# Group Assignment 1 - Group Lab Activity 1

TNE10006/TNE60006 S2 2023

**Assignment Weight:**

7.5%

**Assignment Points:**

75

**Submission Due Date:**

Week 7 Lab session.

**Reference Material:**

* Lab SU-5a – Configuring Per-Interface Inter-VLAN Routing
* Lab SU-5b – Configuring 802.1Q Trunk-Based Inter-VLAN Routing
* Lab SU-6a – Troubleshooting Inter-VLAN Routing

**Instructions:**

1. Form a group of 3-4 people amongst the students present in the lab session.
2. Discuss and answer the questions in Group Assignment 1 with your group members.
3. Organize for your group to meet as needed to complete all the questions.
4. Each group will submit one completed Group Assignment 1
5. Submit Group Assignment 1 in the Canvas shell under the Group Lab Activity 1
6. Late penalties will apply for submission after the due date.

**Group Assignment 1 Sections:**

Section 1: Lab SU-5a Per-Interface Inter-VLAN Routing Configuration (15 marks)

Section 2: Lab SU-5b 802.1Q Trunk-Based Inter-VLAN Routing Configuration (7 marks)

Section 3: Labs SU-5a and SU-5b Reflection (14 marks)

Section 4: Lab SU-6a Inter-VLAN Routing Troubleshooting (30 marks)

Section 5: Lab SU-6a Connectivity Scenarios (9 marks)

**Group Assignment 1 Member Information:**

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| --- | --- |
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**Section 1: Lab SU-5a Per-Interface Inter-VLAN routing Configuration**

**(15 marks)**

Q1. After completing steps 1-3 in **Part 2, Configure Switches with VLANs and Trunking of Lab SU-5a**,

* + 1. Did S3 and S4 ping each other? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

They ping each other because they were in the same network, and port Gi1/0/5 was in trunk mode.

* + 1. Would S3 ping PC-A? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

S3 would ping PC-A because port G1/0/7, connected between S3 and PC-A, is in access mode and allows them to ping each other.

* + 1. Would S3 ping PC-B? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

They would not ping because they are in different networks, and the default gateway was not configured in the router due to the fact that there is no layer 3 routing device being set up to allow inter-VLAN connection.

* + 1. Would S4 ping PC-A? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

S4 would ping PC-A because S3 and S4 are in the same network and port Gi1/0/5 is in trunk mode so S4 would send the packet to S3 and S3 would send it to PC-A since port G1/0/7 is in access mode.

* + 1. Would PC-A ping PC-B? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

They would not ping each other because they are in different VLANs, and no layer 3 routing device has been set up to allow inter-VLAN connection, so the default gateway was not configured in the router.

Q2. After completing steps 1-3 in **Part 3: Basic Router Configuration of Lab SU-5a**,

* + 1. How many directly connected networks (C) were there in R1’s routing table? If any, list them.

(2 marks)

There are 2 directly connected networks: 192.168.10.0/24 and 192.168.20.0/24

* + 1. Would all devices now be able to ping each other? Give reasons for your answer.

(2 marks)

All devices would ping each other because the layer 3 router has been configured and has connected to all the networks through ports/sub-interfaces. The default gateway has been activated in all devices, allowing inter-vlan connection.

* + 1. When PC-A pings PC-B, would this traffic traverse R1? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

The traffic would traverse R1 because the two PCs are in different VLANs

* + 1. When PC-A pings S3, would this traffic traverse R1? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

The traffic would not traverse R1 because S3 and PC-A are in the same network.

Q3. If you shutdown port Gi0/0/1 on R1,

* + 1. How many directly connected (C) networks would there be in R1’s routing table? If any, list them.

(2 marks)

There would be 1 directly connected network: 192.168.20.0/24

* + 1. Would S3 and S4 still ping each other? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

They will ping each other because they are in the same VLAN, and port Gi1/0/5 is in trunk mode.

* + 1. Would PC-A and PC-B still ping each other? Yes/No? If yes, explain why. If not, explain why not.

(1 mark)

They would not ping each other because they are in different VLANs, and port g0/0/1 on R1 is disabled, so the traffic would not flow to each PC.

**Section 2: Lab SU-5b Trunk-Based Inter-VLAN Routing Configuration**

**(7 marks)**

Q1. After completing steps 1-4 in **Part 2, Configure Switches with VLANs and Trunking of lab SU-5b**,

1. How many directly connected (C) networks are there in R1’s routing table? If any, list them.

(2 marks)

There are 4 directly connected networks in R1’s routing table:

* Sub-interface for VLAN 99: 192.168.1.1/24, Gi0/0/1.99
* Sub-interface for VLAN 10: 192.168.10.1/24, Gi0/0/1.10
* Sub-interface for VLAN 20: 192.168.20.1/24, Gi0/0/1.20
* Loopback0: 209.165.200.225/27

1. Would S3 ping PC-A? If yes, would this traffic traverse R1?

(1 mark)

S3 would be able to ping PC-A. Because the S3 Management IP address belongs to VLAN 99 and the connection between S3 and PC-A is Gi1/0/7, which is an access port in order to send the packet, S3 will send the packet to R1's VLAN 99 sub-interface, and R1 will deliver the packet to PC-A by replacing the VLAN 99 tag with VLAN 10 tag.

This traffic traverses R1 because S3 and PC-A are in different networks.

1. Would PC-A ping PC-B? If yes, would this traffic traverse R1?

(1 mark)

PC-A would ping PC-B. PC-A and PC-B are on different VLANs, so a layer 3 routing device is needed to communicate with each other, and this traffic would traverse R1 because PC-A and PC-B are in different networks.

1. What was the purpose of pinging S3 and S4 using the source option from R1?

(1 mark)

The purpose of pinging S3 and S4 using the source option from R1 is to verify Inter VLAN communication and verify that devices in the network can ping each other through layer 3 routing device to ensure all the sub-interfaces were properly configured in R3.

Q2. If you shutdown port Gi0/0/1 on R1,

1. How many directly connected (C) networks would there be in R1’s routing table? If any, list them.

(2 marks)

There is 1 directly connected network in R1 routing table : 209.165.200.225/27 – Loopback0

**Section 3: Labs SU-5a and SU-5b Reflection**

**(14 marks)**

Q1. Answer the following questions regarding IP settings on layer 2 switches:

* + 1. On a layer 2 switch, what is the purpose of creating an interface VLAN and allocating an IP address to it?

(1 mark)

Creating an interface VLAN and allocating an IP address allows the network admin to configure the network remotely.

* + 1. On a layer 2 switch, what is the purpose of configuring a default gateway?

(1 mark)

Using a default gateway allows the switch to send the packet from the switch to distant networks, which allows inter-VLAN communication.

* + 1. Based on what you learned in labs SU-5a and SU-5b, which IP address should be configured as the default gateway IP on layer 2 switches?

(1 mark)

The default gateway IP address needs to be the same as the subnet of the management VLAN IP address and the IP address of the router interface.

Q2. Answer the following questions regarding inter-VLAN routing configuration:

* + 1. Explain the benefits of using the "router-on-a-stick" topology for inter-VLAN routing instead of the per-interface routing approach?

(4 marks)

* Cost-effective because router-on-a-stick requires fewer physical router interfaces, which can be helpful in small networks.
* Scalable because when the network grows up and needs more VLANs, the network admin does not need to add more router interfaces but only configure new subinterfaces.
* Admin can increase the number of networks and reduce their size.
* Only the admin can access broadcast domains, increasing network security.
  + 1. Are there any disadvantages to using "router-on-a-stick" inter-VLAN routing compared to the per-interface routing approach?

(2 marks)

* The router can become the network’s bottleneck if it malfunctions.
* There is no limit on the number of available VLANs, although only one available link exists.
* Packet dropping can happen since there is only one link with so many VLANs, creating network congestion and affecting all VLANs.
  + 1. When configuring a router-on-a-stick topology, the link between the switch and the router must carry traffic for multiple VLANs. How is this achieved on the router? How is this achieved on the switch?

(4 marks)

* On the router, if the router wants to carry traffic for multiple VLANs, we must create sub-interfaces through the 802.1Q trunk port connecting to the default gateway, and packets are encapsulated with IEEE 802.1Q VLAN tags.
* On the switch, if the switch wants to carry traffic for multiple VLANs, we need to use a trunk port for the connection between switches.
  + 1. Other than directly connected (C) networks, did you observe any other type of networks in R1’s routing table? If yes, specify what type of networks were there and what they represent.

(1 mark)

* Other than the directly connected networks, the other type of network is the local (L) network, which represents the IP address of the sub-interfaces

**Section 4: Lab SU-6a Inter-VLAN Routing Troubleshooting**

**(30 marks)**

Q1. Refer to **Part 2, Troubleshoot Inter-VLAN Routing Configuration of Lab SU-6a**,

* + 1. Were there any networks missing from R1’s routing table? If so, which networks?

(3 marks)

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Description automatically generated

3 networks were missing:

* Sub-interface for VLAN 1: 192.168.1.1/24, Gi0/0/1.1
* Sub-interface for VLAN 10: 192.168.11.1/24, Gi0/0/1.10
* Sub-interface for VLAN 20: 192.168.20.1/24, Gi0/0/1.20
  + 1. Were any networks still missing after all relevant R1 interfaces were enabled? Were there any networks that should not have been present? If so, specify which networks are missing and should not be present.

(1 mark)

There is no missing network. One network that should not have been displayed in all relevant R1 interfaces was enabled is the 192.168.11.1 network, which should be changed to 192.168.10.1/24.

Ảnh có chứa văn bản, ảnh chụp màn hình, Phông chữ

Mô tả được tạo tự động

* + 1. Were all R1’s interfaces, including loopback and sub-interfaces, configured correctly? If not, list the configuration issues you found.

(3 marks)

* There are some mistakes in configuring the network interfaces :

G0/0/1 should have been switched on, but this was not done so none of the sub-interfaces was enabled.

The IP address and subnet mask of the sub-interface for VLAN 10 is supposed to be 192.168.10.0/24 instead of 192.168.11.0/24.

The encapsulation of dot1q on g0/0/1.1 should be dot1q 1 instead of dot1q 11.

Q2. Refer to **Part 3, Verify VLAN Configuration and Port Assignments and Trunking of Lab SU-6a**,

* + 1. Were there any VLAN numbers or names missing from S3’s VLAN database? If so, list them.

(1 mark)

There is one VLAN that is missing, which is VLAN 20 - Engineering

* + 1. Were all access ports on S3 assigned to the correct VLANs? If not, list the missing or incorrect assignments.

(1 mark)

Gi1/0/5 was configured to be an access port while it should have been a trunk port.

G1/0/7 is assigned to VLAN 1, while it should be assigned to VLAN 10

* + 1. Were there any VLAN numbers or names missing from S4’s VLAN database? If so, list them.

(1 mark)

VLAN 10 was not configured in S4, so the switch creates VLAN 10 with the name VLAN0010 but not R&D

* + 1. Were all access ports on S4 assigned to the correct VLANs? If not, list the missing or incorrect assignments.

(1 mark)

G1/0/24 was configured to VLAN 10 but not VLAN 20

* + 1. Based on the Lab SU-6a topology diagram, which port(s) on S3 should operate in trunking mode?

(2 marks)

G1/0/5 and G1/0/11 should be operated in trunking mode

* + 1. Based on the Lab SU-6a topology diagram, which port(s) on S4 should operate in trunking mode?

(1 mark)

G1/0/5 should have been operated in trunking mode

* + 1. Were all ports operating in trunking mode configured correctly? If not, list the configuration issues you found.

(2 marks)

Gi1/0/5 on S3 was configured to be an access port while it should have been a trunk port

Q3. Use the table provided to list the configuration issues you found in Lab SU-6a. List the troubleshooting command(s) that helped you find it for each issue and the configuration command(s) you used to fix it.

(2 marks for each correct issue)

|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Configuration Issue** | **Troubleshooting Command(s)** | **Re-Configuration Command(s)** |
| S3 | VLAN 20 is missing | S3#sh vlan brief | S3(config)# vlan 20  S3(config-vlan)# name Engineering  S3(config-vlan)# exit |
| S3 | G1/0/5 is not configured as a trunk port | S3#sh int trunk | S3(config)# int g1/0/5  S3(config-if)# switchport mode trunk  S3(config-if) exit |
| S4 | VLAN 10 is named as VLAN0010 | S4#sh vlan brief | S4(config)# vlan 10  S4(config-vlan)# name R&D  S4(config-vlan)# exit |
| S4 | G1/0/24 was configured to VLAN 10 but not VLAN 20 | S4#sh vlan brief | S4( config)# int g1/0/24  S4(config-if)# switchport mode access  S4(config-if)# switchport access vlan 20  S4(config-if)# exit |
| S3 | G1/0/7 is not assigned to VLAN 10 | S3#sh vlan brief | S3(config)# int g1/0/7  S3(config-if)# switchport mode access  S3(config-if)# switchport access vlan 10  S3(config-if)# exit |
| S3 | G1/0/11 is not configured as a trunk port | S3#sh int trunk | S3(config)# int g1/0/11  S3(config-if)# switchport mode trunk  S3(config-if)# exit |
| R1 | G0/0/1 is turned off | R1#sh ip route | R1(config)# int g0/0/1  R1(config)# no shutdown  R1(config)# end |
| R1 | encapsulation dot1q  11 should be  encapsulation dot1q  1 | R1#sh ip route | R1(config)# int g0/0/1.1  R1(config)# encapsulation  dot1q 1  R1(config)#ip address  192.168.1.1 255.255.255.0  R1(config)# end |
| R1 | The ip address on  g0/0/1.10 should be  192.168.10.1 | R1# sh ip int br | R1(config)# int g0/0/1.10  R1(config)#encapsulation dot1q  10  R1(config)# ip address 192.168.10.1 255.255.255.0  R1(config)# end |

**Section 5: Lab SU-6a Connectivity Scenarios**

**(9 marks)**

Q1. After fixing all configuration issues in Lab SU-6a,

* + 1. Can S3 and S4 ping each other? If so, does this traffic traverse R1? Give reasons for your answers.

(1 mark)

They could ping each other because they were in the same network, and port Gi1/0/5 was in trunk mode. The traffic does not traverse R1.

* + 1. Can S3 and S4 ping all router sub-interfaces and loopback interfaces? Give reasons for your answer.

(1 mark)

S3 can ping all sub-interfaces and loopback interfaces of the router because S3 is directly

connected to the router through the 802.1Q trunk, which allows S3 to communicate with

other networks. Additionally, the switch is also configured with the default gateway IP address.

Q2. If you were to connect PC-A and PC-B to the network as shown in Lab SU-6a Topology Diagram,

* + 1. What IP address would you configure on PC-A as the Default Gateway?

(1 mark)

192.168.10.1

* + 1. What IP address would you configure on PC-B as the Default Gateway?

(1 mark)

192.168.20.1

* + 1. Would PC-A and PC-B ping each other? If so, would this traffic traverse R1? Give reasons for your answers.

(1 mark)

PC-A and PC-B will be able to ping each other, and the traffic will traverse R1 because they are in different VLANs, the traffic would be directed to the default gateway in R1.

Q3. In Lab SU-6a, if you did not configure VLAN 20 on S3,

* 1. Would PC-A and PC-B ping each other? Give reasons for your answer.

(1 mark)

No. Because to ping each other both the switches need to know what VLAN there are. Here in S3 without configuring VLAN20, PC A will not be able to communicate with PC B as they are on different networks.

* 1. Would PC-A ping R1’s loopback interface? Give reasons for your answer.

(1 mark)

Yes, PC-A should be able to ping R1’s loopback interface because PC-A is in VLAN 10, and the router R1 has a sub-interface in VLAN 10 (Gi0/0/1.10).

* 1. Would PC-B ping R1’s loopback interface? Give reasons for your answer.

(1 mark)

No, PC-B would not be able to ping R1's loopback interface. Even though VLAN routing is properly configured, PC-B is in VLAN 20, and if VLAN 20 is not configured on S3, there would be no route for traffic from PC-B to reach R1's loopback interface through S3.

Q4. In Lab SU-6a, if you did not configure the default gateway on S3 and/or S4,

* 1. Would PC-A and PC-B ping each other? Give reasons for your answer.

(1 mark)

No. If we did not configure the default gateway on S3 and/or S4 , both the switches would not be able connect to the router so the communication between PC A and B will not be possible.