connectivity between both routers by pinging the other routers **fa0/0** IPv6 address ☐

☛ (***Check out this Wiki Link***: *IPv6*)

This lab is complete once both routers are successfully able to ping each others **fa0/0** address.

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Acknowledgements

I want to say thanks to all the IT professionals, students, and fans of networking technology who took the time to review and purchase my material. It takes a lot of dedication to obtain and sustain any type of IT career. Your decision to choose my material to help obtain or sustain the current IT career field you've chosen means the world to me.

Additional Resources

There are many great IT certification forums out there, my personal favorite is www.techexams.net. They provide great supplemental learning about not just Cisco certifications, but other standard IT certifications as well.

I post frequently on my own study blog http://shawnmoorecisco.blogspot.com with notes about my current certification and learning progress.

Cisco's Learning Network is also a great source of information including forums, white papers, and even free training videos! Check out their web site https://learningnetwork.cisco.com/ and create a login for free.

If you're interested in a great study source for your Cisco Security certifications, check out http://www.studyshorts.co.uk/. The guides are very comprehensive and a good companion for any of the Cisco related security tests.

For additional FREE lab ideas, check out http://www.gns3-labs.com/