Lab 2: Enterprise Network Infrastructure Analysis

CNIT 24000-005

Group 12

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Executive Summary

In this laboratory assignment, the utilization of router and switch to observe the results of the primary LAN segmentation approach was applied. There were five major phases in this project. First, the TP-LINK router was switched off because it was not needed for this lab project. Then, the construction of the lab network architecture was needed where the hosts connect to the switches and routers in a star topology. Next, extending the IEEE 802.1Q VLAN to one of the host PC was completed. However, the next two phases, monitoring the amount of traffic between each interface in a VLAN and capturing a 802.1Q tag within a frame from the host in transit to outside of the network were not successfully completed. Major problems in this lab project was when the network driver broke down for an unknown reason and when there was no internet connection in one of the PC. The recommendations to highlight during this lab is to not try to do pointless configurations on machines which might cause errors in the future and to double check the physical connections are accurate as shown in the network architecture of the lab. The business scenario implements how the work done in the lab is done in a real-life situation where industries use this technology. The procedure lists the steps how to successfully accomplish this lab with specific instructions and the results explains the outcome of the lab based on the written procedure. The conclusion and recommendation talk about how this lab can improve in various ways and Appendix A lists the issues that were met in this lab and Appendix B contains the configurations of routers and switches that were used in this lab.

Business Scenario

A medium-sized finance industry named InK, files confidential information such as bank accounts and wealth information for their clients. To keep this information, secure as possible, a network architecture identical as this lab is implemented. This industry has one finance department and one technology department where it is separated into VLAN 10 and VLAN 20 respectively. Since there are two VLANs for each department the data sent by each department will not be sent to other departments to secure the information. By applying this network architecture an industry like InK which prioritizes security, the information of the clients will be kept more secure due to security functions in switches and by having separated VLANs. This network architecture ensures which files should be sent to what destination without leakage of files which is critical to the company. The applications that this project will utilize is Windows, Putty, and Wireshark. The network assigned by the ISP is 10.17.12.0/24 and the network used internally is 192.168.12.0/24. In the network, VLAN 10 is for the financial department where it has a network id of 192.168.10.0/24 and VLAN 20 is for the technology department where it has a network id of 192.168.20.0/24. The pre-lab network diagram depicts how the host PCs transmit data through a switch and a TP-Link router to another host PC with transmission options such as jumbo frames and flow control. The pre-lab network architecture is shown below:

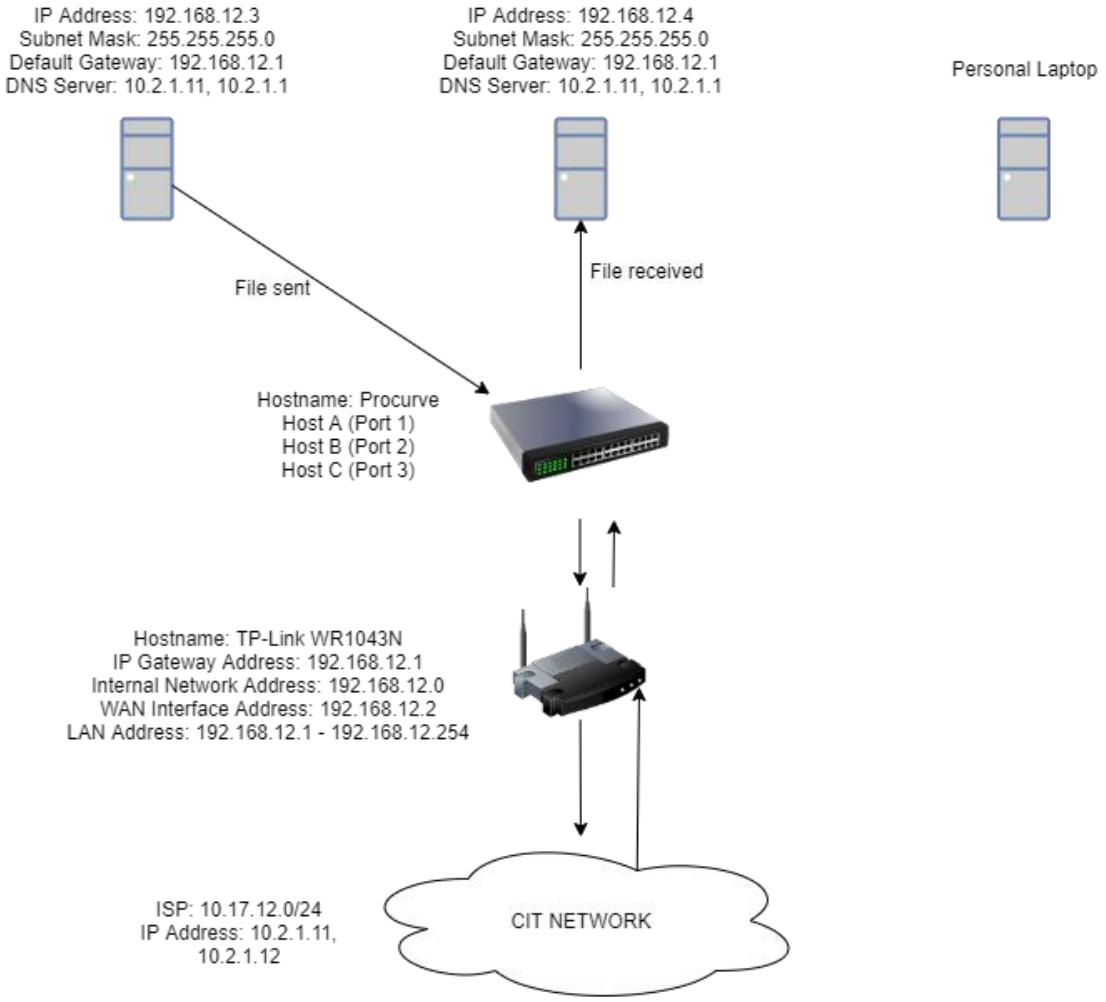

Figure 1: Pre-lab Logical Network Diagram

Procedures

This procedure phase is separated by the list of tasks shown chronologically in the check off sheet. The format for the procedure is according to: **buttons** are bold, *options* are italicized, text entered into the computer is in Courier New, menu navigation is by the pipe symbol and italic words: *Start* | *Programs* | *MS Office* | *Word*.

Powered off TP-Link router

1. Pressed the **On/Off** switch behind the TP-Link router to Off

Deployed IEEE 802.1Q VLANs and Extended to One Host

1. Created appropriate network architecture
    a. Unplugged all pre-lab straight through cables
    b. Prepared four straight through cables and one crossover cables
    c. Connected Group12A PC to SW1 (fa0/17) using a straight through cable
    d. Connected Group12B PC to SW2 (fa0/17) using a straight through cable
    e. Connected SW1 (fa0/18) and SW2 (fa0/18) to ProCurve (Port 2,3) switch using crossover cables
    f. Connected ProCurve (Port 1) to Cisco router 1900 (Gi0/1) using a straight through cable
    g. Connected Cisco router (Gi0/2) to CIT network using a straight through cable
2. Checked if all ports had yellow colored lights blinking
    a. Yellow blinking lights signify that the ports are active/connected
3. Logged in to Windows with credentials:
    a. Username: `Group12B`
    b. Password: `Group12!`

4. Pressed **Window Key** + **S** to open Windows search bar
    a. Typed `Putty`
    b. Pressed **Enter**
5. Pressed **Window Key** + **S** to open Windows search bar
    a. Typed `Device Manager`
    b. Pressed **Enter**
6. Connected a console cable from Group12B PC to SW1
7. Navigated to Device Manager
    a. Expanded *Ports* dropdown menu
    b. Checked if another port other than *COM1* was online
8. Navigated to Putty
    a. Checked the radio button next to *Serial*
    b. Entered the port shown other than *COM1* in the text box
    c. Clicked **Open**
9. Entered the following configuration to SW1:

```
a. en
b. conf t
c. hostname S1
d. vlan 1012
e. vlan 2012
f. int fa0/17
g. switchport trunk allowed vlan 1012,2012
h. switchport mode trunk
i. int fa0/18
j. switchport access vlan 2012
k. switchport mode access
```

```
l. int vlan1
m. ip address 192.168.12.20 255.255.255.0
n. no ip route-cache
o. ip default-gateway 192.168.12.254
```

10. Connected a console cable from Group12B PC to SW2
    a. Pressed **Enter** twice on Putty session to refresh session
11. Entered the following configuration to SW2:

```
a. en
b. conf t
c. hostname S2
d. vlan 1012
e. vlan 2012
f. int fa0/17
g. switchport trunk allowed vlan 1012,2012
h. switchport mode trunk
i. int fa0/18
j. switchport access vlan 1012
k. switchport mode access
l. int vlan1
m. ip address 192.168.12.10 255.255.255.00
n. no ip route-cache
o. ip default-gateway 192.168.12.254
```

12. Connected a console cable from Group12B PC to Cisco Router 1921
    a. Pressed **Enter** twice on Putty session to refresh session
13. Entered the following configuration to Cisco Router 1921:

```
a. en
```

```
b. conf t
c. hostname R1
d. no ip domain lookup
e. int gi0/0
f. ip address 10.17.12.2 255.255.255.0
g. ip nat outside
h. duplex auto
i. speed auto
j. int gi0/1
k. ip address 192.168.12.1 255.255.255.0
l. ip nat inside
m. duplex auto
n. speed auto
o. int gi0/1.1012
p. encapsulation dot1q 1012
q. ip address 192.168.10.1 255.255.255.0
r. ip nat inside
s. int gi0/1.2012
t. encapsulation dot1q 2012
u. ip address 192.168.20.1 255.255.255.0
v. ip nat inside
w. ip nat pool G12 10.17.12.2 10.17.12.2 netmask 255.255.255.0
x. ip nat inside source list 1 pool G12 overload
y. ip route 0.0.0.0 0.0.0.0 10.17.12.1
z. access-list 1 permit 192.168.0.0 0.0.255.255
```

14. Connected a console cable from Group12B PC to ProCurve 2900-24G

a. Pressed **Enter** twice on Putty session to refresh session

15. Entered the following configuration to ProCurve 2900-24G:

```
a. en
b. conf t
c. hostname ProCurve
d. trunk A1-A3 Trk2 Trunk
e. vlan 1
f. tagged 1-3
g. exit
h. vlan 1012
i. tagged 1-3
j. no ip address
k. exit
l. vlan 2012
m. tagged 1-3
n. no ip address
o. exit
```

16. Opened Microsoft Edge on Windows Task bar on host Group12A and Group12B

    a. Navigated to www.google.com

    b. Checked if internet was working

Results

Throughout this lab by successfully following the procedure, the objectives were mostly met. The architecture of the final solution is a star topology network diagram and to successfully function the network, the procedure was provided. There were two major accomplishments in this particular project. First, the network architecture of the lab was constructed according to the network diagram (Figure 3) and the deployment of IEEE 802.1Q VLANs into the network diagram were accomplished. Second, the extension of the IEEE 802.1Q VLAN tagging was successfully done to one of the hosts. As shown in the network diagrams below, VLANs 10 and 20 was created for each of the two hosts to separate them in the network. Through these two steps, the Group12A was able to ping outside of the CIT network, such as 1.1.1.1 and it was able to ping to Group12B which was 192.168.10.10. However, Group12B did not successfully connect to the internet due to an unknown issue. This lab project has fully constructed a star topology network diagram where hosts can communicate outside of the CIT network through switches and routers. As for the physical diagram (Figure 3), it depicts how the network architecture were constructed in a lab environment and shows all the required ethernet connections between machines. The logical diagram (Figure 4) represents a network diagram of how information or data travel through the architecture and in this case, it shows Group12A pinging Group12B. There also are login credentials, IP information, port information, and other network addresses mentioned in the two diagrams below. All the hosts are considered equal and there is no hierarchy between each host. Both diagrams are very important to understand how the systems and network work.

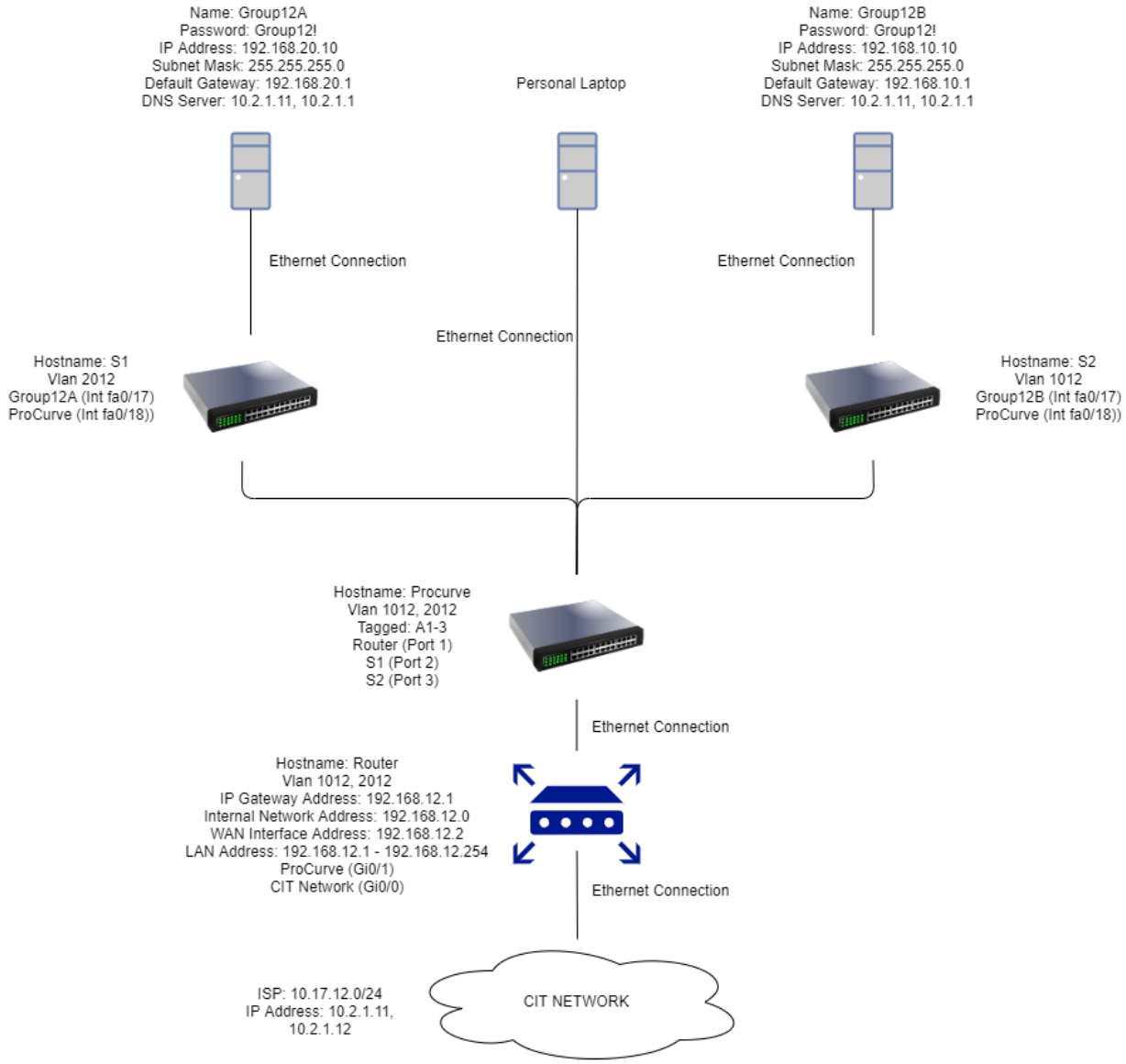

Figure 3: Physical Network Diagram

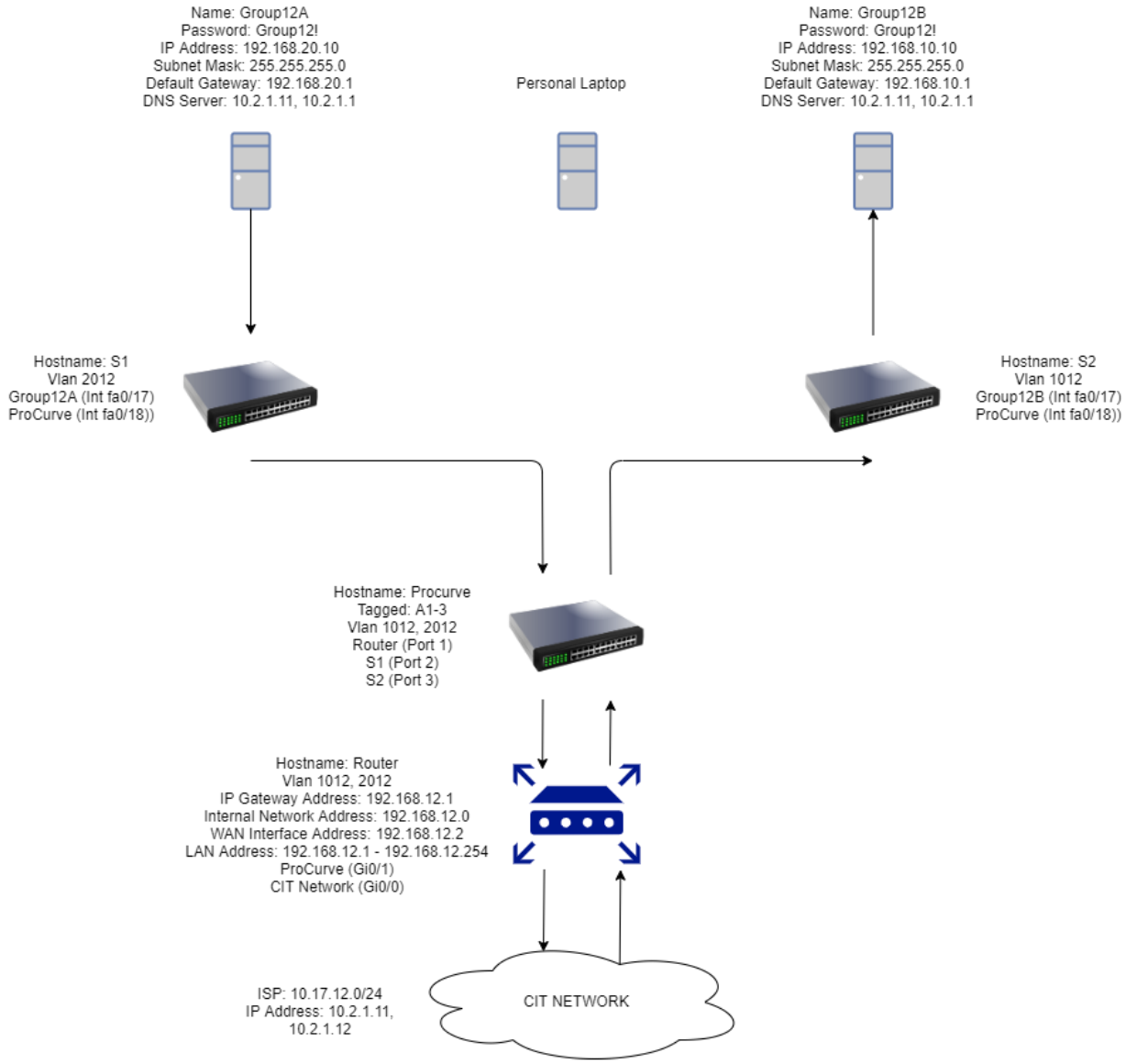

Figure 4: Logical Network Diagram (ping 192.168.10.10)

Conclusions and Recommendations

Based on the requirements listed in the business scenario, the project did meet most of the requirements and expectations. InK's main purpose is to ensure the security of the transmitted files within the company and this project did successfully constructed a secure LAN network architecture with two distinct VLANs which securely transmits data to its preferred destination efficiently. This lab was not able to accomplish other tasks such as monitoring traffic and capturing tags but from the perspective of the business case, security and transmission of files were major parts of the job. As shown in the procedures and mentioned in the results section of this report, the procedures gave specific steps to configure switches and routers which led to a successful result that met the business requirements. The limitations were the internet connection error on one of the host PCs due to the network driver or a switchport error.

Recommendations

Recommendation 1: When monitoring the amount of traffic between each of the interfaces within a VLAN, there should be no any other data through the chosen VLAN due to network performance degradation and transmission delay. If other data traffic is transmitted within the same VLAN but with a different interface with the monitored interface, there might be an issue which will affect the lab results.

Recommendation 2: When connecting the crossover cables and straight through cables to create the desired network architecture, the cable connections must be double checked before starting to work on the lab procedure. If the cables are mistakenly connected to other switches or routers, it might cause configuration errors which will waste time for lab.

Recommendation 3: When choosing which port or interface to use on switches or router, it is better to keep the number of the interfaces chosen uniform. For example, if Group12A is connected to interface 17,

Group12B should also be connected to interface 17 on the partner switch. If the interface configurations are different on each switch it can cause confusion when configuring the switches and routers later in the lab.

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APPENDIX A: Problem Solving

Problem 1: Network driver had errors starting up

Problem Description: When trying to configure the IPv4 properties network driver for Group12B PC could not startup for an unknown reason.

Problem Solution: The potential solutions for this issue were to change the NIC driver for the broken network driver, restarting the PC, disabling and enabling the network driver, and uninstalling the network driver.

Solution Attempted: The attempted solutions for this problem was to restart the PC, disabling and enabling the network driver, and uninstalling the network driver.

Final Solution: All of the attempted solutions did not work successfully and did not solve the problem due to time constraints.

Problem 2: No Internet connection in one host PC

Problem Description: The internet connection of Group12B was not successful due to a computer error or a SW2 configuration error.

Problem Solution: The potential solutions for this problem was to go back and double check the switch's show run by comparing the SW2 configuration with SW1 due to the similarity between the switches, and restarting the PC.

Solution Attempted: The solutions attempted for this issue was to double check the switch's configuration by comparing the partner switch's configuration and to restart the Group12B PC.

Final Solution: After attempting the solutions, there were no differences except IP and VLAN number differences between the two switches, but the problem was not resolved and restarting the computer did not help solve the issue as well.

APPENDIX B: Router and Switch Configurations

Cisco Router 1921

```
en
conf t
hostname R1
!
no ip domain lookup
!
int gi0/0
ip address 10.17.12.2 255.255.255.0
ip nat outside
duplex auto
speed auto
!
int gi0/1
ip address 192.168.12.1 255.255.255.0
ip nat inside
duplex auto
speed auto
!
int gi0/1.1012
encapsulation dot1q 1012
ip address 192.168.10.1 255.255.255.0
ip nat inside
```

```
!
int gi0/1.2012
encapsulation dot1q 2012
ip address 192.168.20.1 255.255.255.0
ip nat inside
!
ip nat pool G12 10.17.12.2 10.17.12.2 netmask 255.255.255.0
!
ip nat inside source list 1 pool G12 overload
!
ip route 0.0.0.0 0.0.0.0 10.17.12.1
!
access-list 1 permit 192.168.0.0 0.0.255.255
!
```

Procurve Switch 2900-24G

```
en
conf t
hostname ProCurve
!
trunk A1-A3 Trk2 Trunk
!
vlan 1
tagged 1-3
exit
```

```
!
vlan 1012
tagged 1-3
no ip address
exit
!
vlan 2012
tagged 1-3
no ip address
exit
!
```

Cisco Switch 1 2950

```
en
conf t
hostname S1
!
vlan 1012
!
vlan 2012
!
int fa0/17
switchport trunk allowed vlan 1012,2012
switchport mode trunk
!
```

```
int fa0/18
switchport access vlan 2012
switchport mode access
!
int vlan1
ip address 192.168.12.20 255.255.255.0
no ip route-cache
!
ip default-gateway 192.168.12.254
!
```

Cisco Switch 2 2950

```
en
conf t
hostname S2
!
vlan 1012
!
vlan 2012
!
int fa0/17
switchport trunk allowed vlan 1012,2012
switchport mode trunk
!
int fa0/18
```

```
switchport access vlan 1012
switchport mode access
!
int vlan1
ip address 192.168.12.10 255.255.255.00
no ip route-cache
!
ip default-gateway 192.168.12.254
```