Router & Switch Configuration - Final Project

SSH[ghost]

The University

Executive Summary

This report is to create five networks in five of the locations of Emergency Services & Support for the use of local emergency services. Those sites include Tampa, FL (the Media/News site and main site), Phoenix, AZ (the Database/Maintenance/Redundancy Site), Portland, OR (the Mobile/Communications site), Washington DC, MD (the Emergency site), and Atlanta, GA (the CDC Research site). Emergency Services & Support has contracted Spencer Security & Networking to create these five networks at these five sites.

This report will provide network configuration details including networking requirements, networking devices, router and routing configurations for LANs with EIGRP routing and for WANs with Frame Relay, and switch configuration for trunk VLANs via .1Q encapsulation.

Each site has one Cisco 2811 Custom Router, three 3560 switches, and the same configurations with varying differences on address, hostnames, passwords, and select uniqueness. Such select uniqueness includes a DMZ network at the Tampa site and a direct connection between the DC and Atlanta site over a GRE IP tunnel.

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Introduction

This report is to create five networks in five of the locations of Emergency Services & Support for the use of local emergency services. Those sites include Tampa, FL (the Media/News site and main site), Phoenix, AZ (the Database/Maintenance/Redundancy Site), Portland, OR (the Mobile/Communications site), Washington DC, MD (the Emergency site), and Atlanta, GA (the CDC Research site). Emergency Services & Support has contracted Spencer Security & Networking to create these five networks at these five sites.

Emergency Services and Support acts as a call center service for local law enforcement, firefighters, hospitals, and private-practicing doctors. They provide after-hours doctors, hospital on-call support, 911 call center redundancy support, disaster command and communications support, and mobile services of various kinds. Each site employs 50 support technicians with Red Cross CPR, AED, and First Aid training and certifications for children and adults with a staff of five in Phoenix for IT support and maintenance.

This report will provide network configuration details including networking requirements, networking devices, router and routing configurations for LANs with EIGRP routing and for WANs with Frame Relay, and switch configuration for trunk VLANs via .1Q encapsulation.

Script Layout

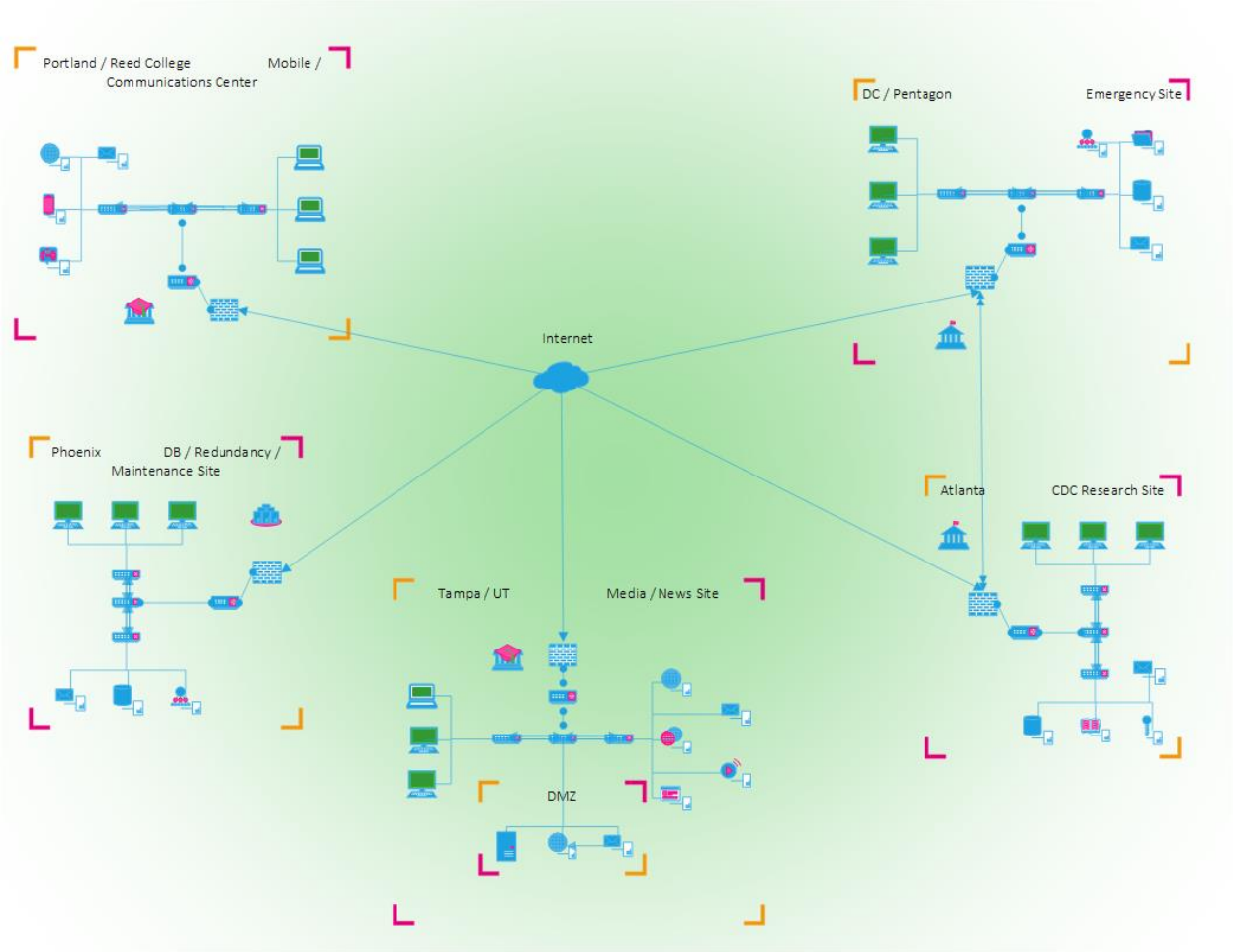
The script layouts will be provided in the following order:

- Tampa, FL
    - Main router
    - Main / DMZ switch
    - User switch

    - Server switch

- Phoenix, AZ
    - Main router
    - Main switch
    - User switch
    - Server switch
- Portland, OR
    - Main router
    - Main switch
    - Server switch
    - User switch
- Washington DC, MD
    - Main router
    - Main switch
    - Server switch
    - User switch
- Atlanta, GA
    - Main router
    - Main switch
    - User switch
    - Server switch

Proposed Network Layout



Requirements

Emergency Services & Support's requirements for all sites are as follows:

- One Router
    - IPv4 / IPv6 Addresses
    - Access Control List
    - EIGRP Routing
    - Hostname
    - Password Security

    - Frame Relay

- Three switches
    - IPv4 Addresses
    - VLANs
    - Trunking
    - Hostname

Emergency Services & Support's requirement for the Tampa site is as follows:

- DMZ

Emergency Services & Support's requirement for the DC & Atlanta sites is as follows:

- Direct connection to each other along with WAN

All of the above requirements are met by the installation of Cisco networking devices and the respective scripts provided.

Network Devices

Cisco's 2811 Custom Router meets all the requirements. It supports IPv4 and IPv6 addresses, EIGRP routing over both address types, .1Q encapsulation for switch trunking, Frame Relay for WAN communication, hostnames, usernames, passwords, and ACLs. It is the optimal router for all sites.

Cisco's 3560 Switch meets all the requirements. It supports IPv4 addresses, .1Q encapsulation for switch trunking, VLANs, and hostnames. It is the optimal switch for all sites.

Network Sites / Configurations

The following includes the configuration documentation per each site and includes device information, script instructions, script screenshots of set-up, and script screenshots of network tests.

Tampa, FL

Device Information

- Router
    - Username – FLAdmin
    - 1bluetrunk
    - Hostname – FL-R
    - Secret – Redvine1
    - F0/0 IPv4 Address – 172.16.1.1
    - F0/0 IPv6 Address – 2001:db8:3c4d:9::/64
        - F0/0.10 IPv4 Address – 10.1.1.1
        - F0/0.20 IPv4 Address – 20.1.1.1
    - S0/0/0 IPv4 / IPv6 Address – N/A
        - S0/0/0.102 IPv4 Address – 10.10.12.50
        - S0/0/0.102 IPv6 Address – 2001:db8:3c4d:12::/64
        - S0/0/0.103 IPv4 Address – 10.10.13.50
        - S0/0/0.103 IPv6 Address – 2001:db8:3c4d:13::/64
        - S0/0/0.104 IPv4 Address – 10.10.14.50
        - S0/0/0.104 IPv6 Address – 2001:db8:3c4d:14::/64
        - S0/0/0.105 IPv4 Address – 10.10.15.50
        - S0/0/0.105 IPv6 Address – 2001:db8:3c4d:15::/64
    - Routing EIGRP – IPv4 / IPv6
    - ACL – Auto Secure
- Switches

- Username / Password / Secret – N/A
- Hostnames – FL-S1 / FL-S2 / FL-S3
- VL1 IPv4 Address – 192.168.10.1 / 192.168.11.1 / 192.168.12.1
- VLAN 10 IPv4 Address – 10.1.1.1
- VLAN 20 IPv4 Address – 20.1.1.1

The first step in creating this site network is to hook up any PC in the physical area to the router and switches via console cable one network device at a time. The order we want to follow was indicated by the Script Layout section of this report (main router > main switch > user or server switch (interchangeable)). It's assumed the cables for the network connecting to everything has already been installed such as the straight-through cables are already installed into the switches into the end devices and the main router to the main switch and the crossover cables are already installed between the switches. Upon installing the cable, we access the terminal. Since our networking device is attached via console cable, the terminal will automatically place us in the terminal of that device. On the PC, we open the ROUTER script. We must find the site location at which we are setting up the network (i.e. Tampa, FL site users would find the area of the script marked FLORIDA). The starting and end point of each device portion of the script is clear. We copy the contents between both points and paste into the terminal. Upon completion, the output should look like the following:

```
Router>en
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname FL-R
FL-R(config)#enable secret Redvine1
FL-R(config)#ipv6 unicast-routing
FL-R(config)#int f0/0
FL-R(config-if)#ip address 172.16.1.1 255.255.255.252
FL-R(config-if)#ipv6 address 2001:db8:3c4d:9::/64
FL-R(config-if)#no shut

FL-R(config-if)#int f0/0.10
FL-R(config-subif)#encap dot1q 10
FL-R(config-subif)#ip address 10.1.1.1 255.255.255.252
FL-R(config-subif)#no shut
FL-R(config-subif)#int f0/0.20
FL-R(config-subif)#encap dot1q 20
FL-R(config-subif)#ip address 20.1.1.1 255.255.255.252
FL-R(config-subif)#no shut
FL-R(config-subif)#int s0/0/0
FL-R(config-if)#no shut

FL-R(config-if)#encap frame-relay
FL-R(config-if)#int s0/0/0.102 point-to-point
FL-R(config-subif)#ip address 10.10.12.50 255.255.255.0
FL-R(config-subif)#ipv6 address 2001:db8:3c4d:12::/64
FL-R(config-subif)#frame-relay interface-dlci 102
FL-R(config-subif)#int s0/0/0.103 point-to-point
FL-R(config-subif)#ip address 10.10.13.50 255.255.255.0
FL-R(config-subif)#ipv6 address 2001:db8:3c4d:13::/64
FL-R(config-subif)#frame-relay interface-dlci 103
FL-R(config-subif)#int s0/0/0.104 point-to-point
FL-R(config-subif)#ip address 10.10.14.50 255.255.255.0
FL-R(config-subif)#ipv6 address 2001:db8:3c4d:14::/64
FL-R(config-subif)#frame-relay interface-dlci 104
FL-R(config-subif)#int s0/0/0.105 point-to-point
FL-R(config-subif)#ip address 10.10.15.50 255.255.255.0
FL-R(config-subif)#ipv6 address 2001:db8:3c4d:15::/64
FL-R(config-subif)#frame-relay interface-dlci 105
FL-R(config-subif)#exit
FL-R(config)#router eigrp 100
FL-R(config-router)#network 172.16.0.0
FL-R(config-router)#network 10.0.0.0
FL-R(config-router)#no auto-summary
FL-R(config-router)#exit
```

The second step is uninstalling the console cable from the main router and installing it into the main switch. On the PC, we open the SWITCH script. We copy the contents between both points and paste into the terminal. Upon completion, the output should look like the following:

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname FL-S1
FL-S1(config)#int vl1
FL-S1(config-if)#ip address 192.168.10.1 255.255.255.0
FL-S1(config-if)#no shut

FL-S1(config-if)#exit
FL-S1(config)#vlan 10
FL-S1(config-vlan)#vlan 20
FL-S1(config-vlan)#int fa0/2
FL-S1(config-if)#switchport trunk encapsulation dot1q
FL-S1(config-if)#switchport mode trunk

FL-S1(config-if)#switchport access vlan 10
FL-S1(config-if)#switchport access vlan 20
FL-S1(config-if)#int fa0/3
FL-S1(config-if)#switchport trunk encapsulation dot1q
FL-S1(config-if)#switchport mode trunk

FL-S1(config-if)#switchport access vlan 10
FL-S1(config-if)#switchport access vlan 20
FL-S1(config-if)#int fa0/4
FL-S1(config-if)#switchport trunk encapsulation dot1q
FL-S1(config-if)#switchport mode trunk

FL-S1(config-if)#switchport access vlan 10
FL-S1(config-if)#switchport access vlan 20
FL-S1(config-if)#int fa0/5
FL-S1(config-if)#switchport trunk encapsulation dot1q
FL-S1(config-if)#switchport mode trunk

FL-S1(config-if)#switchport access vlan 10
FL-S1(config-if)#switchport access vlan 20
FL-S1(config-if)#exit
FL-S1(config)#ip routing
FL-S1(config)#int vlan 10
FL-S1(config-if)#ip address 10.1.1.1 255.255.255.252
FL-S1(config-if)#int vlan 20
FL-S1(config-if)#ip address 20.1.1.1 255.255.255.252
FL-S1(config-if)#exit
FL-S1(config)#exit
FL-S1#clear arp
FL-S1#
```

The third step is to uninstall the console cable from the main switch and install it into of the two secondary switches. These two scripts are interchangeable, thus will appear identical. The output should look like the following:

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname FL-S2
FL-S2(config)#int vl1
FL-S2(config-if)#ip address 192.168.11.1 255.255.255.0
FL-S2(config-if)#no shut

FL-S2(config-if)#exit
FL-S2(config)#vlan 10
FL-S2(config-vlan)#vlan 20
FL-S2(config-vlan)#int fa0/2
FL-S2(config-if)#switchport trunk encapsulation dot1q
FL-S2(config-if)#switchport mode trunk
FL-S2(config-if)#switchport access vlan 10
FL-S2(config-if)#switchport access vlan 20
FL-S2(config-if)#int fa0/3
FL-S2(config-if)#switchport trunk encapsulation dot1q
FL-S2(config-if)#switchport mode trunk
FL-S2(config-if)#switchport access vlan 10
FL-S2(config-if)#switchport access vlan 20
FL-S2(config-if)#int fa0/6
FL-S2(config-if)#switchport trunk encapsulation dot1q
FL-S2(config-if)#switchport mode trunk

FL-S2(config-if)#switchport access vlan 10
FL-S2(config-if)#switchport access vlan 20
FL-S2(config-if)#int fa0/7
FL-S2(config-if)#switchport trunk encapsulation dot1q
FL-S2(config-if)#switchport mode trunk

FL-S2(config-if)#switchport access vlan 10
FL-S2(config-if)#switchport access vlan 20
FL-S2(config-if)#exit
FL-S2(config)#exit
FL-S2#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
FL-S2#
```

A screenshot of the third can be found here.

The next steps are verifying that the network was successfully set up. First, we'll ping the VLANs from the main switch to ensure trunking was successful. The result should look like the following:

```
FL-S1#ping 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/7 ms

FL-S1#ping 20.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/6/29 ms
```

Next, we should repeat this step from the router. The results should look like the following:

```
FL-R#ping 10.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/8/28 ms

FL-R#ping 20.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/8 ms
```

The last step is to ping the other routers from the main router, but we need to save this step until the other networks are configured.

Phoenix, AZ

Device Information

- Router
  - Username – AZAdmin
  - 2bluetrunk
  - Hostname – AZ-R
  - Secret – Redvine2
  - F0/0 IPv4 Address – 172.16.2.1
  - F0/0 IPv6 Address – 2001:db8:3c4d:9::/64

        - F0/0.10 IPv4 Address – 10.1.1.1
        - F0/0.20 IPv4 Address – 20.1.1.1
    - S0/0/0 IPv4 / IPv6 Address – N/A
        - S0/0/0.201 IPv4 Address – 10.20.21.50
        - S0/0/0.201 IPv6 Address – 2001:db8:3c4d:21::/64
        - S0/0/0.203 IPv4 Address – 10.20.23.50
        - S0/0/0.203 IPv6 Address – 2001:db8:3c4d:23::/64
        - S0/0/0.204 IPv4 Address – 10.20.24.50
        - S0/0/0.204 IPv6 Address – 2001:db8:3c4d:24::/64
        - S0/0/0.205 IPv4 Address – 10.20.25.50
        - S0/0/0.205 IPv6 Address – 2001:db8:3c4d:25::/64
    - Routing EIGRP – IPv4 / IPv6
    - ACL – Auto Secure
- Switches
    - Username / Password / Secret – N/A
    - Hostnames – AZ-S1 / AZ-S2 / AZ-S3
    - VL1 IPv4 Address – 192.168.10.1 / 192.168.11.1 / 192.168.12.1
    - VLAN 10 IPv4 Address – 10.1.1.1
    - VLAN 20 IPv4 Address – 20.1.1.1

Following the order of main router > main switch > secondary switches should yield similar results as the Tampa, FL site. Those configurations should look like [screenshot] [screenshot] [screenshot] and [screenshot]. The internal pings from the main switch and router should look

like [screenshot] and [screenshot]. Once the networks are completely set up, we will ping each site router over WAN.

Portland, OR

Device Information

- Router
  - Username – ORAdmin
  - 3bluetrunk
  - Hostname – OR-R
  - Secret – Redvine3
  - F0/0 IPv4 Address – 172.16.1.1
  - F0/0 IPv6 Address – 2001:db8:3c4d:9::/64
    - F0/0.10 IPv4 Address – 10.1.1.1
    - F0/0.20 IPv4 Address – 20.1.1.1
  - S0/0/0 IPv4 / IPv6 Address – N/A
    - S0/0/0.301 IPv4 Address – 10.30.31.50
    - S0/0/0.301 IPv6 Address – 2001:db8:3c4d:31::/64
    - S0/0/0.302 IPv4 Address – 10.30.32.50
    - S0/0/0.302 IPv6 Address – 2001:db8:3c4d:32::/64
    - S0/0/0.304 IPv4 Address – 10.30.34.50
    - S0/0/0.304 IPv6 Address – 2001:db8:3c4d:34::/64
    - S0/0/0.305 IPv4 Address – 10.30.35.50
    - S0/0/0.305 IPv6 Address – 2001:db8:3c4d:35::/64
  - Routing EIGRP – IPv4 / IPv6

- ACL – Auto Secure

- Switches
  - Username / Password / Secret – N/A
  - Hostnames – OR-S1 / OR-S2 / OR-S3
  - VL1 IPv4 Address – 192.168.10.1 / 192.168.11.1 / 192.168.12.1
  - VLAN 10 IPv4 Address – 10.1.1.1
  - VLAN 20 IPv4 Address – 20.1.1.1

Following the order of main router > main switch > secondary switches should yield similar results as the Tampa, FL site. Those configurations should look like [screenshot] [screenshot] [screenshot] and [screenshot]. The internal pings from the main switch and router should look like [screenshot] and [screenshot]. Once the networks are completely set up, we will ping each site router over WAN.

Washington DC, MD

Device Information

- Router
  - Username – DCAdmin
  - 4bluetrunk
  - Hostname – DC-R
  - Secret – Redvine4
  - F0/0 IPv4 Address – 172.16.1.1
  - F0/0 IPv6 Address – 2001:db8:3c4d:9::/64
    - F0/0.10 IPv4 Address – 10.1.1.1
    - F0/0.20 IPv4 Address – 20.1.1.1

    - S0/0/0 IPv4 / IPv6 Address – N/A
        - S0/0/0.401 IPv4 Address – 10.40.41.50
        - S0/0/0.401 IPv6 Address – 2001:db8:3c4d:41::/64
        - S0/0/0.402 IPv4 Address – 10.40.42.50
        - S0/0/0.402 IPv6 Address – 2001:db8:3c4d:42::/64
        - S0/0/0.403 IPv4 Address – 10.40.43.50
        - S0/0/0.403 IPv6 Address – 2001:db8:3c4d:43::/64
        - S0/0/0.405 IPv4 Address – 10.40.45.50
        - S0/0/0.405 IPv6 Address – 2001:db8:3c4d:45::/64
    - Routing EIGRP – IPv4 / IPv6
    - ACL – Auto Secure
- Switches
    - Username / Password / Secret – N/A
    - Hostnames – DC-S1 / DC-S2 / DC-S3
    - VL1 IPv4 Address – 192.168.10.1 / 192.168.11.1 / 192.168.12.1
    - VLAN 10 IPv4 Address – 10.1.1.1
    - VLAN 20 IPv4 Address – 20.1.1.1

Following the order of main router > main switch > secondary switches should yield similar results as the Tampa, FL site. Those configurations should look like [screenshot] [screenshot] [screenshot] and [screenshot]. The internal pings from the main switch and router should look like [screenshot] and [screenshot]. Once the networks are completely set up, we will ping each site router over WAN.

Atlanta, GA

Device Information

- Router
    - Username – GAAdmin
    - 5bluetrunk
    - Hostname – GA-R
    - Secret – Redvine5
    - F0/0 IPv4 Address – 172.16.1.1
    - F0/0 IPv6 Address – 2001:db8:3c4d:9::/64
        - F0/0.10 IPv4 Address – 10.1.1.1
        - F0/0.20 IPv4 Address – 20.1.1.1
    - S0/0/0 IPv4 / IPv6 Address – N/A
        - S0/0/0.501 IPv4 Address – 10.50.51.50
        - S0/0/0.501 IPv6 Address – 2001:db8:3c4d:51::/64
        - S0/0/0.502 IPv4 Address – 10.50.52.50
        - S0/0/0.502 IPv6 Address – 2001:db8:3c4d:52::/64
        - S0/0/0.503 IPv4 Address – 10.50.53.50
        - S0/0/0.503 IPv6 Address – 2001:db8:3c4d:53::/64
        - S0/0/0.504 IPv4 Address – 10.50.54.50
        - S0/0/0.504 IPv6 Address – 2001:db8:3c4d:54::/64
    - Routing EIGRP – IPv4 / IPv6
    - ACL – Auto Secure
- Switches

- Username / Password / Secret – N/A
- Hostnames – GA-S1 / GA-S2 / GA-S3
- VL1 IPv4 Address – 192.168.10.1 / 192.168.11.1 / 192.168.12.1
- VLAN 10 IPv4 Address – 10.1.1.1
- VLAN 20 IPv4 Address – 20.1.1.1

Following the order of main router > main switch > secondary switches should yield similar results as the Tampa, FL site. Those configurations should look like [screenshot] [screenshot] [screenshot] and [screenshot]. The internal pings from the main switch and router should look like [screenshot] and [screenshot]. Now that all the networks are set up, we can ping each router from each site.

WAN Test

From the Tampa, FL router, we need to ping Phoenix, AZ, Portland OR, Washington DC, MD, and Atlanta, GA. We decided to ping the IPv4 addresses over Frame Relay. The results for the FL test looks like the following:

```
FL-R#ping 10.10.12.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.12.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/6/10 ms

FL-R#ping 10.10.13.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.13.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/3/9 ms

FL-R#ping 10.10.14.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.14.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/6/12 ms

FL-R#ping 10.10.15.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.15.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/6/8 ms
```

The tests amongst all routers over WAN look identical. The results for Phoenix, AZ and Portland, OR should look like [screenshot] and [screenshot]. The tests for Washington DC, MD and Atlanta, GA are almost the same as the other three, but both require pinging each other over their GRE IP tunnel as well as over WAN. The results for Atlanta, GA should look like [screenshot] and the results for Washington DC, MD are as follows:

```
DC-R#ping 10.40.41.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.40.41.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/11/24 ms

DC-R#ping 10.40.42.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.40.42.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 9/11/16 ms

DC-R#ping 10.40.43.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.40.43.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/8 ms

DC-R#ping 10.40.45.50

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.40.45.50, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/14 ms

DC-R#ping 1.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/6/12 ms
```

Summary

All five networks at all five sites were set up successfully. Each router was able to communicate with each other and the routers and switches of each internal network were able to communicate with each other. We have logged the results of the set-ups and tests, which can be found in the folder marked Script Screenshots. This report has provided network configuration details including networking requirements, networking devices, router and routing configurations for LANs with EIGRP routing (with IPv4 and IPv6 addressing) and for WANs with Frame Relay (with IPv4 and IPv6 addressing), and switch configuration for trunk VLANs via .1Q encapsulation. We've added usernames, passwords, secrets, and ACLs to add a level of security

to each network on each router. If you have any further questions, please feel free to email or

class at Spencer Security & Networking.