***Lab 3: Spanning Tree Protocol and Physical Security***

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# EXECUTIVE SUMMARY

This lab included implementation of a second router into the network topology and a rearrangement of the current switches. Along with a hardware rearrangement, there were some software configurations that needed to be adjusted to meet the new hardware. This included nearly copying the config page from the old Cisco router to the new one. The switches were to be put with one Cisco switch connected to each router, as well as both Cisco switches connected to the same HP switch.

The second phase of the lab completion included applying Multiple Spanning Tree Protocol, or MSTP, to all switches to prevent any network looping or broadcast storms within the network. MSTP was set with the first Cisco switch to be the root bridge of traffic from VLAN 11, and the second Cisco switch as the root bridge of VLANs 111 and 211. All unused ports of the switches were shut down for maximum security and ease of access. Lastly, Wireshark was used with SPAN sessions to track all traffic moving through the network and to record the correct traffic flow.

This lab report includes a business scenario to explain the purpose of the lab, a procedures section to show how every task was carried out, a results section to explain the outcome of the lab, a references section for all data that was taken from outside sources, and appendices for lab report questions and device configurations.

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# BUSINESS SCENARIO

Physical patch cables and building wiring from KNOY 203 and 204 needed to be used to rearrange all the network architecture. Terminal programs like PuTTY and SecureCRT were used to configure all networking devices. Configurations were done to Cisco and HP switches and Cisco routers. Physical patch cables were used to create a connection to be able to console or SSH into the switches and routers. Console commands were also used to set up Multiple Spanning Tree Protocol as well as initial configurations for all new and old equipment. To configure all of the necessary hardware, there needed to be DNS servers as well as reserved IPs for DHCP pools for the lab group’s respective subnet. New equipment in enterprise environments come fairly frequently, as technology is always advancing, and new models of switches and routers are always being released. Therefore, it was necessary to learn how to configure all devices.

Multiple Spanning Tree Protocol (MSTP) was configured through PuTTY terminals and SSH connections to the three switches. MSTP is used in company’s IT infrastructures to prevent broadcast storms and network loops by establishing root bridges, root ports, designated ports, and blocking ports. Companies use MSTP per VLAN to separate their network and have network traffic go in a specific path and create the ability for them to closely monitor it.

Security was also necessary to keep in mind during the reconfiguration of lab equipment. Shutting down all unused ports on all switches and routers was necessary to prevent anyone from accidentally plugging something in the wrong port or configuring the wrong port and getting mixed up. Large companies would use this strategy when there are a lot of employees working on the same equipment so that everyone can keep track of all ports as well as not mess anything up. Passwords are also used by companies to prevent unauthorized access to devices.

# PROCEDURES

The formatting key of the following section will obey rules below: buttons are **bold**; options are *italicized*; text entered into the computer is in Courier New style; menu and folder navigation are shown with the pipe symbol and are *italicized*: *Start | Programs | MS Office | Word*.

## Initial Configuration of Cisco 1921 Router

An additional router was applied to the network topology to more efficiently manage data going across the network. This router was to be used to take all data going over VLAN 11.

1. Turned off the Cisco router and turned it back on and pressed ‘ctrl + break’ on a keyboard to enter *rommon* mode.
2. Entered confreg 0x2142 and then reset to set the registrar to ignore the startup-config (NVRAM) on reboot and to reload the router.
3. Entered config-register 0x2102 to set the configuration register back to default after reboot
4. Used hostname g11rtr1in config terminal mode to change the name of the switch.
5. Set the domain name of the network with ip domain-name cit.lcl.
6. Generate the RSA keys with the command crypto key generate rsa.
7. Enter 1024 for the bits in the modulus of the RSA key.
8. Set the username password with the command username cisco password RTcnit344.
9. Configure the VTY lines with line vty 0 15*.*
10. Set the input for ssh access with transport input sshand login local to set it at login.
11. Returned to previous configuration mode with the command Exit*.*
12. Configured the console with the command line console 0*.*
13. Enable logging for the console lines with logging synchronous*.*
14. Set login access for the console lines with login local*.*
15. Returned to privileged mode with the command End and save with wr*.*

## DNS/DHCP Configurations for Cisco Router

The new Cisco router needed to be configured similarly to the old Cisco router. For example, the router needed to have DNS servers and DHCP pools set for maximum efficiency.

1. Used ip dns server and then ip dhcp pool VLAN11 to enable dns and create a DHCP pool named ‘VLAN11’.
2. Used default-router 192.168.11.1 255.255.255.0to set the default router.
3. Entered network 192.168.11.0 255.255.255.0 to set the network address.
4. Typed dns-server 10.2.1.11 followed by dns-server 10.2.1.12 to set the dns servers.
5. Entered ip dhcp excluded-address 192.168.11.1 192.168.11.99 | ip dhcp excluded-address 192.168.11.201 192.168.11.254 to exclude all unused IPs for the VLANs.
6. Used ip dns server and then ip dhcp pool VLAN111 to enable dns and create a DHCP pool named ‘VLAN111’.
7. Used default-router 192.168.111.1 255.255.255.0to set the default router.
8. Entered network 192.168.111.0 255.255.255.0 to set the network address.
9. Typed dns-server 10.2.1.11 followed by dns-server 10.2.1.12 to set the dns servers.
10. Entered ip dhcp excluded-address 192.168.111.1 192.168.111.1 99 and ip dhcp excluded-address 192.168.111.201 192.168.111.254 to exclude all unused IPs for the VLANs.
11. Used ip dns server and then ip dhcp pool VLAN211 to enable dns and create a DHCP pool named ‘VLAN211’.
12. Used default-router 192.168.211.1 255.255.255.0to set the default router.
13. Entered network 192.168.211.0 255.255.255.0 to set the network address.
14. Typed dns-server 10.2.1.11 and dns-server 10.2.1.12 to set the dns servers.
15. Entered ip dhcp excluded-address 192.168.211.1 192.168.211.1 99 followed by ip dhcp excluded-address 192.168.211.201 192.168.211.254 to exclude all unused IPs for the VLANs.

## NAT, IP, and VLAN Configurations for Cisco Router

NAT, IP, and VLANs would also need to be reconfigured on the Cisco router with the same parameters as the VyOs router.

1. Used Interface gigabitEthernet0/0 and ip nat outside to set the upstream.
2. Entered interface gigabitEthernet0/1 followed by ip nat inside to set the downstream.
3. Typed access-list 1 permit 192.168.11.0 0.0.0.255 to set the VLAN11 NAT.
4. Retyped step 3 for VLAN 111 and 211, replacing the third octet of the IP address with 111 and 211 respectively.
5. Used ip nat inside source list 1 interface gigabitEthernet0/0 overload*.*
6. Entered int gigabitEthernet 0.0 to enter the interface.
7. Used ip address 10.17.11.254 255.255.255.0 to set the IP for the router.
8. Typed exit to get out of the interface.
9. Usedint g0/1.11 and encapsulation dot1Q 11to create the vlan.
10. Entered ip address 192.168.11.1 255.255.255.0 to set the ip of the vlan.
11. Usedint g0/1.111 followed by encapsulation dot1Q 111to create the vlan.
12. Entered ip address 192.168.111.1 255.255.255.0 to set the ip of the vlan.
13. Usedint g0/1.211 and then encapsulation dot1Q 211to create the vlan.
14. Entered ip address 192.168.211.1 255.255.255.0 to set the ip of the vlan.
15. Typed ip route 0.0.0.0 0.0.0.0 10.17.11.1to set the default route.

## Renaming, Descriptions, and Passwords on all devices

It was necessary to add descriptions and names to all aspects of all devices to better manage everything as there are now a lot of devices within the network. Also, passwords needed to be set on all devices to ensure maximum security.

1. Changed the name of the Cisco 1921 router with hostname g11rtr1.
2. Set a description on the 1921 router uplink interface with description “CIT-UPLINK” for gi0/0.
3. Set a description on the 1921 router downstream interface with description “Downstream” for gi0/1.
4. Set the password on the 1921 router using username cisco password RTcnit344 and enabled secret passwords with enable secret RTcnit344.
5. Repeated steps 1 through 4 for Cisco 2901 router with the hostname set to g11rtr2.
6. Renamed switch 1 using hostname g11sw1.
7. Set descriptions for Switch 1 ports 1, 11, 19, 21, 47, 48, Switch 2 ports 1, 11, 21, 29, 47, 48 using the command int <interface name> | description <description string>.
8. Set the descriptions for Switch 3 ports 1, 11, 21, 23, 24 using the command interface ethernet <port number> name <name string>.

The nicknames given to each port can be found in Appendix B.

## Trunk Port Configurations

To allow all VLANs to travel across all ports and up through the uplink to CIT-NET, trunk ports needed to be configured to allow all VLANs to travel through the port trunk.

1. Set switchport encapsulation for gi1/0/19, gi1/0/47 and gi1/0/48 to trunk mode on Switch 1 with switchport trunk encapsulation dot1q.
2. Set switchport trunk mode for port 19, 47 and 48 with switchport mode trunk.
3. Set switchport encapsulation for gi2/0/29, gi2/0/47 and gi 2/0/48 to trunk mode on Switch 2 with switchport trunk encapsulation dot1q.
4. Set switchport trunk mode for port 29, 47 and 48 with switchport mode trunk.
5. Entered the HP Switch menu with menu and navigated to *Switch configuration | VLAN Menu | VLAN Port Assignment*.
6. Changed Port 24 to trunk mode by switching the configurations to *No | Tagged | Tagged | Tagged*.
7. Saved and exited the menu.

## MSTP Configurations

Multiple Spanning Tree Protocol (MSTP) needed to be configured to prevent any loops in the network. With two routers and three switches, different switches had to be configured to be the root of its respective VLAN.

1. Entered conf t to get into the switch configurations for Switch 1.
2. Used spanning-tree mode mst to turn off RSTP and turn on MSTP.
3. Typed name region1 to give the MST region a name.
4. Entered revision 1 | instance 1 vlan 11 | instance 2 vlan 111, 211 to create MST instances for the VLANs.
5. Used spanning-tree mst 1 priority 4096 and spanning-tree mst 2 priority 8192 to set left side priority for Switch 1.
6. Repeated steps 1 through 4 for Switch 2
7. Typed spanning-tree mst 1 priority 8092 and spanning-tree mst 2 priority 4096 in Switch 2.
8. Typed spanning-tree config-name region1 in the HP Switch to give the MST region the same name as the other two switches.
9. Used spanning-tree instance 1 vlan 11 to create the first instance.
10. Typed spanning-tree instance 1 priority 2 to set vlan 11 priority lower than the other.
11. Entered spanning-tree instance 2 vlan 111, 211 to create the second instance.
12. Used spanning-tree instance 2 priority 2 to set the other two VLANs as higher priority.

## Configure MSTP end device ports

After MSTP was configured for the switches to be connected to each other, the ports that connect the switches to the end devices (computers) had to be set to portfast ports.

1. Used spanning-tree portfast bpduguard default in Switch 1 to enable bpdu-guard on all non-trunk ports.
2. Used int range gi1/0/1,gi1/0/11,gi1/0/21 to configure all access ports
3. Entered spanning-tree portfast to enable portfast on all specific ports
4. Used int gi1/0/19 to configure router interface
5. Entered spanning-tree portfast trunk to configure the port for use on the STP configuration to be a trunk portfast interface.
6. Repeated steps 1 through 4 for Switch 2
7. Used int gi2/0/29 to configure router interface for Switch 2
8. Entered spanning-tree portfast trunk in Switch 2.
9. Used configure to enter the switch configuration mode for the HP Switch.
10. Entered spanning-tree ethernet 1 admin-edge-port to set the ethernet interface to transition to mst forwarding state.
11. Repeated step 10 for the HP Switch for ethernet 11 and ethernet 21.

## Shutting Down all Unused Ports

To prevent any security hazards as well as to prevent any accidental port changes that would mess up the network, all unused ports were shut down on all network devices.

1. Used int range gigabitEthernet {1/0/1-10, 1/0/11-18, 1/0/20, 1/0/22-34, 1/0/36-46} shut to shut down all unused gigabitEthernet ports on Switch 1.
2. Typed int range tenGigabitEthernet 1/0/1-2 *shut* to shut down all tenGigabitEthernet ports.
3. Entered int range FastEthernet 1/0/0 shut to shut down all FastEthernet ports.
4. Used int range gigabitEthernet 1/0/2 no shut to turn port 2 back on to function as a SPAN port.
5. Used int range tenGigabitEthernet 2/0/1-2 to configure the ten gigabit ethernet ports for Switch 2.
6. Used shut to shutdown all the unused ten gigabit ethernet ports.
7. Typed int range gigabitEthernet {2/0/3-10, 2/0/12-20, 2/0/22-28, 2/0/30-46} to configure gigabit ethernet ports.
8. Used shut to shutdown all unused gigabit ethernet ports.
9. Entered int range FastEthernet 2/0/0 to configure the fast ethernet ports.
10. Used shut to shutdown all unused fast ethernet ports.
11. Used int range gigabitEthernet 2/0/2 to configure the SPAN port.
12. Used no shut to enable the SPAN port for monitoring.
13. Disabled ports 2 through 10, 12 through 20, and 22 on the HP Switch using the menu.

## Set SPAN Sessions and Port Costs

SPAN sessions were set up to monitor the internet traffic across each of the switches and routers. Port costs were then set to allow a connection to go through the network.

1. Entered monitor session 1 source int gi1/0/47 in Switch 1 to set the source port
2. Typed monitor session 1 destination int gi1/0/2 to set the destination port
3. Entered monitor session 1 source int gi2/0/47 in Switch 2 to set the source port
4. Typed monitor session 1 destination int gi2/0/2 to set the destination port
5. Used int range gi1/0/47-48 in Switch 1 to configure a range of interfaces
6. Configured the port cost with the command *spanning-tree mst 1-2 cost 20000*
7. Used int range gi2/0/47-48 in Switch 2 to configure a range of interfaces
8. Configured the port cost with the command spanning-tree mst 1-2 cost 20000
9. Used spanning-tree instance 1 ethernet 23-24 path-cost 20000 on the HP Switch to configure the first mst instance port costs.
10. Used spanning-tree instance 2 ethernet 23-24 path-cost 20000 to configure the second mst instance port costs.

## Wireshark monitoring

Wireshark was also used to monitor how internet traffic was moving through the network to make sure that MSTP was working correctly with the correct VLANs going up the correct sides of the network.

1. Connected pc3 to VLAN 111 on the HP Procurve switch.
2. Connected PC2 to SPAN connection on port 2 of Cisco switch 1.
3. Connected PC1 to SPAN connection on port 2 of Cisco switch 2.
4. Monitored the traffic going from PC3 up through Cisco switch 2 to CIT-NET.
5. Switched PC3 to VLAN 11 on the HP Procurve switch.
6. Monitored the traffic going from PC3 up through Cisco switch 1 to CIT-NET.

# RESULTS

The outcome of this lab’s work expands on the setup from the previous lab, with an additional router being added to the network as well as Spanning Tree Protocol (STP) being utilized to prevent looping data transfers between the three linked switches. Specifically, the present configuration uses Multiple Spanning Tree Protocol (MSTP) to allow support of multiple instances of the protocol. This setup allows certain ports to be blocked when data is sent from certain VLANs to stop data from looping between the switches.

The architecture of the network is similar to the previous setup, but now with two routers on two sticks. The switches are also now all connected to each other to form a ring topology. The Spanning Tree Protocol diverts data from VLAN 11 to the switch on the left, and data from VLANs 111 and 211 is sent to the switch on the right.

The following figures illustrate the physical and logical architecture for the network.

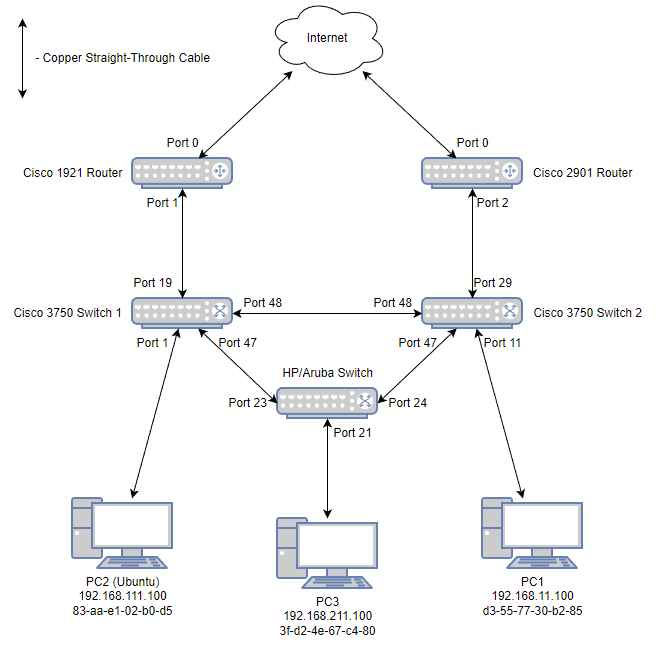


Figure 1: Physical Network Diagram

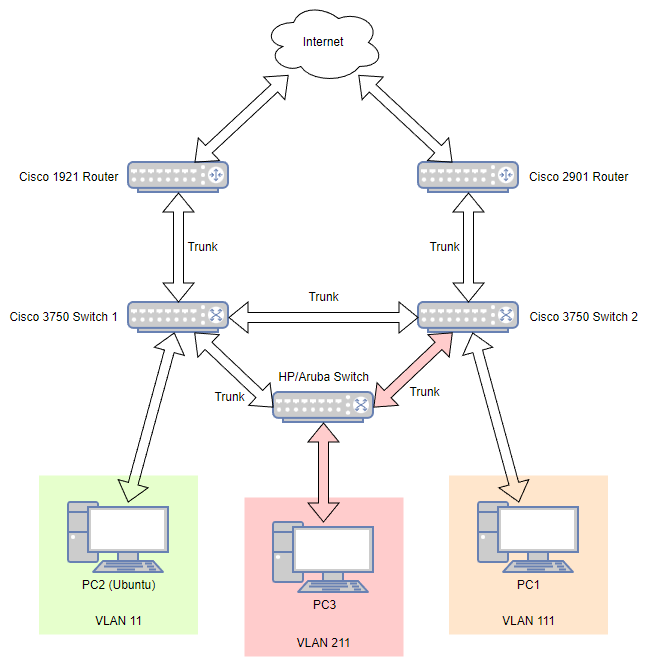


Figure 2: Logical Network Diagram. The red arrows from PC3 to Switch 2 represent Spanning Tree Protocol directing most traffic from VLAN 211 up to Switch 2.

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W. Nasr (Personal communication, October 26, 2022).

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# APPENDIX A: QUESTIONS AND ANSWERS

Demonstrate knowledge of where the Root Bridge is located.

The root bridge for VLANs 111 and 211 is switch 2, while the root bridge for VLAN 11 is switch 1. This was established by two MSTP instances using the determination of the lowest priority and path cost.

Demonstrate knowledge of where the Blocking Ports, Root Ports, and Designated Ports are located on the Network Diagram.

Ports using MSTP can be in different states depending on what VLANs are mapped to MST instances and will change stats if the topology changes. First looking at the MST instance 1 for VLAN 11, cisco 3750 switch 1 has port 19 connected to the cisco 1921 router, port 48 connected to the other cisco switch, and port 47 connected to the Aruba all in the designated state. While the cisco 3750 switch 2 has port 29 connected to the cisco 2901 router in the designated state, port 48 connected to the other cisco switch in the root state, and port 47 connected to the Aruba in the blocked state. For the Aruba switch, port 23 connected to the cisco switch 1 is in the root state and port 24 connected to the other cisco switch 2 is in the designated state. On the other hand with MST instance 2 for VLANs 111 and 211, the cisco 3750 switch 1 has port 19 connected to the cisco 1921 router in the designated role, port 48 connected to the other cisco 3750 switch in the root role, and port 47 connected to Aruba is the blocked role. While the other cisco 3750 switch 2 has ports 29 connected to the cisco 2901 router, port 47 connected to the Aruba, and port 48 connected to the other cisco 3750 switch are all in the designated role. Finally, the Aruba switch has port 23 connected to the cisco 3750 switch 1 in the designated role and port 24 connected to the other cisco 3750 switch 2 in the root role.

Identify priorities of all switches in the STP configuration.

The cisco 3750 switch 1 has a priority of 4096 set for MST instance 1 on VLAN 11 and a priority of 8192 set for MST instance 2 on VLANs 111 and 211. The cisco switch 2 has a priority of 8192 set for MST instance 1 on VLAN 11 and a priority of 4096 set for MST instance 2 on VLANs 111 and 211. The Aruba switch has a priority of 8192 set for both MST instance 1 on VLAN 11 and MST instance 2 for both VLANs 111 and 211.

# APPENDIX B: ROUTER CONFIGURATIONS

Cisco 1921 Router (g11rtr1)

version 15.5

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname g11rtr1

boot-start-marker

boot-end-marker

enable secret 5 $1$qD8Y$uWRiVyK8mDIhkIOxjGpfg/

no aaa new-model

ethernet lmi ce

ip dhcp excluded-address 192.168.11.1 192.168.11.99

ip dhcp excluded-address 192.168.11.201 192.168.11.254

ip dhcp excluded-address 192.168.111.1 192.168.111.99

ip dhcp excluded-address 192.168.111.201 192.168.111.254

ip dhcp excluded-address 192.168.211.1 192.168.211.99

ip dhcp excluded-address 192.168.211.201 192.168.211.254

ip dhcp pool VLAN11

network 192.168.11.0 255.255.255.0

default-router 192.168.11.1 255.255.255.0

dns-server 10.2.1.12

ip dhcp pool VLAN111

network 192.168.111.0 255.255.255.0

default-router 192.168.111.1 255.255.255.0

dns-server 10.2.1.12

ip dhcp pool VLAN211

network 192.168.211.0 255.255.255.0

default-router 192.168.211.1 255.255.255.0

dns-server 10.2.1.11

ip domain name cit.lcl

ip name-server 10.2.1.11

ip name-server 10.2.1.12

ip cef

no ipv6 cef

multilink bundle-name authenticated

license udi pid CISCO1921/K9 sn FTX182485KJ

username cisco password 7 0813784D07101144465F

redundancy

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

description "CIT-Uplink"

ip address 10.17.11.254 255.255.255.0

ip nat outside

ip virtual-reassembly in

duplex auto

speed auto

interface GigabitEthernet0/1

description "Downstream"

no ip address

ip nat inside

ip virtual-reassembly in

duplex auto

speed auto

interface GigabitEthernet0/1.11

description "VLAN 11 Subinterface"

encapsulation dot1Q 11

ip address 192.168.11.1 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface GigabitEthernet0/1.111

description "VLAN 111 Subinterface"

encapsulation dot1Q 111

ip address 192.168.111.1 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface GigabitEthernet0/1.211

description "VLAN 211 Subinterface"

encapsulation dot1Q 211

ip address 192.168.211.1 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface Serial0/0/0

no ip address

shutdown

clock rate 2000000

ip forward-protocol nd

no ip http server

no ip http secure-server

ip dns server

ip nat inside source list 1 interface GigabitEthernet0/0 overload

ip nat inside source list 2 interface GigabitEthernet0/0 overload

ip nat inside source list 3 interface GigabitEthernet0/0 overload

ip route 0.0.0.0 0.0.0.0 10.17.11.1

access-list 1 permit 192.168.11.0 0.0.0.255

access-list 2 permit 192.168.111.0 0.0.0.255

access-list 3 permit 192.168.211.0 0.0.0.255

control-plane

vstack

line con 0

logging synchronous

login local

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 local

transport input ssh

line vty 5 15

login local

transport input ssh

scheduler allocate 20000 1000

end

Cisco 2901 Router (g11rtr2)

version 15.7

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname g11rtr2

boot-start-marker

boot-end-marker

enable secret 5 $1$5Zj0$T.oOhzVxxmqDhdb02ZBXx/

no aaa new-model

ip dhcp excluded-address 192.168.11.1 192.168.11.99

ip dhcp excluded-address 192.168.11.201 192.168.11.254

ip dhcp excluded-address 192.168.111.1 192.168.111.99

ip dhcp excluded-address 192.168.211.1 192.168.211.99

ip dhcp excluded-address 192.168.111.201 192.168.111.254

ip dhcp excluded-address 192.168.211.201 192.168.211.254

ip dhcp pool VLAN11

network 192.168.11.0 255.255.255.0

default-router 192.168.11.1 255.255.255.0

dns-server 10.2.1.11 10.2.1.12

ip dhcp pool VLAN111

network 192.168.111.0 255.255.255.0

default-router 192.168.111.1 255.255.255.0

dns-server 10.2.1.11 10.2.1.12

ip dhcp pool VLAN211

network 192.168.211.0 255.255.255.0

default-router 192.168.211.1 255.255.255.0

dns-server 10.2.1.11 10.2.1.12

ip domain name cit.lcl

ip name-server 10.2.1.11

ip name-server 10.2.1.12

ip cef

no ipv6 cef

multilink bundle-name authenticated

license udi pid CISCO2901/K9 sn FJC1905A316

username cisco password 7 122B31141C0218577E7F

redundancy

interface Embedded-Service-Engine0/0

no ip address

shutdown

interface GigabitEthernet0/0

description "CIT-Uplink"

ip address 10.25.11.254 255.255.255.0

ip nat outside

ip virtual-reassembly in

duplex auto

speed auto

interface GigabitEthernet0/1

description "Downstream"

no ip address

ip nat inside

ip virtual-reassembly in

duplex auto

speed auto

interface GigabitEthernet0/1.11

description "VLAN 11 Subinterface"

encapsulation dot1Q 11

ip address 192.168.11.2 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface GigabitEthernet0/1.111

description "VLAN 111 Subinterface"

encapsulation dot1Q 111

ip address 192.168.111.2 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface GigabitEthernet0/1.211

description "VLAN 211 Subinterface"

encapsulation dot1Q 211

ip address 192.168.211.2 255.255.255.0

ip nat inside

ip virtual-reassembly in

interface Serial0/0/0

no ip address

shutdown

clock rate 2000000

ip forward-protocol nd

no ip http server

no ip http secure-server

ip nat inside source list 1 interface GigabitEthernet0/0 overload

ip nat inside source list 2 interface GigabitEthernet0/0 overload

ip nat inside source list 3 interface GigabitEthernet0/0 overload

ip route 0.0.0.0 0.0.0.0 10.25.11.1

access-list 1 permit 192.168.11.0 0.0.0.255

access-list 2 permit 192.168.111.0 0.0.0.255

access-list 3 permit 192.168.211.0 0.0.0.255

control-plane

vstack

line con 0

logging synchronous

login local

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 local

transport input ssh

line vty 5 15

login local

transport input ssh

scheduler allocate 20000 1000

end

# 

# APPENDIX C: SWITCH CONFIGURATIONS

Cisco 3750 (g11sw1)

version 15.0

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname g11sw1

boot-start-marker

boot-end-marker

enable secret 5 $1$6CST$5Ws2EJu.reI4AxshKRtKJ0

username cisco password 7 03376C080806351F1A5D

no aaa new-model

switch 1 provision ws-c3750e-48pd

system mtu routing 1500

ip domain-name cit.lcl

crypto pki trustpoint TP-self-signed-226055936

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-226055936

revocation-check none

rsakeypair TP-self-signed-226055936

crypto pki certificate chain TP-self-signed-226055936

certificate self-signed 01

30820229 30820192 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274

69666963 6174652D 32323630 35353933 36301E17 0D313130 33333030 31323931

375A170D 32303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F

532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3232 36303535

39333630 819F300D 06092A86 4886F70D 01010105 0003818D 00308189 02818100

F51AB902 F5A756D9 7703F3A7 E1C6AAFF E70391D3 C8414F32 F7B53035 7DEF420D

BA991260 A08468C5 4A239AF0 8EBADA0D 6480CF18 89636E0B 419866E4 6F82EEB9

24DC9F2C 2060BF37 18331BCC 421E1F8D D1B5F4B5 A17DBCE3 F04903B8 0DE8F6C9

8F611E5D FA542EE5 86603396 24D11CC0 7AAF6FF4 25FE8BE1 3B9F45BC 1073CF07

02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F 0603551D

23041830 16801489 4788099D 6D696E95 B2C49BFD B3E3F73A ED5B5730 1D060355

1D0E0416 04148947 88099D6D 696E95B2 C49BFDB3 E3F73AED 5B57300D 06092A86

4886F70D 01010505 00038181 00686416 3C86C8C4 75D2E03A DE3B2F3E 076CB98D

0A2B5124 7D7D8E44 17B10203 854DBA01 66006C27 E096D2CF 5FD2075C 1DC7849E

C73CF3CB 6E786007 85E1AFF6 15853EE3 96CFD019 1FD8A2E1 727A359F 31228E4C

184599C1 F77F305F DF3F5FE8 0822AECB B90FFB35 752232F3 38DC7DB8 2B4B68D4

3C495B3B 1CD70BFF 45758584 FB

quit

spanning-tree mode mst

spanning-tree portfast bpduguard default

spanning-tree extend system-id

spanning-tree mst configuration

name region1

revision 1

instance 1 vlan 11

instance 2 vlan 111, 211

spanning-tree mst 1 priority 4096

spanning-tree mst 2 priority 8192

vlan internal allocation policy ascending

interface FastEthernet0

no ip address

shutdown

interface GigabitEthernet1/0/1

description "VLAN11 Access"

switchport access vlan 11

switchport mode access

spanning-tree portfast

interface GigabitEthernet1/0/2

description "SPAN Port"

interface GigabitEthernet1/0/3

shutdown

interface GigabitEthernet1/0/4

shutdown

interface GigabitEthernet1/0/5

shutdown

interface GigabitEthernet1/0/6

shutdown

interface GigabitEthernet1/0/7

shutdown

interface GigabitEthernet1/0/8

shutdown

interface GigabitEthernet1/0/9

shutdown

interface GigabitEthernet1/0/10

shutdown

interface GigabitEthernet1/0/11

description "VLAN111 Access"

switchport access vlan 111

switchport mode access

spanning-tree portfast

interface GigabitEthernet1/0/12

shutdown

interface GigabitEthernet1/0/13

shutdown

interface GigabitEthernet1/0/14

shutdown

interface GigabitEthernet1/0/15

shutdown

interface GigabitEthernet1/0/16

shutdown

interface GigabitEthernet1/0/17

shutdown

interface GigabitEthernet1/0/18

shutdown

interface GigabitEthernet1/0/19

description "g11rtr1-uplink"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree portfast trunk

interface GigabitEthernet1/0/20

shutdown

interface GigabitEthernet1/0/21

description "VLAN211 Access"

switchport access vlan 211

switchport mode access

spanning-tree portfast

interface GigabitEthernet1/0/22

shutdown

interface GigabitEthernet1/0/23

shutdown

interface GigabitEthernet1/0/24

shutdown

interface GigabitEthernet1/0/25

shutdown

interface GigabitEthernet1/0/26

shutdown

interface GigabitEthernet1/0/27

shutdown

interface GigabitEthernet1/0/28

shutdown

interface GigabitEthernet1/0/29

shutdown

interface GigabitEthernet1/0/30

shutdown

interface GigabitEthernet1/0/31

shutdown

interface GigabitEthernet1/0/32

shutdown

interface GigabitEthernet1/0/33

shutdown

interface GigabitEthernet1/0/34

shutdown

interface GigabitEthernet1/0/35

shutdown

interface GigabitEthernet1/0/36

shutdown

interface GigabitEthernet1/0/37

shutdown

interface GigabitEthernet1/0/38

shutdown

interface GigabitEthernet1/0/39

shutdown

interface GigabitEthernet1/0/40

shutdown

interface GigabitEthernet1/0/41

shutdown

interface GigabitEthernet1/0/42

shutdown

interface GigabitEthernet1/0/43

shutdown

interface GigabitEthernet1/0/44

shutdown

interface GigabitEthernet1/0/45

shutdown

interface GigabitEthernet1/0/46

shutdown

interface GigabitEthernet1/0/47

description "g11sw3"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree mst 1-2 cost 20000

interface GigabitEthernet1/0/48

description "g11sw2"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree mst 1-2 cost 20000

interface GigabitEthernet1/0/49

shutdown

interface GigabitEthernet1/0/50

shutdown

interface GigabitEthernet1/0/51

shutdown

interface GigabitEthernet1/0/52

shutdown

interface TenGigabitEthernet1/0/1

shutdown

interface TenGigabitEthernet1/0/2

shutdown

interface Vlan1

no ip address

interface Vlan11

description "VLAN 11 Management Interface"

ip address 192.168.11.11 255.255.255.0

interface Vlan111

description "VLAN 111 Management Interface"

ip address 192.168.111.11 255.255.255.0

interface Vlan211

description "VLAN 211 Management Interface"

ip address 192.168.211.11 255.255.255.0

ip http server

ip http secure-server

line con 0

login local

line vty 0 4

login local

transport input ssh

line vty 5 15

login local

transport input ssh

monitor session 1 source interface Gi1/0/47

monitor session 1 destination interface Gi1/0/2

end

Cisco 3750 (g11sw2)

version 15.0

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

hostname g11sw2

boot-start-marker

boot-end-marker

enable secret 5 $1$z8iH$E3e6hXZBL0Be6TjyZF9.j/

username cisco password 7 012031075502125C7518

no aaa new-model

switch 2 provision ws-c3750e-48pd

system mtu routing 1500

ip domain-name cit.lcl

crypto pki trustpoint TP-self-signed-3397340800

enrollment selfsigned

subject-name cn=IOS-Self-Signed-Certificate-3397340800

revocation-check none

rsakeypair TP-self-signed-3397340800

crypto pki certificate chain TP-self-signed-3397340800

certificate self-signed 01

3082022B 30820194 A0030201 02020101 300D0609 2A864886 F70D0101 05050030

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

69666963 6174652D 33333937 33343038 3030301E 170D3131 30333330 30313239

32315A17 0D323030 31303130 30303030 305A3031 312F302D 06035504 03132649

4F532D53 656C662D 5369676E 65642D43 65727469 66696361 74652D33 33393733

34303830 3030819F 300D0609 2A864886 F70D0101 01050003 818D0030 81890281

8100AAFD B9EEA1FE 84F81832 5BF1BF37 34131739 8C90F6A0 587C352D 6DBB0521

5EDC1929 C48FDA19 49D4883C 7ACBA271 57B20283 4AAD56EB C2D73094 CBAF0C28

0C565A38 37F1153A 3378FA1D A3041905 A2BF64D7 A5A6B107 7E6B30E0 2C7444AD

EF3B6EEE 44D801F6 08EE7462 268C0F4E 5F7886B7 4E5745D0 5D1D1FCD FEF6FAFA

C6BF0203 010001A3 53305130 0F060355 1D130101 FF040530 030101FF 301F0603

551D2304 18301680 14049082 C374348E E1992303 8B7C31A4 C61EB274 97301D06

03551D0E 04160414 049082C3 74348EE1 9923038B 7C31A4C6 1EB27497 300D0609

2A864886 F70D0101 05050003 8181007F E8924808 D2324FD5 086D95D3 8572F5A5

97EA406A 0DB3451F E9B14401 F4A26914 BAF1EE92 04D40478 B85F8824 E919F5A8

4DAD7417 F7652156 80F80398 46E091F9 509AA713 EB06B3E7 6BA827A6 1448E00B

1EF71F0D D8C04EE2 F38C8ED1 CEE6D7F0 B176CB99 B62E1BB6 ECE96BF8 93579FD3

91CC135B 8FD25039 3BD93339 3E239C

quit

spanning-tree mode mst

spanning-tree portfast bpduguard default

spanning-tree extend system-id

spanning-tree mst configuration

name region1

revision 1

instance 1 vlan 11

instance 2 vlan 111, 211

spanning-tree mst 1 priority 8192

spanning-tree mst 2 priority 4096

vlan internal allocation policy ascending

interface FastEthernet0

no ip address

shutdown

interface GigabitEthernet2/0/1

description "VLAN11 Access"

switchport access vlan 11

switchport mode access

spanning-tree portfast

interface GigabitEthernet2/0/2

description "SPAN Port"

interface GigabitEthernet2/0/3

shutdown

interface GigabitEthernet2/0/4

shutdown

interface GigabitEthernet2/0/5

shutdown

interface GigabitEthernet2/0/6

shutdown

interface GigabitEthernet2/0/7

shutdown

interface GigabitEthernet2/0/8

shutdown

interface GigabitEthernet2/0/9

shutdown

interface GigabitEthernet2/0/10

shutdown

interface GigabitEthernet2/0/11

description "VLAN111 Access"

switchport access vlan 111

switchport mode access

spanning-tree portfast

interface GigabitEthernet2/0/12

shutdown

interface GigabitEthernet2/0/13

shutdown

interface GigabitEthernet2/0/14

shutdown

interface GigabitEthernet2/0/15

shutdown

interface GigabitEthernet2/0/16

shutdown

interface GigabitEthernet2/0/17

shutdown

interface GigabitEthernet2/0/18

shutdown

interface GigabitEthernet2/0/19

shutdown

interface GigabitEthernet2/0/20

shutdown

interface GigabitEthernet2/0/21

description "VLAN211 Access"

switchport access vlan 211

switchport mode access

spanning-tree portfast

interface GigabitEthernet2/0/22

shutdown

interface GigabitEthernet2/0/23

shutdown

interface GigabitEthernet2/0/24

shutdown

interface GigabitEthernet2/0/25

shutdown

interface GigabitEthernet2/0/26

shutdown

interface GigabitEthernet2/0/27

shutdown

interface GigabitEthernet2/0/28

shutdown

interface GigabitEthernet2/0/29

description "g11rtr2"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree portfast trunk

interface GigabitEthernet2/0/30

shutdown

interface GigabitEthernet2/0/31

shutdown

interface GigabitEthernet2/0/32

shutdown

interface GigabitEthernet2/0/33

shutdown

interface GigabitEthernet2/0/34

shutdown

interface GigabitEthernet2/0/35

shutdown

interface GigabitEthernet2/0/36

shutdown

interface GigabitEthernet2/0/37

shutdown

interface GigabitEthernet2/0/38

shutdown

interface GigabitEthernet2/0/39

shutdown

interface GigabitEthernet2/0/40

shutdown

interface GigabitEthernet2/0/41

shutdown

interface GigabitEthernet2/0/42

shutdown

interface GigabitEthernet2/0/43

shutdown

interface GigabitEthernet2/0/44

shutdown

interface GigabitEthernet2/0/45

shutdown

interface GigabitEthernet2/0/46

shutdown

interface GigabitEthernet2/0/47

description "g11sw3"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree mst 1-2 cost 20000

interface GigabitEthernet2/0/48

description "g11sw1"

switchport trunk encapsulation dot1q

switchport mode trunk

spanning-tree mst 1-2 cost 20000

interface GigabitEthernet2/0/49

shutdown

interface GigabitEthernet2/0/50

shutdown

interface GigabitEthernet2/0/51

shutdown

interface GigabitEthernet2/0/52

shutdown

interface TenGigabitEthernet2/0/1

shutdown

interface TenGigabitEthernet2/0/2

shutdown

interface Vlan1

no ip address

interface Vlan11

description "VLAN 11 Management Interface"

ip address 192.168.11.12 255.255.255.0

interface Vlan111

description "VLAN 111 Management Interface"

ip address 192.168.111.12 255.255.255.0

interface Vlan211

description "VLAN 211 Management Interface"

ip address 192.168.211.12 255.255.255.0

ip http server

ip http secure-server

line con 0

login local

line vty 0 4

login local

transport input ssh

line vty 5 15

login local

transport input ssh

monitor session 1 source interface Gi2/0/47

monitor session 1 destination interface Gi2/0/2

end

HP/Aruba (g11sw3)

hostname "g11sw3"

interface 1

name "VLAN 11 Access"

exit

interface 2

disable

exit

interface 4

disable

exit

interface 5

disable

exit

interface 6

disable

exit

interface 7

disable

exit

interface 8

disable

exit

interface 9

disable

exit

interface 10

disable

exit

interface 11

name "VLAN 111 Access"

exit

interface 12

disable

exit

interface 13

disable

exit

interface 14

disable

exit

interface 15

disable

exit

interface 16

disable

exit

interface 17

disable

exit

interface 18

disable

exit

interface 19

disable

exit

interface 20

disable

exit

interface 21

name "VLAN 211 Access"

exit

interface 22

disable

exit

interface 23

name "g11sw1"

exit

interface 24

name "g11sw2"

exit

snmp-server community "public" Unrestricted

vlan 1

name "DEFAULT\_VLAN"

untagged 2,4-10,12-20,22

ip address dhcp-bootp

no untagged 1,3,11,21,23-24

exit

vlan 11

name "vlan 11"

untagged 1,3

ip address 192.168.11.10 255.255.255.0

tagged 23-24

exit

vlan 111

name "vlan 111"

untagged 11

ip address 192.168.111.10 255.255.255.0

tagged 23-24

exit

vlan 211

name "vlan 211"

untagged 21

ip address 192.168.211.10 255.255.255.0

tagged 23-24

exit

spanning-tree

spanning-tree 1 admin-edge-port

spanning-tree 11 admin-edge-port

spanning-tree 21 admin-edge-port

spanning-tree config-name "region1"

spanning-tree config-revision 1

spanning-tree instance 1 vlan 11

spanning-tree instance 1 priority 2

spanning-tree instance 1 23 path-cost 20000

spanning-tree instance 1 24 path-cost 20000

spanning-tree instance 2 vlan 111 211

spanning-tree instance 2 priority 2

spanning-tree instance 2 23 path-cost 20000

spanning-tree instance 2 24 path-cost 20000

ip ssh

password manager

password operator