

## Link Vector Routing

### ***Lab 3: Link State Routing and Layer 3 Redundancy***

CNIT34500-006

Group 2

Laura Fung

Ethan Hammond

Submitted To: Dominic Russo

Date Submitted: 04/18/2023

Date Due: 04/18/2023

## Table of Contents

Table of Contents .....	ii
Executive Summary .....	4
Business Scenario .....	5
Procedures .....	8
<b>Removed Unnecessary Configurations and adding required hardware ...</b>	<b>8</b>
<b>Added Required Hardware.....</b>	<b>8</b>
<b>Configured Loopback Interfaces.....</b>	<b>9</b>
<b>Configured /30 Networks .....</b>	<b>10</b>
Configured VLANs on Routers .....	10
<b>Created VLANs on Switches.....</b>	<b>11</b>
<b>Configured Layer 2 Switch .....</b>	<b>11</b>
<b>Configured Layer 3 Switches.....</b>	<b>12</b>
<b>Implemented OSPF.....</b>	<b>13</b>
<b>Implemented EIGRP .....</b>	<b>14</b>
<b>Configured Redistribution and license enabling.....</b>	<b>15</b>
<b>Configured GLBP and NTP.....</b>	<b>16</b>
Configured NTP.....	16
<b>Configured ICMP Strings .....</b>	<b>17</b>
<b>Configured SNMP monitoring on LibreNMS.....</b>	<b>18</b>
<b>Configured 6504 as DHCP Server.....</b>	<b>19</b>
<b>Configured Additional DHCP Servers.....</b>	<b>19</b>
Conclusions and Recommendations .....	21

RESULTS .....	23
Bibliography.....	25
APPENDIX A: Problem Solving.....	27
APPENDIX B: Tables .....	31
Table 1: 2811 Console Cabling.....	31
Table 3: Term Server Menu Mapping .....	32
Table 4: IOS Files .....	32
Table 5: Network Cabling Information.....	33
Table 6: Loopback Addressing Information .....	33
Table 7: Interface Addressing Information.....	34
Table 8a: OSPF network information .....	35
Table 8b: EIGRP network information.....	37
Table 9: PC IP Addressing Information.....	38
Table 10: DHCP Information.....	38
APPENDIX C: Router and Switch Configurations .....	40
<b>2811 Term Server</b> .....	40

### EXECUTIVE SUMMARY

The main goals of this project were to configure the routers and switches with a link state protocol and other layer 3 redundancy protocols- such as Gateway Load Balancing Protocol (GLBP) and Open Shortest Path First (OSPF). Furthermore, network connectivity needed to be established between the varying routing protocols- OSPF and Enhanced Interior Gateway Protocol (EIGRP).

In the following report, the Business Case describes the lab and its requirements in further detail, including the logical and physical diagrams of the network as it was before the lab completion. The Procedures section lists all the steps taken to complete the objectives with details in the descriptions before each. The Results section includes the lab in its final form, with updated logical and physical diagrams showing changes made. The Conclusions and Recommendations section states whether the project met all the requirements and expectations of the Business Case, and includes any recommendations for further implementations. The appendices include tables, problem solving write ups, and each router/switch's configuration files.

### BUSINESS SCENARIO

The company needed to modify their network to be able to use multiple routing protocols. They needed to start by changing their 4 Virtual Local Area Network (VLAN) IDs to VLANs 1002, 2002, and 3002- plus the native VLAN. To meet the network design requirements, multiple Enhanced High-speed WAN Interface Cards (EHWICs) needed to be ordered and placed into the network devices to allow for fiber channel connections, and to add additional Network Interface Cards (NICs) to routers to allow for more concurrent connections.

Three OSPF areas and two EIGRP autonomous systems (AS) were required to segment the network. OSPF areas 2 and 102 should be created, alongside area 0 to interconnect them. EIGRP autonomous systems 2 and 102 should also be created but should not be directly connected to area 0. As a result, redistribution would need to be implemented to pass network traffic between OSPF and EIGRP networks.

Dynamic Host Configuration Protocol (DHCP) should also be configured to automatically assign IP addresses and gateways to their hosts on their respective VLANs. The 6504 should serve as the DHCP server for all three OSPF areas, and the 1921 and 3750-C should serve as DHCP servers for their EIGRP autonomous systems, for a total of 3 DHCP servers serving out 192.168.X.0/24 networks for their respective VLANs.

Network Time Protocol (NTP) should also be configured on all network devices to synchronize to CIT net and set the correct time zone. A Trivial File Transfer Protocol (TFTP) server should be set up and all network devices should be configured to automatically backup their configuration files to the server periodically. Additionally, LibreNMS should be used

## Link State Routing

for Simple Network Management Protocol (SNMP) monitoring for all network devices.

Physical and logical diagrams of the initial network were provided in figures 1 and 2 below.

The diagram illustrates a network topology with the following components and connections:

- WAN Uplink:** A cloud icon at the top center representing the Internet or a central WAN.
- Core Routers:**
  - Cisco 2901-A:** Connected to the WAN Uplink (g0/0/0 to g0/0/1) and to Cisco 3750-A (g2/1 to g0/0/0).
  - Cisco 2911-B:** Connected to Cisco 2901-A (g0/0/0 to g0/1) and to Cisco 2911-A (g0/0/0 to g0/2).
  - Cisco 6504:** The central core router, connected to Cisco 2901-A (g3/1 to g3/3), Cisco 2911-B (g3/5 to g3/7), Cisco 2921-A (g1/1 to g3/9), and the WAN Uplink (g1/3).
  - Cisco 2921-A:** Connected to Cisco 6504 (g3/9 to g0/2) and to the Stacked Cisco 3750-B/C (g0/1/0 to g0/0/0).
- Access Switches:**
  - Cisco 3750-A:** Connected to PC 1 (g2/1 to g2/7) and Cisco 2901-A (g2/1 to g0/0/0).
  - Stacked Cisco 3750-B 3750-C RPS Powered:** Connected to PC 2 (g2/1 to g2/3) and Cisco 2921-A (g0/1/0 to g0/0/0).
- End Devices:**
  - PC 1:** Connected to Cisco 3750-A (g2/1 to g2/7).
  - PC 3:** Connected to Cisco 6504 (g3/5 to g3/7).
  - PC 2:** Connected to the Stacked Cisco 3750-B/C (g2/1 to g2/3).
- Other Connections:**
  - Cisco 2911-A (g0/1 to g0/0) is connected to Cisco 2911-B (g0/0/0 to g0/1).
  - Cisco 2901-B (g0/0/0 to g0/1) is connected to Cisco 2921-A (g0/0/0 to g0/1).
  - There are additional links between Cisco 2901-A and Cisco 2911-B (g0/0/0 to g0/0) and between Cisco 2901-A and Cisco 2921-A (g0/0/0 to g0/1).

The diagram illustrates a network topology with two EIGRP domains, EIGRP 202 and EIGRP 102, connected via a WAN Uplink. The WAN Uplink is represented by a cloud icon with the IP address 10.21.2.0/24. The EIGRP 202 domain includes Cisco 2901-A, Cisco 2911-B, Cisco 2911-A, and Cisco 3750-A. The EIGRP 102 domain includes Cisco 2901-B, Cisco 2912-A, and a Stacked Cisco 3750-B/3750-C RPS Powered switch. Various loopback and interface IP addresses are shown for each device. PCs are connected to the switches: PC 1 to Cisco 3750-A, PC 3 to Cisco 6504, and PC 2 to the stacked switch.

7

### PROCEDURES

The procedures section was broken up into major groups of steps. In the steps, the **buttons pressed** were bolded, *options* were italicized, text entered into console/terminal was typed in Courier New, menu navigation and repeated actions were shown with the | pipe | symbol. Repeated steps were shortened by referencing specific information in the Appendix. Varying input is also placed between [brackets].

#### **Removed Unnecessary Configurations and adding required hardware**

Before beginning, it was necessary to remove any conflicting configurations. Since this new network implemented completely different protocols and IP schemes, completely wiping each device's configuration was found to be easier than manually removing each one. This was done with the steps below.

1. Logged into the device and entered `write erase` to erase the startup config.
2. Used `reload` to restart the device.
3. Used `write memory` to save the blank config as the startup config.

#### **Added Required Hardware**

Before configuring devices, additional hardware was needed to meet the network design requirements. This included EHWIC cards- to add interfaces to routers and implement fiber channel, and Double Wide Service Modules (DWSMs). It was imperative to power the devices off before inserting the hardware.



## Link State Routing

4. Added an EHWIC card to the 2911b to allow for a fiber channel between itself and the 2901A.
5. Added two EHWIC cards to the 2901a to allow for a fiber channel to the 2911b and to the 6504.
6. Installed an EHWIC card on the 2911a to allow for a fiber channel to the 2901b.
7. Added an EHWIC card to the 2901b to allow for a fiber channel to the 2911A.
8. Installed a Double Wide Service Module to the 2901b to allow for end devices to be plugged in and act as a switchport.

## Configured Loopback Interfaces

Loopback interfaces were configured on each router and switch to test network connectivity. Since these virtual interfaces were used primarily to ping one another, /32 networks were used to simplify addressing and avoid wasting addresses.

1. Logged into the 2911a.
2. Entered `en`
3. Entered `conf t`
4. Entered `interface loopback 0`
5. Entered `ip address [169.254.1.96] [255.255.255.255]`
  - a. Repeated steps 2-5 on all devices- see Appendix A for loopback addressing information.

## Link State Routing

### Configured /30 Networks

Networks between routers can be condensed into the smallest possible subnet of a /30. Since this allows for 2 devices, it is perfectly sized for router interconnects. All router interconnect interfaces were configured with /30 networks.

1. Entered `conf t`
2. Used `int [gig0/1]` to enter the interface between the two routers.
3. Used IP address `[192.168.254.9] [255.255.255.252]` to set the IP address.
  - a. Repeated steps 1-3 on all devices- see Appendix A for IP addressing information.

### Configured VLANs on Routers

One requirement for this network design was 4 separate VLANs. Since VLAN 1 serves as the default and is present when no other VLAN configurations are made, VLANs 1002, 2002, and 3002 were added to total 4 VLANs. VLANs were configured on routers by creating sub interfaces and assigning each one a /24 network.

4. Entered `conf t`
5. Entered `int [gigabitEthernet 0/1.2002]`
6. Entered `encapsulation dot1q [2002]`
7. Entered `ip address [192.168.12.1] [255.255.255.0]`
8. Entered `no shut`
  - a. Repeated steps 2-5 for each sub interface on all routers- see Appendix A for VLAN addressing information.

## Link State Routing

### Created VLANs on Switches

Similarly, VLAN 1 is the default on switches when no VLAN configurations are made. Therefore, VLANs 1002, 2002, and 3002 were added by creating a virtual interface for each VLAN. A management IP was also assigned to each VLAN.

1. Entered `conf t`
2. Entered `vlan [2002]`
  - a. Repeated step 2 for VLANs 102, 2002, and 3002 on all switches
3. Used `interface vlan [102, 2002, 3002]` to enter the VLAN interfaces.
4. Typed `ip address 192.168.12.10 255.255.255.0` to add a management IP for VLAN 102.
5. Typed `ip address 192.168.22.10 255.255.255.0` to add a management IP for VLAN 2002.
6. Typed `ip address 192.168.32.10 255.255.255.0` to add a management IP for VLAN 3002.

### Configured Layer 2 Switch

The 3750 switches operate on layer 2 by default. To provide connectivity to its connected interfaces, the ports simply have to be trunked to allow the respective VLAN traffic through. In this case, interfaces were trunked on the 3750-B to allow traffic from all four VLANs through.

1. Entered `conf t`
2. Entered the interfaces that are connected to the 2901A and the 2911A routers.
3. Used `switchport trunk allowed vlan 1,102,2002,3002`.

## Link State Routing

4. Entered switchport trunk encapsulation dot1q.
5. Used switchport mode trunk to trunk the VLANs.
6. Created the VLAN interfaces with int [vlan102] [vlan2002], [vlan3002].
7. Created the VLANs with vlan102, vlan2002, and vlan3002.
8. Assigned IP addresses to these interfaces with ip address [192.168.9.5] [255.255.255.0]
  - a. See Appendix A for IP addressing information.

## Configured Layer 3 Switches

Since the 3750 switches operate on layer 2 by default, additional configurations must be made for them to use routing functions. This was done by converting each interface to routing mode, and assigning each an IP within a /30 network.

1. Entered `conf t`.
2. Used `ip routing` to enable IP routing capabilities on a L3 switch.
3. Entered the interfaces that were interconnects between the switches and routers using the `int` command.
4. Used `no switchport` to turn it into an L3 link.
5. Assigned an IP address with `ip address [192.168.254.22] [255.255.255.252]`.
6. Repeated steps 1-5 on the Cisco 3750A and 3750C.
  - a. See Appendix A for IP addressing information

## Link State Routing

### Implemented OSPF

Open Shortest Path First (OSPF) was implemented as a primary routing protocol in the network as it is a reliable link-state routing protocol. OSPF is configured by creating a process ID and defining adjacent networks to each router in each specified OSPF area.

6504

1. Used `conf t` to enter configuration mode.
2. Typed `router ospf 2` to enter ospf configuration.
3. Entered `network [169.254.1.0] [0.0.0.255] area 0` to add network adjacencies.
  - a. Added all directly connected networks including the 2901A /30 link and the 2911A /30 link.
  - b. Added all area 0 VLAN networks with `network 192.168.[7, 8, 9].0 [255.255.255.0] area 0`.
4. Used `default-information originate`.

2901A

5. Typed `router ospf 2` to enter ospf configuration.
6. Entered `network [169.254.1.0] [255.255.255.0] area 0` for loopback addresses.
7. Entered `network [192.168.254.4] [255.255.255.252] area 0` for the 6504 interconnect.
8. Used `network [192.168.[7, 8, 9].0] [255.255.255.0] area 0` for the area 0 VLANs.

## Link State Routing

9. Used network [192.168.[4,5,6].0] [255.255.255.0] area 102 for the area 102 VLANs.

### 2911B

10. Typed router ospf 2 to enter ospf configuration.
11. Entered network [169.254.1.0] [255.255.255.0] area 102 for IP address connections.
12. Repeated step 2 for all networks connected shown in Appendix A.

### 2911A

13. Typed router ospf 2 to enter ospf configuration
14. Entered network [169.254.1.0] [255.255.255.0] area 2 for all IP addresses in Area 2.
15. Entered network [192.168.[7,8,9].0] [255.255.255.0] area 0 for all area 0 IP addresses.

### 2901B

16. Typed router ospf 2 to enter ospf configuration.
17. Entered network [169.254.1.0] [255.255.255.0] area 2 to add loopbacks to the area 2.
18. Repeated step 2 for all addresses connected in area 2 seen in Appendix A.

## Implemented EIGRP

Enhanced Interior Gateway Protocol (EIGRP) was configured on all routers in the network to allow them to exchange routing information with each other. Each instance of

## Link State Routing

EIGRP is assigned an Autonomous System Number (ASN) as shown below- in this case the ASN was 2.

1. Entered `conf t`
2. Entered `router eigrp [2]`
3. Entered `no auto-summary`
4. Entered `network [192.168.254.0] [0.0.0.0]`
  - a. Repeated steps 1-5 on all routers- See Appendix A for EIGRP information.

## Configured Redistribution and license enabling

Due to two different routing protocols being used in the same network topology, redistribution needed to be implemented to allow the routing protocols to communicate to each other.

1. Entered `license right-to-use activate ipservices accepteula to activate the license .`
2. Entered `conf t`
3. Used `license boot level ipservices to enable IPservices.`
4. Logged into the Cisco 2901b.
5. Entered `conf t`
6. Used `router eigrp 2` to enter EIGRP settings.
7. Entered `redistribute ospf 2 metric 1 1 1 1 1` to set the OSPF redistribution.
8. Entered `router ospf 2` to enter OSPF settings.
9. Use `redistribute eigrp 2 metric 1 subnets` to set EIGRP redistribution.

## Link State Routing

10. Logged into the Cisco 3750a.
11. Entered `conf t | router eigrp 102` to enter EIGRP settings.
12. Used `redistribute ospf 2 metric 1 1 1 1 1` to redistribute OSPF.
13. Entered `router ospf 2` to enter OSPF settings.
14. Used `redistribute eigrp 102 metric 1 subnets` to redistribute EIGRP.

## Configured GLBP and NTP

Gateway redundancy protocols were used on routers to allow for multiple routers to host 1 gateway. In the event that 1 router were to go down, the other router would still host the gateway, and end devices would still be able to connect to the IP address.

1. Logged into the Cisco 2911A
2. Entered `conf t`.
3. Entered each VLAN sub interface with `int gig0/1.[102,2002,3002]`.
4. Used `glbp 102 ip 192.168.[7,8,9].254` to set a redundant gateway IP.
5. Logged into the Cisco 2901A
6. Entered `conf t`.
7. Entered each VLAN sub interface with `int gig0/1.[102,2002,3002]`.
8. Used `glbp 102 ip 192.168.[7,8,9].254` to set the redundant gateway IP.

## Configured NTP

Each device's clock was synchronized to the CIT network by setting the device's Network Time Protocol (NTP) servers to CIT's NTP servers. Unfortunately, the time was



## Link State Routing

still inaccurate, so the timezone and daylight savings were taken into account with the following commands.

9. Entered `conf t`

10. Entered `ntp server 10.2.1.11`

11. Entered `ntp server 10.2.1.12`

12. Entered `clock timezone EST -5`

13. Entered `clock summer-time EDT recurring 2 Sun Mar 2:00 1 Sun  
Nov 2:00`

14. Entered `ntp update-calendar`

- a. Repeated steps 1-6 on all devices

## Configured ICMP Strings

To view and modify devices from the SNMP monitoring software, configurations needed to be made on each device. These specified permissions for each user group. The public was set to “read-only”, while private was set to “read-write”.

1. Entered `conf t`

2. Entered `snmp-server community public RO`

3. Entered `snmp-server community private RW`

4. Entered `wr`

## Link State Routing

### Configured SNMP monitoring on LibreNMS

Network management protocols can be used to monitor the status and issues within a network. The management protocol that was used was SNMP using LibreNMS on an Alma Linux VM.

#### Docker installation

1. Opened a Terminal window in the Alma Linux 9 Virtual Machine.
2. Used `sudo yum install -y yum-utils`.
3. Typed `sudo yum-config-manager \ --add-repo \ https://download.docker.com/linux/centos/docker-ce.repo` to add the repository.
4. Entered `sudo yum install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin` to install docker from the repo.
5. Started docker with `sudo systemctl start docker`.

#### LibreNMS

6. Used `sudo mkdir librenms` to make a folder for LibreNMS.
7. Entered the folder with `cd`.
8. Used `wget https://github.com/librenms/docker/archive/refs/heads/master.zip` to get the LibreNMS docker image.
9. Typed `unzip master.zip` to unzip the file.
10. Used `cd docker-master/examples/compose`.
11. Started docker with `docker compose up -d`.

## Link State Routing

12. Opened a Firefox tab and searched `http://localhost:8000` to get to the Web GUI.
13. Clicked 'Devices' | 'Add a device' and added all devices by their loopback addresses.

### Configured 6504 as DHCP Server

A DHCP server was implemented so that static IP addresses did not need to be set on the machines for them to have internet. This was done on the uplink layer 3 switch so that it could reach both sides equally.

1. Entered `conf t`
2. Used `ip dhcp pool right-1002` to define the right 1002 DHCP pool.
3. Typed `network 192.168.10.0 255.255.255.0` to define a range of IP addresses to serve out.
4. Used `default-router 192.168.10.1` to set the default route.
5. Entered `dns-server 10.2.1.11 10.2.1.12` to add both CIT DNS servers.
  - a. Repeated steps 1-5 for each side and each VLAN on the network. IP addressing information can be seen in Appendix A.
6. Used `ip dhcp excluded-address 192.168.[4-12].1 192.168.[4-12].10` to exclude the first 10 addresses in each subnet for networking device interconnects and gateways.

### Configured Additional DHCP Servers

DHCP servers needed to be configured in the EIGRP autonomous systems to be able to reach past OSPF into a second routing protocol. This was done on the 3750C and the 1921a.

1. Entered `conf t` on the 3750A.

## Link State Routing

2. Used `ip dhcp pool VLAN3002` to set a DHCP pool.
3. Entered `network 192.168.15.0 255.255.255.0` to set a pool of IP addresses.
4. Used `default-router 192.168.15.1` to set the default route to be distributed.
5. Entered `dns-server 10.2.1.11 10.2.1.12` to set DNS servers.
6. Entered `conf t` on the 1921a.
7. Used `ip dhcp pool 1002` to create a DHCP pool.
8. Entered `network 192.168.4.0 255.255.255.0` to create a pool of addresses.
9. Entered `default-router 192.168.4.4` to set the default route.
10. Used `dns-server 10.2.1.11 10.2.1.12` to set DNS servers.
11. Used `ip dhcp excluded-address 192.168.4.1 192.168.4.10` to exclude the first 10 addresses.

### CONCLUSIONS AND RECOMMENDATIONS

Ultimately, all requirements and expectations mentioned in the business scenario were fulfilled. Link State Routing and Layer 3 redundancy protocols were successfully implemented in the network with GLBP and OSPF. These protocols along with EIGRP provided network connectivity to all devices, with redistribution implemented to allow connectivity between the different routing protocols. Some recommendations for the future are included below.

**Recommendation 1:** Rather than implementing the network design in progressive phases, construct the network as one big phase. This way, physical network connections can be made all at once and an overarching network/IP scheme can be created to fulfill all requirements. Additionally, no network devices would need to be moved around to accommodate changes in future phases.

**Recommendation 2:** Focus on connectivity first and foremost. Once complete connectivity is established throughout the entire network for all devices, the following configurations are simple and will most likely be implemented successfully as devices that need to contact each other/outside networks are able to do so.

**Recommendation 3:** Spend more time/thought creating an all-encompassing network scheme. Carelessly throwing networks and subnetworks around will most likely result in conflicting or overlapping IP schemes, which are often hard to find and troubleshoot.

## Link State Routing

Conflicting IPs prevent one's devices from reaching exterior networks despite successfully pinging devices in the local area network.

### RESULTS

By the end of this project, all network devices on all VLANs were successfully connected to both the outside network and all other LAN devices. 3 additional VLANs were created on top of the native VLAN, totaling 4 VLANs- 1, 1002, 2002, and 3002.

Additional EHWICs and a Double Wide were purchased with company funds and added to network devices to fulfill network requirements. This allowed fiber channel connections to be made, as well as more concurrent connections between network devices with a limited number of NICs, such as the 2901 routers. Three OSPF areas were created- 2 and 102, interconnected by area 0. Two additional EIGRP autonomous systems were created on either side of the OSPF areas- AS 2 and 102. Redistribution was configured to allow network connectivity between the two routing protocols.

The 6504 was configured as a DHCP server for all OSPF areas, and the 3750-C and 1921-A were configured as DHCP servers for their respective autonomous systems, totaling 3 DHCP servers serving out 192.168.X.0/24 networks for their respective VLANs. NTP was also configured on all network devices, and they all periodically backed up their config files to a TFTP server. LibreNMS was used for SNMP monitoring of all network devices from a central GUI. Resulting physical and logical diagrams of the network are provided in figures 3 and 4 below, respectively.

## Link State Routing

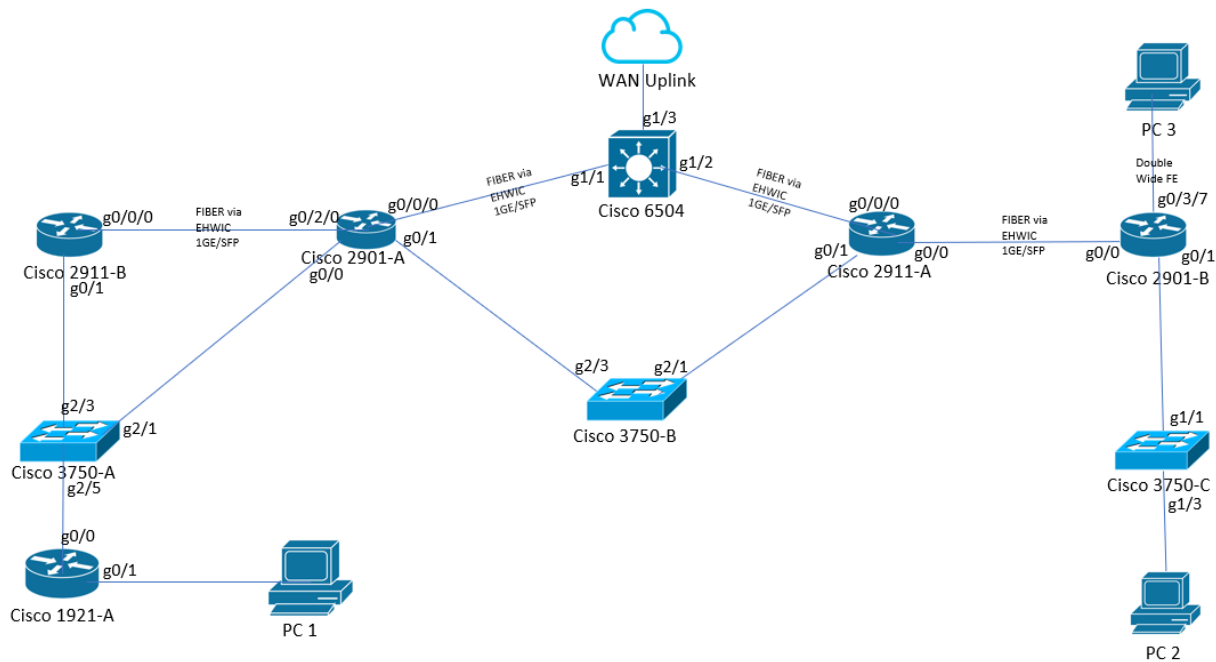


Figure 3: Physical Network Diagram

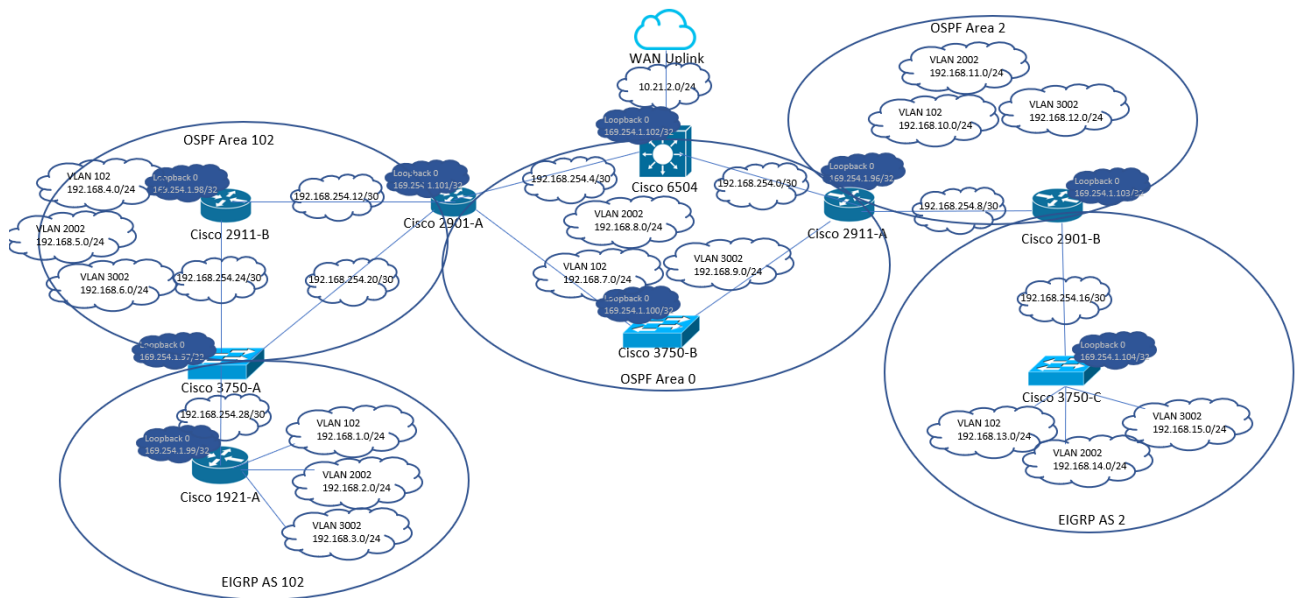


Figure 4: Logical Network Diagram



## BIBLIOGRAPHY

*GLBP - Gateway Load Balancing Protocol*. Cisco. (2009, August 6). Retrieved April 18, 2023, from [https://www.cisco.com/en/US/docs/ios/12\\_2t/12\\_2t15/feature/guide/ft\\_glb.html](https://www.cisco.com/en/US/docs/ios/12_2t/12_2t15/feature/guide/ft_glb.html)

*CIT Networking Laboratories: Laboratory Manual*. (2019). Purdue University.

D. Russo, personal communication, April 11, 2023

*Install Docker engine on centos*. Docker Documentation. (2023, April 18). Retrieved April 18, 2023, from <https://docs.docker.com/engine/install/centos/>

LibreNMS. (n.d.). *Docker*. Docker - LibreNMS Docs. Retrieved April 18, 2023, from <https://docs.librenms.org/Installation/Docker/>

Molenaar, R. (2020, May 19). *Basic ospf configuration*. NetworkLessons.com. Retrieved April 18, 2023, from <https://networklessons.com/ospf/basic-ospf-configuration>

R. Deadman, personal communication, April 11, 2023

Saputra, A. (2018, December 30). *Redistribute static route into EIGRP in Cisco IOS router*. MustBeGeek. Retrieved April 18, 2023, from <https://www.mustbegeek.com/redistribute-static-route-into-eigrp-in-cisco-ios-router/>

Upravnik. (2022, December 18). *Configure Cisco Router as DHCP Server*. Study CCNA. Retrieved April 18, 2023, from <https://study-ccna.com/configure-cisco-router-as-dhcp-server/>

## Link State Routing

Wireshark. (2023). *Wireshark* (Version 3.6.5) [Computer software].

<https://www.wireshark.org/download.html#spelunking>

## APPENDIX A: PROBLEM SOLVING

### **Problem 1: VLAN 1002**

**Problem Description:** When attempting to create 4 Virtual Local Area Networks following the network design with VLAN numbers 1002, 2002, and 3002, VTP needed to be set to transparent mode to allow for VLAN numbers greater than 1000. Unfortunately, it was discovered that Cisco devices used VLANs 1002-1005 for token ring and FDDI. These VLANs were reserved and unable to be deleted.

**Possible Solutions:** Possible solutions included: 1) removing VLAN 1002- since its token ring/FDDI function was not planning to be used, 2) attaching the FDDI/Token Ring function of the to a different VLAN- since that VLAN served some purpose despite not currently being in use, and 3) using a different VLAN ID.

**Solutions Attempted:** Of the possible solutions, solutions attempted included: 1) removing VLAN 1002 via CLI with the commands “no int vlan 1002” and “no vlan 1002”, which returned the error that this VLAN was unable to be removed, 2) editing VLAN 1002 via CLI with the commands “vlan 1002” and “no fddi-default”, and 3) using VLAN 102 instead.

**Final Solution:** Ultimately, the solution that worked was 3) simply using a different VLAN ID. VLAN 102 was used instead of VLAN 1002, since VLAN ID numbers are somewhat arbitrary and the number used doesn’t matter, as long as it remains consistent across devices. This was done with the commands “vlan 102” and “int vlan 102” on the CLI of all devices.

## **Problem 2: Duplicate Addressing**

**Problem Description:** The same /24 networks that were assigned to devices in the OSPF areas were also assigned to devices in EIGRP autonomous systems (AS). This caused confusion as all network devices were able to ping each other's interfaces, loopback addresses, and outside networks- but no hosts could access the internet. VLAN 1002 was assigned the 192.168.12.0/24 network, 192.168.22.0/24 assigned to VLAN 2002, and 192.168.32.0/24 to VLAN 3002.

**Possible Solutions:** Possible solutions included: 1) adding networks missing from OSPF/EIGRP- since some devices were able to access the internet but not others, 2) fixing problems with redistribution between OSPF and EIGRP- since hosts connected to an EIGRP AS were unable to access the network, and 3) providing separate /24 network spaces to each OSPF area and EIGRP AS.

**Solutions Attempted:** Of the possible solutions, solutions attempted included: 1) adding the loopback network into all devices' OSPF configurations- which enabled loopback pinging between devices but were still unable to access the internet, 2) entering the OSPF instance number (2) into the redistribution command instead of the OSPF area number (102)- which resolved some inter-device pinging but hosts were still unable to ping out to the internet, and 3) creating separate network spaces.

**Final Solution:** Ultimately, the solution that worked was 3) creating separate /24 networks for each VLAN in each OSPF area/EIGRP AS. This was done by creating 3 unique /24

## Link State Routing

networks in each AS/area- one for each VLAN. As a result, 3 /24 networks were assigned to area 0, 3 to area 2, 3 to area 102, 3 to AS 2, and 3 to AS 102. This solved the issue because the problem was ultimately to do with overlapping addresses, and creating separate address spaces prevented this from happening.

### **Problem 3: No Connectivity on 3750-A**

**Problem Description:** After successfully configuring all devices and their connections to implement the desired network design, all devices in EIGRP AS 102 were unable to ping out, access the internet, or ping anything other than their directly connected interfaces. This was only an issue on the layer 3 switch (3750-A) on the left side of the network. Devices before this switch were able to ping all other devices, and devices beyond this switch were unable to ping out.

**Possible Solutions:** Possible solutions included: 1) configuring all connected interfaces to routing mode- since these interfaces needed to perform routing functions, 2) removed GLBP from OSPF area 102- since the ports needed to be trunked to implement GLBP which conflicts with its layer 3 functions, and 3) removed the “stub” configuration from OSPF- since this would restrict which LSAs were sent.

**Solutions Attempted:** Of the possible solutions, solutions attempted included: 1) configuring all interfaces to layer 3 routing mode by entering the “no switchport” command and assigning each interface a /30 IP, 2) removing GLBP from OSPF area 102 by entering

## Link State Routing

configure terminal mode on the interface and entering “no glbp”, and 3) removing the “stub” configuration from OSPF.

**Final Solution:** Ultimately, the solution that worked was a combination of 1) configuring all interfaces of the 3750-A as a layer 3 switch, 2) removing GLBP from OSPF area 102, and 3) removing the “stub” configuration from OSPF. This was done by changing the licensing to an elevated version- since the current license was restrictive and did not allow for the removal of the stub configuration. These solutions worked because configuring interfaces as layer 3 allowed for appropriate routing, and removing the stub configuration allowed for required LSAs to be forwarded.

## APPENDIX B: TABLES

Table 1: 2811 Console Cabling

Device	Interface	Cable	Interface	Device
Cisco 2811	Console	Patch Cable	COM1	PC1

**Table 2:** Octal Console Cabling

Device	Interface	Cable	Interface	Device
TERM Server	ASYNC-16	Octal ASYNC	Console	2911-A
-	-	-	Console	2911-B
-	-	-	Console	2901-A
-	-	-	Console	2901-B
-	-	-	Console	1921-A
-	-	-	Console	3750-A
-	-	-	Console	3750-B
-	-	-	Console	6504

Table 3: Term Server Menu Mapping

Command #	Port Value	Device Name
1	2002	2911r1
2	2003	3750s1
3	2004	2911r2
4	2005	1921r3
5	2006	3750s2
6	2007	2901r4
7	2008	6504r5
8	2009	2901r6

Table 4: IOS Files

Device	Image Filename
2911-A	c2900-universalk9-mz.SPA.157-3.M4b.bin
2911-B	c2900-universalk9-mz.SPA.157-3.M4b.bin
2901-A	c2900-universalk9-mz.SPA.156-3.M8.bin
2901-B	c2900-universalk9-mz.SPA.156-3.M8.bin
3750-A	c3750e-universalk9-mz.152-4.E10.bin
3750-B	c3750e-universalk9-mz.152-4.E10.bin
6504	s72033-adventerprisek9-mz.151-2.SY16.bin



Table 5: Network Cabling Information

Device	Interface	Cable	Interface	Device
6504	g1/3	Patch Cable	Uplink	-
6504	g1/2	Fiber cable	g0/0	2911-A
6504	g1/1	Fiber cable	g0/0	2901-A
2911-A	g0/1	Patch Cable	g2/1	3750-B
2911-A	g0/0	Patch Cable	g0/0	2901-B
2901-B	g0/1	Patch Cable	g1/1	3750-C
2901A	g0/1	Patch Cable	g2/3	3750-B
2901A	g0/2/0	Patch Cable	g0/0/0	2911-B
2901-A	g0/0	Patch Cable	g2/1	3750-A
2911-B	g0/1	Patch Cable	g2/3	3750-A
3750-A	g2/5	Patch Cable	g0/0	1921-A
1921-A	g0/1	Patch Cable	Ethernet	PC1
3750-C	g1/3	Patch Cable	Ethernet	PC2
2901-B	g0/3/7	Patch Cable	Ethernet	PC3

Table 6: Loopback Addressing Information

Device	Loopback Address	Subnet Mask
--------	------------------	-------------

## Link State Routing

Term Server	10.10.10.10	/32
2901-A	169.254.1.101	/32
2901-B	169.254.1.103	/32
2911-A	169.254.1.96	/32
2911-B	169.254.1.98	/32
3750-A	169.254.1.97	/32
3750-B	169.254.1.100	/32
6504	169.254.1.102	/32

Table 7: Interface Addressing Information

Device	Interface	IP Address	Subnet Mask
6504	g1/3	10.21.2.3	255.255.255.0
	g1/2	192.168.254.1	255.255.255.252
	g1/1	192.168.254.5	255.255.255.252
1921a	g0/0	192.168.254.30	255.255.255.252
	g0/1	192.168.4.4	255.255.255.0
3750a	g2/0/1	192.168.254.22	255.255.255.252
	g2/0/3	192.168.254.26	255.255.255.252
	g2/0/5	192.168.254.29	255.255.255.252
2911b	g0/1	192.168.254.25	255.255.255.252

## Link State Routing

	g0/0/0	192.168.254.14	255.255.255.252
	g0/1.1002	192.168.4.1	255.255.255.0
	g0/1.2002	192.168.5.1	255.255.255.0
	g0/1.3002	192.168.6.1	255.255.255.0
2901a	g0/0	192.168.254.21	255.255.255.252
	g0/0/0	192.168.254.6	255.255.255.252
	g0/2/0	192.168.254.13	255.255.255.252
	g0/1.102	192.168.7.1	255.255.255.0
	g0/1.2002	192.168.8.1	255.255.255.0
	g0/1.3002	192.168.9.1	255.255.255.0
2911a	g0/0	192.168.254.9	255.255.255.252
	g0/0/0	192.168.254.2	255.255.255.252
	g0/1.102	192.168.7.2	255.255.255.0
	g0/1.2002	192.168.8.2	255.255.255.0
	g0/1.3002	192.168.9.2	255.255.255.0
2901b	g0/0	192.168.254.10	255.255.255.252
	g0/1	192.168.254.17	255.255.255.252
3750c	g1/0/1	192.168.254.18	255.255.255.252

Table 8a: OSPF network information

Device	OSPF Network
--------	--------------

---

6504	169.254.1.0 0.0.0.255 area 0
	192.168.[7,8,9].0 0.0.0.255 area 0
	192.168.254.0 0.0.0.3 area 0
	192.168.254.4 0.0.0.3 area 0
3750A	169.254.1.0 0.0.0.255 area 102
	192.168.[4,5,6].0 0.0.0.255 area 102
	192.168.254.20 0.0.0.3 area 102
	192.168.254.24 0.0.0.3 area 102
2911B	169.254.1.0 0.0.0.255 area 102
	192.168.[7,8,9].0 0.0.0.255 area 0
	192.168.254.12 0.0.0.3 area 102
	192.168.254.24 0.0.0.3 area 102
2901A	169.254.1.0 0.0.0.255 area 0
	192.168.[4,5,6].0 0.0.0.255 area 102
	192.168.[7,8,9].0 0.0.0.255 area 0
	192.168.254.4 0.0.0.3 area 0
	192.168.254.12 0.0.0.3 area 102
	192.168.254.20 0.0.0.3 area 102
2911A	169.254.1.0 0.0.0.255 area 0
	169.254.1.0 0.0.0.255 area 2
	192.168.[7,8,9].0 0.0.0.255 area 0
	192.168.[10,11,12].0 0.0.0.255 area

## Link State Routing

2901B	192.168.254.0 0.0.0.3 area 0
	192.168.254.8 0.0.0.3 area 2
	169.254.1.0 0.0.0.255 area 2
	192.168.11.0 0.0.0.255 area 2
	192.168.254.8 0.0.0.3 area 2

Table 8b: EIGRP network information

Device	EIGRP Network
1921a	169.254.1.0 0.0.0.255
	192.168.[4,5,6].0 0.0.0.255
	192.168.254.28 0.0.0.3
3750a	169.254.1.0 0.0.0.255
	192.168.254.28 0.0.0.3
3750c	169.254.1.0 0.0.0.255
	192.168.[13,14,15].0 0.0.0.255
	192.168.254.16 0.0.0.3
2901b	169.254.1.0 0.0.0.255
	192.168.[13,14,15].0 0.0.0.255
	192.168.254.16 0.0.0.3

## Link State Routing

Table 9: PC IP Addressing Information

Device	IP Address	Subnet Mask	Gateway	DNS Servers
PC1	192.168.4.12	255.255.255.0	192.168.4.4	10.2.1.11, 10.2.1.12
PC2	192.168.15.12	255.255.255.0	192.168.15.1	10.2.1.11,
PC3	192.168.12.12	255.255.255.0	192.168.12.1	10.2.1.12 10.2.1.11, 10.2.1.12

Table 10: DHCP Information

DHCP Server	IP Pool Name	Network	Subnet Mask	Gateway	DNS Servers
6504	Right-1002	192.168.10.0	255.255.255.0	192.168.10.1	10.2.1.11,
	Right-2002	192.168.11.0	255.255.255.0	192.168.11.1	10.2.1.12
	Right-3002	192.168.12.0	255.255.255.0	192.168.12.1	
	Mid-1002	192.168.7.0	255.255.255.0	192.168.7.1	
	Mid-2002	192.168.8.0	255.255.255.0	192.168.8.1	
	Mid-3002	192.168.9.0	255.255.255.0	192.168.9.1	
	Left-1002	192.168.4.0	255.255.255.0	192.168.4.1	

## Link State Routing

	Left-2002	192.168.5.0	255.255.255.0	192.168.5.1	
	Left-3002	192.168.6.0	255.255.255.0	192.168.6.1	
1921A	Left-1002	192.168.4.0	255.255.255.0	192.168.4.4	10.2.1.11,
3750C	Right-1002	192.168.14.0	255.255.255.0	192.168.14.1	10.2.1.12
	Right-2002	192.168.15.0	255.255.255.0	192.168.15.1	
	Right-3002	192.168.16.0	255.255.255.0	192.168.16.1	

## APPENDIX C: ROUTER AND SWITCH CONFIGURATIONS

This section contains a full copy of all configured options in their final form from each device on the network.

### **2811 Term Server**

Current configuration : 3620 bytes

Last configuration change at 21:51:31 UTC Wed Mar 8 2023 by g2

version 15.1

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname G2TermServer

boot-start-marker

boot-end-marker

no aaa new-model

dot11 syslog

ip source-route



## Link State Routing

ip cef

ip domain name cit.lcl

ip host 2911r1 2002 10.10.10.10

ip host 3750s1 2003 10.10.10.10

ip host 2911r2 2004 10.10.10.10

ip host 1921r3 2005 10.10.10.10

ip host 3750s2 2006 10.10.10.10

ip host 2901r4 2007 10.10.10.10

ip host 6504r5 2008 10.10.10.10

ip host 2901r6 2009 10.10.10.10

no ipv6 cef

multilink bundle-name authenticated

voice-card 0

crypto pki token default removal timeout 0

license udi pid CISCO2811 sn FTX1045A0TL

archive

path tftp://192.168.52.12/\$h-\$t

## Link State Routing

time-period 360

username g2 password 7 10420F1C0D

redundancy

ip ssh version 1

interface Loopback0

ip address 10.10.10.10 255.255.255.255

interface FastEthernet0/0

ip address 10.21.2.2 255.255.255.0

duplex auto

speed auto

interface FastEthernet0/1

no ip address

shutdown

duplex auto

speed auto

interface Async0/0/0

no ip address

## Link State Routing

encapsulation slip

[shutdown interfaces removed for brevity]

ip forward-protocol nd

no ip http server

no ip http secure-server

ip route 0.0.0.0 0.0.0.0 10.21.2.1

menu cisco title ^C

=====

Welcome Laura/Ethan. Another day, another 345 lab :(

To exit, CTRL+SHIFT+6 then press x.

=====

^C

menu cisco prompt ^C

Select an option

^C

menu cisco text e menu-exit

menu cisco command e menu-exit

menu cisco text q disconnect from term server

menu cisco command q exit

## Link State Routing

menu cisco text 1 login to 2911r1

menu cisco command 1 telnet 10.10.10.10 2002

menu cisco text 2 login to 3750s1

menu cisco command 2 telnet 10.10.10.10 2003

menu cisco text 3 login to 2911r2

menu cisco command 3 telnet 10.10.10.10 2004

menu cisco text 4 login to 1921r3

menu cisco command 4 telnet 10.10.10.10 2005

menu cisco text 5 login to 3750s2

menu cisco command 5 telnet 10.10.10.10 2006

menu cisco text 6 login to 2901r4

menu cisco command 6 telnet 10.10.10.10 2007

menu cisco text 7 login to 6504r5

menu cisco command 7 telnet 10.10.10.10 2008

menu cisco text 8 login to 2901r6

menu cisco command 8 telnet 10.10.10.10 2009

menu cisco line-mode

## Link State Routing

control-plane

mgcp profile default

line con 0

password 7 060A092444

login local

no exec

line aux 0

login local

no exec

transport input telnet

line 0/0/14 0/0/15

transport input telnet

line vty 0 4

password 7 141B140E04

login local

transport input ssh

scheduler allocate 20000 1000

end

## Link State Routing

### **1921a**

Current configuration : 1782 bytes

Last configuration change at 10:25:58 EDT Wed Apr 12 2023

NVRAM config last updated at 11:13:55 EDT Wed Apr 12 2023

version 15.4

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 1921a

boot-start-marker

boot-end-marker

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

ip dhcp excluded-address 192.168.4.1 192.168.4.10

ip dhcp pool 1002

network 192.168.4.0 255.255.255.0

default-router 192.168.4.4

dns-server 10.2.1.11 10.2.1.12

ip cef

Link State Routing

no ipv6 cef

multilink bundle-name authenticated

cts logging verbose

license udi pid CISCO1921/K9 sn FJC2144L1V3

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

vtp mode transparent

redundancy

interface Loopback0

ip address 169.254.1.99 255.255.255.255

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

description "3750A"

ip address 192.168.254.30 255.255.255.252

duplex auto

## Link State Routing

speed auto

interface GigabitEthernet0/1

ip address 192.168.4.4 255.255.255.0

duplex auto

speed auto

router eigrp 102

network 169.254.1.0 0.0.0.255

network 192.168.4.0

network 192.168.5.0

network 192.168.6.0

network 192.168.254.28 0.0.0.3

ip forward-protocol nd

no ip http server

no ip http secure-server

snmp-server community public RO

snmp-server community private RW

control-plane



## Link State Routing

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input none

scheduler allocate 20000 1000

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

End

## Link State Routing

### **2901a**

Current configuration : 2574 bytes

Last configuration change at 11:01:36 EDT Wed Apr 12 2023

NVRAM config last updated at 19:06:43 EDT Tue Apr 11 2023

version 15.6

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 2901a

boot-start-marker

boot-end-marker

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

## Link State Routing

ip cef

no ipv6 cef

multilink bundle-name authenticated

license udi pid CISCO2901/K9 sn FTX164583HE

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

vtp mode transparent

redundancy

interface Loopback0

ip address 169.254.1.101 255.255.255.255

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

description "3750A"

ip address 192.168.254.21 255.255.255.252

## Link State Routing

duplex auto

speed auto

interface GigabitEthernet0/1

description "3750B"

no ip address

duplex auto

speed auto

interface GigabitEthernet0/1.102

description "VLAN 102"

encapsulation dot1Q 102

ip address 192.168.7.1 255.255.255.0

ip helper-address 169.254.1.102

glbp 102 ip 192.168.7.254

interface GigabitEthernet0/1.2002

description "VLAN 2002"

encapsulation dot1Q 2002

ip address 192.168.8.1 255.255.255.0

ip helper-address 169.254.1.102

glbp 202 ip 192.168.8.254

## Link State Routing

```
interface GigabitEthernet0/1.3002
description "VLAN 3002"
encapsulation dot1Q 3002
ip address 192.168.9.1 255.255.255.0
ip helper-address 169.254.1.102
glbp 302 ip 192.168.9.254
```

```
interface GigabitEthernet0/0/0
description "6504"
ip address 192.168.254.6 255.255.255.252
```

```
interface GigabitEthernet0/2/0
description "2911B"
ip address 192.168.254.13 255.255.255.252
```

```
router ospf 2
network 169.254.1.0 0.0.0.255 area 0
network 192.168.4.0 0.0.0.255 area 102
network 192.168.5.0 0.0.0.255 area 102
network 192.168.6.0 0.0.0.255 area 102
network 192.168.7.0 0.0.0.255 area 0
network 192.168.8.0 0.0.0.255 area 0
network 192.168.9.0 0.0.0.255 area 0
```

## Link State Routing

```
network 192.168.254.4 0.0.0.3 area 0
```

```
network 192.168.254.12 0.0.0.3 area 102
```

```
network 192.168.254.20 0.0.0.3 area 102
```

```
ip forward-protocol nd
```

```
no ip http server
```

```
no ip http secure-server
```

```
snmp-server community public RO
```

```
snmp-server community private RW
```

```
control-plane
```

```
line con 0
```

```
line aux 0
```

```
line 2
```

```
no activation-character
```

```
no exec
```

```
transport preferred none
```

```
transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
```

```
stopbits 1
```

```
line vty 0 4
```

Link State Routing

login

transport input none

scheduler allocate 20000 1000

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

End

## Link State Routing

### **2901b**

Current configuration : 2828 bytes

Last configuration change at 10:26:22 EDT Wed Apr 12 2023

NVRAM config last updated at 19:06:40 EDT Tue Apr 11 2023

version 15.7

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 2901b

boot-start-marker

boot-end-marker

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

ip cef

no ipv6 cef



Link State Routing

multilink bundle-name authenticated

voice-card 0

vxml logging-tag

license udi pid CISCO2901/K9 sn FTX1502802W

license boot module c2900 technology-package datak9

hw-module pvdm 0/0

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

vtp mode transparent

redundancy

vlan 102,2002,3002

interface Loopback0

ip address 169.254.1.103 255.255.255.255

interface Embedded-Service-Engine0/0

no ip address

## Link State Routing

shutdown

interface GigabitEthernet0/0

description "To 2911A"

ip address 192.168.254.10 255.255.255.252

duplex auto

speed auto

interface GigabitEthernet0/1

description "To 3750C"

ip address 192.168.254.17 255.255.255.252

duplex auto

speed auto

interface GigabitEthernet0/0/0

no ip address

duplex auto

speed auto

interface GigabitEthernet0/3/0

no ip address

interface GigabitEthernet0/3/1

## Link State Routing

no ip address

interface GigabitEthernet0/3/2

no ip address

interface GigabitEthernet0/3/3

no ip address

interface GigabitEthernet0/3/4

no ip address

interface GigabitEthernet0/3/5

no ip address

interface GigabitEthernet0/3/6

no ip address

interface GigabitEthernet0/3/7

description "PC3"

switchport mode access

no ip address

interface Vlan1

## Link State Routing

description "VLAN 2002"

ip address 192.168.11.1 255.255.255.0

ip helper-address 10.21.2.3

router eigrp 2

network 169.254.1.0 0.0.0.255

network 192.168.13.0

network 192.168.14.0

network 192.168.15.0

network 192.168.254.16 0.0.0.3

redistribute ospf 2 metric 1 1 1 1 1

router ospf 2

redistribute eigrp 2 metric 1 subnets

network 169.254.1.0 0.0.0.255 area 2

network 192.168.11.0 0.0.0.255 area 2

network 192.168.254.8 0.0.0.3 area 2

ip forward-protocol nd

no ip http server

no ip http secure-server

## Link State Routing

snmp-server community public RO

snmp-server community private RW

control-plane

mgcp behavior rsip-range tgcp-only

mgcp behavior comedia-role none

mgcp behavior comedia-check-media-src disable

mgcp behavior comedia-sdp-force disable

mgcp profile default

gatekeeper

shutdown

vstack

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

## Link State Routing

transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input none

scheduler allocate 20000 1000

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

End

**2911a**

Current configuration : 2942 bytes

Last configuration change at 11:00:15 EDT Wed Apr 12 2023

NVRAM config last updated at 19:06:43 EDT Tue Apr 11 2023

version 15.7

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 2911a

boot-start-marker

boot-end-marker

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

ip domain name cit.lcl

ip cef

## Link State Routing

no ipv6 cef

multilink bundle-name authenticated

voice-card 0

vxml logging-tag

license udi pid CISCO2911/K9 sn FTX1631AKEZ

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

redundancy

interface Loopback0

ip address 169.254.1.96 255.255.255.255

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

description "To 2901B"



## Link State Routing

```
ip address 192.168.254.9 255.255.255.252
```

```
duplex auto
```

```
speed auto
```

```
interface GigabitEthernet0/1
```

```
no ip address
```

```
duplex auto
```

```
speed auto
```

```
interface GigabitEthernet0/1.102
```

```
description "VLAN 1002"
```

```
encapsulation dot1Q 102
```

```
ip address 192.168.7.2 255.255.255.0
```

```
ip helper-address 169.254.1.102
```

```
glbp 102 ip 192.168.7.254
```

```
interface GigabitEthernet0/1.2002
```

```
description "VLAN 2002"
```

```
encapsulation dot1Q 2002
```

```
ip address 192.168.8.2 255.255.255.0
```

```
ip helper-address 169.254.1.102
```

```
glbp 202 ip 192.168.8.254
```

## Link State Routing

```
interface GigabitEthernet0/1.3002
description "VLAN 3002"
encapsulation dot1Q 3002
ip address 192.168.9.2 255.255.255.0
ip helper-address 169.254.1.102
glbp 302 ip 192.168.9.254
```

```
interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
```

```
interface GigabitEthernet0/0/0
description "Fiber to 6504"
ip address 192.168.254.2 255.255.255.252
```

```
router ospf 2
network 169.254.1.100 0.0.0.0 area 0
network 169.254.1.102 0.0.0.0 area 0
network 169.254.1.103 0.0.0.0 area 2
network 169.254.1.0 0.0.0.255 area 2
network 192.168.7.0 0.0.0.255 area 0
network 192.168.8.0 0.0.0.255 area 0
```

## Link State Routing

network 192.168.9.0 0.0.0.255 area 0

network 192.168.10.0 0.0.0.255 area 2

network 192.168.11.0 0.0.0.255 area 2

network 192.168.12.0 0.0.0.255 area 2

network 192.168.254.0 0.0.0.3 area 0

network 192.168.254.8 0.0.0.3 area 2

ip forward-protocol nd

no ip http server

no ip http secure-server

ipv6 ioam timestamp

snmp-server community public RO

snmp-server community private RW

control-plane

mgcp behavior rsip-range tgcp-only

mgcp behavior comedia-role none

mgcp behavior comedia-check-media-src disable

mgcp behavior comedia-sdp-force disable

## Link State Routing

mgcp profile default

gatekeeper

shutdown

vstack

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input none

scheduler allocate 20000 1000

ntp update-calendar

ntp server 10.2.1.11

Link State Routing

ntp server 10.2.1.12

End

## Link State Routing

### **2911b**

Current configuration : 2342 bytes

Last configuration change at 11:11:25 EDT Mon Apr 17 2023

NVRAM config last updated at 19:06:41 EDT Tue Apr 11 2023

version 15.7

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 2911b

boot-start-marker

boot-end-marker

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

ip cef

no ipv6 cef

## Link State Routing

multilink bundle-name authenticated

license udi pid CISCO2911/K9 sn FTX1821ALC6

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

redundancy

interface Loopback0

ip address 169.254.1.98 255.255.255.255

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

no ip address

duplex auto

speed auto

## Link State Routing

```
interface GigabitEthernet0/1
```

```
ip address 192.168.254.25 255.255.255.252
```

```
duplex auto
```

```
speed auto
```

```
interface GigabitEthernet0/1.202
```

```
interface GigabitEthernet0/1.302
```

```
interface GigabitEthernet0/1.1002
```

```
description "VLAN 1002"
```

```
encapsulation dot1Q 102
```

```
ip address 192.168.4.1 255.255.255.0
```

```
ip helper-address 169.254.1.102
```

```
interface GigabitEthernet0/1.2002
```

```
description "VLAN 2002"
```

```
encapsulation dot1Q 2002
```

```
ip address 192.168.5.1 255.255.255.0
```

```
ip helper-address 169.254.1.102
```

```
interface GigabitEthernet0/1.3002
```

```
description "VLAN 3002"
```



## Link State Routing

```
encapsulation dot1Q 3002
```

```
ip address 192.168.6.1 255.255.255.0
```

```
ip helper-address 169.254.1.102
```

```
interface GigabitEthernet0/2
```

```
no ip address
```

```
duplex auto
```

```
speed auto
```

```
interface GigabitEthernet0/0/0
```

```
description "2901A"
```

```
ip address 192.168.254.14 255.255.255.252
```

```
router ospf 2
```

```
network 169.254.1.0 0.0.0.255 area 102
```

```
network 192.168.7.0 0.0.0.255 area 0
```

```
network 192.168.8.0 0.0.0.255 area 0
```

```
network 192.168.9.0 0.0.0.255 area 0
```

```
network 192.168.254.12 0.0.0.3 area 102
```

```
network 192.168.254.24 0.0.0.3 area 102
```

```
ip forward-protocol nd
```

## Link State Routing

no ip http server

no ip http secure-server

snmp-server community public RO

snmp-server community private RW

control-plane

line con 0

line aux 0

line 2

no activation-character

no exec

transport preferred none

transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

stopbits 1

line vty 0 4

login

transport input none

scheduler allocate 20000 1000

ntp update-calendar

ntp server 10.2.1.11

Link State Routing

ntp server 10.2.1.12

End

## Link State Routing

### **3750a**

Current configuration : 5525 bytes

Last configuration change at 11:13:01 EDT Mon Apr 17 2023

NVRAM config last updated at 11:10:29 EDT Wed Apr 12 2023

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

no service password-encryption

hostname 3750A

boot-start-marker

boot-end-marker

username g2

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

switch 2 provision ws-c3750e-48pd

## Link State Routing

system mtu routing 1500

ip routing

vtp mode transparent

crypto pki trustpoint TP-self-signed-201719040

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-201719040

revocation-check none

rsakeypair TP-self-signed-201719040

crypto pki certificate chain TP-self-signed-201719040

certificate self-signed 01

```
30820229 30820192 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274
69666963 6174652D 32303137 31393034 30301E17 0D303630 31303230 30303135
305A170D 32303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F
532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3230 31373139
30343030 819F300D 06092A86 4886F70D 01010105 0003818D 00308189 02818100
BD9F7831 45CCFF4C 6D605967 ED2BFCF1 D8A82653 8AD18A9B F9410DC8
A5BDDF18
```

## Link State Routing

```
FAE99BFE DEF1A730 361C8779 20C02F04 901C941B DAEA4FE8 1A962A50
0ED17952

46DD388F 086A760A E4D60619 AE2C2C2D 4924B295 6C2FE4A8 867D079A
4DBA3631

7A76074D 80F3C799 A1428F51 29459572 A32FC5D7 5435D8E8 AFB81FC5
7B1BAFFD

02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F 0603551D
23041830 16801497 620924A2 B70EAEA9 55BD9346 DC6216AA AF4BD430 1D060355
1D0E0416 04149762 0924A2B7 0EAEA955 BD9346DC 6216AAAF 4BD4300D
06092A86

4886F70D 01010505 00038181 009490B6 172E091B 6ADCAD84 7521BB3F B957E0B7
EBA9BC23 6068ACC0 D10D26A7 1D0E90A2 CB805D1F 33C5EDB0 B67A8519
35092BF2

D5E2DD1A 7A150DF8 99403D49 44E0CE70 EF38880E 17A4DA0A 7179E8C5
9B989C87

A65B9734 DEFCF342 A59DB3AB D0F57E2B 1A1AFE8E 7CAD5B70 C3AAD72A
D95C551A

04AEAF6A 38817C06 260A7F32 13

quit

license boot level ipservices

archive

path tftp://192.168.15.2/$h-$t

time-period 360
```

## Link State Routing

spanning-tree mode rapid-pvst

spanning-tree extend system-id

vlan internal allocation policy ascending

vlan 102

name vlan102

vlan 2002

name vlan2002

vlan 3002

name vlan3002

interface Loopback0

ip address 169.254.1.97 255.255.255.255

interface FastEthernet0

no ip address

no ip route-cache

interface GigabitEthernet2/0/1

## Link State Routing

description "To 2901a"

no switchport

ip address 192.168.254.22 255.255.255.252

interface GigabitEthernet2/0/2

interface GigabitEthernet2/0/3

description "To 2911B"

no switchport

ip address 192.168.254.26 255.255.255.252

interface GigabitEthernet2/0/4

interface GigabitEthernet2/0/5

description "To 1921a"

no switchport

ip address 192.168.254.29 255.255.255.252

interface GigabitEthernet2/0/6

[removed for brevity]

interface Vlan1



## Link State Routing

no ip address

interface Vlan102

ip address 192.168.4.2 255.255.255.0

interface Vlan2002

ip address 192.168.5.2 255.255.255.0

interface Vlan3002

ip address 192.168.6.2 255.255.255.0

router eigrp 102

network 169.254.1.0 0.0.0.255

network 192.168.254.28 0.0.0.3

redistribute ospf 2 metric 1 1 1 1 1

router ospf 2

redistribute eigrp 102 metric 1 subnets

network 169.254.1.0 0.0.0.255 area 102

network 192.168.4.0 0.0.0.255 area 102

network 192.168.5.0 0.0.0.255 area 102

network 192.168.6.0 0.0.0.255 area 102

network 192.168.254.20 0.0.0.3 area 102

## Link State Routing

```
network 192.168.254.24 0.0.0.3 area 102
```

```
ip forward-protocol nd
```

```
ip http server
```

```
ip http secure-server
```

```
snmp-server community public RO
```

```
snmp-server community private RW
```

```
line con 0
```

```
password lfeh
```

```
login
```

```
line vty 0 4
```

```
login
```

```
line vty 5 15
```

```
login
```

```
ntp update-calendar
```

```
ntp server 10.2.1.11
```

```
ntp server 10.2.1.12
```

```
End
```



## Link State Routing

**3750b**

Current configuration : 3619 bytes

Last configuration change at 10:18:36 EDT Wed Apr 12 2023

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname c345-g2-3750b

boot-start-marker

boot-end-marker

username g2

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

switch 2 provision ws-c3750e-48pd

system mtu routing 1500

## Link State Routing

vtp mode transparent

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

spanning-tree mode rapid-pvst

spanning-tree extend system-id

vlan internal allocation policy ascending

vlan 102

name vlan102

vlan 2002

name vlan2002

vlan 3002

name vlan3002

interface Loopback0

ip address 169.254.1.100 255.255.255.255

## Link State Routing

```
interface FastEthernet0
```

```
no ip address
```

```
interface GigabitEthernet2/0/1
```

```
description "To 2911A"
```

```
switchport trunk allowed vlan 1,102,2002,3002
```

```
switchport trunk encapsulation dot1q
```

```
switchport mode trunk
```

```
interface GigabitEthernet2/0/2
```

```
interface GigabitEthernet2/0/3
```

```
description "To 2901A"
```

```
switchport trunk allowed vlan 1,102,2002,3002
```

```
switchport trunk encapsulation dot1q
```

```
switchport mode trunk
```

```
interface GigabitEthernet2/0/4
```

```
interface GigabitEthernet2/0/5
```

```
switchport access vlan 102
```

```
switchport mode access
```

## Link State Routing

```
interface GigabitEthernet2/0/6
```

```
interface GigabitEthernet2/0/7
```

```
switchport access vlan 2002
```

```
switchport mode access
```

```
interface GigabitEthernet2/0/8
```

```
interface GigabitEthernet2/0/9
```

```
switchport access vlan 3002
```

```
switchport mode access
```

```
interface GigabitEthernet2/0/10
```

```
[removed for brevity]
```

```
interface Vlan1
```

```
no ip address
```

```
interface Vlan102
```

```
ip address 192.168.7.5 255.255.255.0
```

## Link State Routing

```
interface Vlan2002
```

```
ip address 192.168.8.5 255.255.255.0
```

```
interface Vlan3002
```

```
ip address 192.168.9.5 255.255.255.0
```

```
ip default-gateway 10.21.2.1
```

```
ip forward-protocol nd
```

```
ip http server
```

```
ip http secure-server
```

```
snmp-server community public RO
```

```
snmp-server community private RW
```

```
line con 0
```

```
password 7 04570D0307
```

```
login
```

```
line vty 0 4
```

```
login
```

```
line vty 5 15
```

```
login
```



Link State Routing

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

End

## Link State Routing

**3750c**

Current configuration : 5281 bytes

Last configuration change at 10:28:56 EDT Wed Apr 12 2023

version 15.2

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname c345-g2-3750c

boot-start-marker

boot-end-marker

username g2

no aaa new-model

clock timezone EST -5 0

clock summer-time EDT recurring

switch 1 provision ws-c3750e-48pd

system mtu routing 1500

## Link State Routing

ip routing

ip dhcp excluded-address 192.168.12.1 192.168.12.10

ip dhcp pool VLAN3002

network 192.168.15.0 255.255.255.0

default-router 192.168.15.1

dns-server 10.2.1.11 10.2.1.12

vtp mode transparent

crypto pki trustpoint TP-self-signed-2545411584

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-2545411584

revocation-check none

rsa-keypair TP-self-signed-2545411584

crypto pki certificate chain TP-self-signed-2545411584

certificate self-signed 01

3082022B 30820194 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

31312F30 2D060355 04031326 494F532D 53656C66 2D536967 6E65642D 43657274

## Link State Routing

69666963 6174652D 32353435 34313135 3834301E 170D3036 30313032 30303031  
35325A17 0D323030 31303130 30303030 305A3031 312F302D 06035504 03132649  
4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D32 35343534  
31313538 3430819F 300D0609 2A864886 F70D0101 01050003 818D0030 81890281  
81009F95 FC80E7C9 66DE8508 BD5D9C4D C4B09320 0063C697 6D9433BE  
192BB6CB  
A9745B60 8710651C ECD3CB32 452C1708 99C6B2E2 CF9347F3 8B873B8E  
C03BD950  
AA0473FA 17DE0A06 3B0EEB56 D930AF81 1F4F808B B3450F0B CDAB5545  
B6AFAF82  
453E47C3 75C1F6D1 A51DC03F 1F71E46D 7EB56BF7 706B6E5B BE1729FF  
0D865E33  
24010203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF 301F0603  
551D2304 18301680 145399D7 A10E6704 70D2855D 53AA5E72 3A56DCC4 02301D06  
03551D0E 04160414 5399D7A1 0E670470 D2855D53 AA5E723A 56DCC402 300D0609  
2A864886 F70D0101 05050003 8181005B 9DD4F32B 42940DE2 71DE839A 637F7590  
EC2E5757 8EDED349 812FD145 C707699F CD80C3FB F54AB891 1E8962AC  
2CCD70F3  
4F5735BC 6DAE3D1A DD9E078F 380E6E86 09A2A507 5BB4B7E4 3704C888  
D8B959B8  
DF7B255A 53815253 CA33835E D17A6EE3 3C3F6835 A9D4C1D8 CC5B3EC4  
D91B3BFA  
DAB23180 57158979 BE3BC85A 73D675

## Link State Routing

quit

license boot level ipservices

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

spanning-tree mode rapid-pvst

spanning-tree extend system-id

vlan internal allocation policy ascending

vlan 102

name vlan102

vlan 2002

name vlan2002

vlan 3002

name vlan3002

interface Loopback0

ip address 169.254.1.104 255.255.255.255

## Link State Routing

```
interface FastEthernet0
```

```
no ip address
```

```
no ip route-cache
```

```
interface GigabitEthernet1/0/1
```

```
description "To 2901B"
```

```
no switchport
```

```
ip address 192.168.254.18 255.255.255.252
```

```
interface GigabitEthernet1/0/2
```

```
interface GigabitEthernet1/0/3
```

```
switchport access vlan 3002
```

```
switchport mode access
```

```
interface GigabitEthernet1/0/4
```

```
[removed for brevity]
```

```
interface Vlan1
```

```
no ip address
```

```
interface Vlan102
```

## Link State Routing

```
ip address 192.168.13.1 255.255.255.0
```

```
interface Vlan2002
```

```
ip address 192.168.14.1 255.255.255.0
```

```
interface Vlan3002
```

```
ip address 192.168.15.1 255.255.255.0
```

```
router eigrp 2
```

```
network 169.254.1.0 0.0.0.255
```

```
network 192.168.13.0
```

```
network 192.168.14.0
```

```
network 192.168.15.0
```

```
network 192.168.254.16 0.0.0.3
```

```
ip forward-protocol nd
```

```
ip http server
```

```
ip http secure-server
```

## Link State Routing

snmp-server community public RO

snmp-server community private RW

line con 0

password 7 000815030C

login

line vty 0 4

login

line vty 5 15

login

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

End



## Link State Routing

**6504**

Current configuration : 7541 bytes

Last configuration change at 10:41:59 EDT Wed Apr 12 2023 by g2

NVRAM config last updated at 10:35:49 EDT Wed Apr 12 2023 by g2

version 15.1

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

service counters max age 5

hostname c345-g2-6504

boot-start-marker

boot system tftp s72033-adventerprisek9-mz.151-2.SY16.bin 255.255.255.255

boot system flash:s72033-adventerprisek9-mz.151-2.SY16.bin

boot system flash sup-bootdisk:s72033-adventerprisek9-mz.151-2.SY16.bin

boot-end-marker

## Link State Routing

username g2 password 7 11051F001F

no aaa new-model

clock timezone EST -5

clock summer-time EDT recurring

vtp mode transparent

ip dhcp excluded-address 192.168.10.1 192.168.10.10

ip dhcp excluded-address 192.168.11.1 192.168.11.10

ip dhcp excluded-address 192.168.12.1 192.168.12.10

ip dhcp excluded-address 192.168.4.1 192.168.4.10

ip dhcp excluded-address 192.168.5.1 192.168.5.10

ip dhcp excluded-address 192.168.6.1 192.168.6.10

ip dhcp excluded-address 192.168.7.1 192.168.7.10

ip dhcp excluded-address 192.168.8.1 192.168.8.10

ip dhcp excluded-address 192.168.9.1 192.168.9.10

ip dhcp pool right-1002

network 192.168.10.0 255.255.255.0

default-router 192.168.10.1

dns-server 10.2.1.11 10.2.1.12

ip dhcp pool right-2002

## Link State Routing

```
network 192.168.11.0 255.255.255.0
```

```
default-router 192.168.11.1
```

```
dns-server 10.2.1.11 10.2.1.12
```

```
ip dhcp pool right-3002
```

```
network 192.168.12.0 255.255.255.0
```

```
default-router 192.168.12.1
```

```
dns-server 10.2.1.11 10.2.1.12
```

```
ip dhcp pool left-1002
```

```
network 192.168.4.0 255.255.255.0
```

```
default-router 192.168.4.1
```

```
dns-server 10.2.1.11 10.2.1.12
```

```
ip dhcp pool left-2002
```

```
network 192.168.5.0 255.255.255.0
```

```
default-router 192.168.5.1
```

```
dns-server 10.2.1.11 10.2.1.12
```

```
ip dhcp pool left-3002
```

```
network 192.168.6.0 255.255.255.0
```

```
default-router 192.168.6.1
```

```
dns-server 10.2.1.11 10.2.1.12
```

## Link State Routing

ip dhcp pool mid-1002

network 192.168.7.0 255.255.255.0

default-router 192.168.7.1

dns-server 10.2.1.11 10.2.1.12

ip dhcp pool mid-2002

network 192.168.8.0 255.255.255.0

default-router 192.168.8.1

dns-server 10.2.1.11 10.2.1.12

ip dhcp pool mid-3002

network 192.168.9.0 255.255.255.0

default-router 192.168.9.1

dns-server 10.2.1.11 10.2.1.12

ip domain-name cit.lcl

ipv6 unicast-routing

mls netflow interface

archive

path tftp://192.168.15.2/\$h-\$t

time-period 360

## Link State Routing

spanning-tree mode pvst

spanning-tree extend system-id

redundancy

main-cpu

auto-sync running-config

mode sso

vlan internal allocation policy ascending

vlan access-log ratelimit 2000

vlan 102

name vlan1002

vlan 202

name vlan202

vlan 302

name vlan302

vlan 2002

name vlan2002

## Link State Routing

```
vlan 3002
```

```
name vlan3002
```

```
ip ssh version 2
```

```
interface Loopback0
```

```
ip address 169.254.1.102 255.255.255.255
```

```
interface GigabitEthernet1/1
```

```
description "Fiber to 2901A"
```

```
ip address 192.168.254.5 255.255.255.252
```

```
ip nat inside
```

```
interface GigabitEthernet1/2
```

```
description "Fiber to 2911A"
```

```
ip address 192.168.254.1 255.255.255.252
```

```
ip nat inside
```

```
interface GigabitEthernet1/3
```

```
description "CIT Uplink"
```

```
ip address 10.21.2.3 255.255.255.0
```

```
ip nat outside
```

## Link State Routing

```
interface TenGigabitEthernet1/4
```

```
no ip address
```

```
shutdown
```

[removed for brevity]

```
interface Vlan1
```

```
no ip address
```

```
shutdown
```

```
router ospf 2
```

```
redistribute static subnets
```

```
network 169.254.1.0 0.0.0.255 area 0
```

```
network 192.168.7.0 0.0.0.255 area 0
```

```
network 192.168.8.0 0.0.0.255 area 0
```

```
network 192.168.9.0 0.0.0.255 area 0
```

```
network 192.168.254.0 0.0.0.3 area 0
```

```
network 192.168.254.4 0.0.0.3 area 0
```

```
default-information originate
```

```
ip nat pool g2 10.21.2.3 10.21.2.3 netmask 255.255.255.0
```

```
ip nat inside source list 1 interface GigabitEthernet1/3 overload
```

## Link State Routing

```
ip nat inside source static 192.168.15.2 10.21.2.10
```

```
ip forward-protocol nd
```

```
no ip http server
```

```
no ip http secure-server
```

```
ip route 0.0.0.0 0.0.0.0 10.21.2.1
```

```
access-list 1 permit 192.168.0.0 0.0.255.255
```

```
snmp-server community public RO
```

```
snmp-server community private RW
```

```
control-plane
```

```
dial-peer cor custom
```

```
line con 0
```

```
password 7 082D4A4B01
```

```
login
```

```
line vty 0 4
```

```
password 7 082D4A4B01
```

```
login local
```

```
transport input ssh
```



## Link State Routing

ntp update-calendar

ntp server 10.2.1.11

ntp server 10.2.1.12

mac address-table aging-time 480

diagnostic bootup level minimal

end