

Group Assignment 1 - Group Lab Activity 1

TNE10006/TNE60006 S2 2024

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. Organise 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 Members Information:

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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**,

- a) Did S3 and S4 ping each other? Yes/No? If yes, explain why? If no, explain why not.
(1 mark)

Yes, because they are trunked by port Gi1/0/5 and on the same network, subnet and vlan 10.

- b) Would S3 ping PC-A? Yes/No? If yes, explain why? If no, explain why not.
(1 mark)

Yes, because they have the same network ID (192.168.10). S3 and PC-A share the same VLAN. Intra-VLAN traffic operates within the switch.

- c) Would S3 ping PC-B? Yes/No? If yes, explain why? If no explain why not.
(1 mark)

No, because PC-B is in a separate subnet, VLAN (VLAN 20), whilst S3 is on VLAN 10. S3 and PC-B are on distinct VLANs, and we have not yet configured the default gateway (R1).

- d) Would S4 ping PC-A? Yes/No? If yes, explain why? If no, explain why not.
(1 mark)

Yes, because S4 and PC-A are on the same VLAN 10 by trunked port. Intra-VLAN traffic operates across

- e) Would PC-A ping PC-B? Yes/No? If yes, explain why? If no explain why not.
(1 mark)

No, because PC-A is in a separate VLAN (VLAN 10), and PC-B is in VLAN 20. Currently, we have not configured the default gateway (R1).

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

- a) How many directly connected networks (C) were there in R1's routing table? If any, list them.
(2 marks)

There were 2 directly connected networks (C) in R1's routing table: 192.168.10.0/24 and

192.168.20.0/24

- b) Would all devices now be able to ping each other? Give reasons for your answer.
(2 marks)

S3, S4 and PC-A are in the same network – vlan 10.

By the port Gi0/0/1, R1 can ping with S3, S4 and PC-A due to same network address 192.168.10.0.

By the port Gi0/0/0, R1 can ping and PC-B due to same network address 192.168.20.0

R1 was setup with IP addresses for both interfaces, Gi0/0/0 and Gi0/0/1, and connected to two networks: 192.168.10.0/24 and 192.168.20.0/24. Using the default gateway, PC-B, S3, S4, and PC-A can ping each other over R1.

- c) When PC-A pings PC-B, would this traffic traverse R1? Yes/No? If yes, explain why. If no, explain why not.
(1 mark)

Yes, because they were in different VLANs and needed R1 to join. PC-A and PC-B are on distinct VLANs, requiring inter-vlan connection and packet processing by a layer 3 device.

- d) When PC-A pings S3, would this traffic traverse R1? Yes/No? If yes, explain why. If no, explain why not.
(1 mark)

No, because they were on the same VLAN 10. PC-A and S3 share the same VLAN. Layer 2 devices handle intra-VLAN communication, eliminating the need for a default gateway.

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

- a) How many directly connected (C) networks would there be in R1's routing table? If any, list them.
(2 marks)

There would be only 1 directly connected networks (C) in R1's routing table:
192.168.20.0/24 with port Gi0/0/0

- b) Would S3 and S4 still ping each other? Yes/No? If yes, explain why. If no, explain why not.
(1 mark)

Yes, because they are on the same network and connected via the trunking port. S3 and S4 share the same VLAN. Disabling the VLAN10 channel to the router does not impact intra-vlan communication.

- c) Would PC-A and PC-B still ping each other? Yes/No? If yes, explain why. If no, explain why not.

(1 mark)

No, because the Router controls the route and port Gi0/0/1 is unplugged, PC-A cannot connect to PC-B. PC-A and PC-B are in distinct VLANs, requiring inter-vlan connection and packet processing by a layer-3 device. Disabling the VLAN 10 channel to the router will disrupt inter-vlan communication.

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**,

- a) How many directly connected (C) networks are there in R1's routing table? If any, list them.
(2 marks)

There are 4 directly connected (C) networks in R1's routing table:

- 192.168.1.0/24 (Gi0/0/1.99)
- 192.168.10.0/24 (Gi0/0/1.10)
- 192.168.20.0/24 (Gi0/0/1.20)
- 209.165.200.224/27 (Loopback0)

- b) Would S3 ping PC-A? If yes, would this traffic traverse R1?
(1 mark)

Yes, because they are different network, so S3 can ping PC-A and this traffic traverse R1.

- c) Would PC-A ping PC-B? If yes, would this traffic traverse R1?
(1 mark)

Yes, because they are different network, so PC-A can ping PC-B and this traffic traverse R1.

- d) What was the purpose of pinging S3 and S4 using the source option from R1?
(1 mark)

This is for testing inter-VLAN connections and ensuring the R1 can access S3 and S4 over the chosen path.

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

- a) How many directly connected (C) networks would there be in R1's routing table? If any, list them.
(2 marks)

There would be only 1 directly connected networks (C) in R1's routing table:
209.165.200.224/27 (Loopback0 in virtual interface)

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

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

- a) On a layer 2 switch, what is the purpose of creating an interface VLAN and allocating an IP address to it?
(1 mark)
- To allow remote access and switches can ping each other.
 - To create a local network and connect them together

- b) On a layer 2 switch, what is the purpose of configuring a default gateway?
(1 mark)

After connecting to the default gateway, the switch can transport traffic across IP subnets. When a packet is sent from one IP subnet to another, it is routed to the switch. The switch would utilize the default gateway to determine the optimal route to the destination subnet and forward the packet. Accessing a switch from outside its network requires communication with another network. Set up a default gateway on the switch. The switch does not forward packets across separate networks.

- c) Based on what you learned on labs SU-5a and SU-5b, which IP address should be configured as the default gateway IP on layer 2 switches?
(1 mark)

The IP address assigned to the router interface attached to the Switch management VLAN. We can assign any available IP address to the router interface. (Usually, but not always, the first usable IP address is used as the default gateway). In this situation, the IP default gateway can be 192.168.10.1.

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

a) Explain the benefits of using the “router-on-a-stick” topology for inter-vlan routing instead of the per-interface routing approach?

(4 marks)

- The router's single port connects numerous VLANs, reducing the need for physical wires and making it more cost-effective.
- Router-on-a-stick design allows for more VLANs without limiting available router interfaces, making it more scalable.

b) Are there any disadvantages to using “router-on-a-stick” inter-vlan routing as compared to the per-interface routing approach?

(2 marks)

- Congestion can arise owing to restricted bandwidth.
- It is complicated to set up.
- Each VLAN has a limited bandwidth on one physical port. Fault on one

c) 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	On the switch
<ul style="list-style-type: none">- Subinterfaces enable the creation of multiple VLAN connections.- It is linked to an 802.1Q trunking switchport.- Packets are identified and encapsulated.	<p>Layer 2 devices allocated to the VLAN use trunked access ports.</p> <p>-</p>

- d) 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 do they represent.

(1 mark)

Yes, the local (L) network represents the IP address of the interface.

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**,

- a) Were there any networks missing from R1's routing table? If so, which networks?
(3 marks)

Yes, network missing from R1's routing table is 192.168.10.0

- b) After all relevant R1 interfaces were enabled, were there any networks still missing? were there any networks that should not have been present? If so, specify which networks are missing and which networks should not be present.
(1 mark)

Yes, the network 192.168.11.0 are missing and should not be present.

- c) Were all R1's interfaces, including loopback and sub-interfaces, configured correctly? If not, list the configuration issues you found.
(3 marks)

It were not configured correctly. R1 sub-interface was erroneously encapsulated with VLAN ID 11 on interface g0/0/1.1. When g0/0/1.10 was encapsulated with VLAN 10, its IP address was incorrectly assigned to 192.168.10.1 rather than 192.168.11.1. Despite not having any network devices linked to the 192.168.11.0 subnet, this misconfiguration occurred.

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

- a) Were there any VLANs numbers or names missing from S3's VLAN database? If so, list them.
(1 mark)

No, there were not any VLANs missing from S3 database.

- b) Were all access ports on S3 assigned to the correct VLANs? If not, list the missing or incorrect assignments.
(1 mark)

No, the port Gi1/0/7 in S3 interface should not be able to access VLANs.

- c) Were there any VLANs numbers or names missing from S4's VLAN database? If so, list them.
(1 mark)

Yes, the missing vlan is R&D.

- d) Were all access ports on S4 assigned to the correct VLANs? If not, list the missing or incorrect assignments.

(1 mark)

The connection to VLAN 20 should be possible as Interface g1/0/24 is linked to PC-B, and PC-B's interface is also connected to VLAN 20.

- e) Based on Lab SU-6a topology diagram, which port(s) on S3 should operate in trunking mode?

(2 marks)

Port gi1/0/5 and gi1/0/11.

- f) Based on Lab SU-6a topology diagram, which port(s) on S4 should operate in trunking mode?

(1 mark)

Port gi1/0/5.

- g) Were all ports that should operate in trunking mode configured correctly? If not, list the configuration issues you found.

(2 marks)

No, the gi1/0/5 ports in S3 was in access mode.

Q3. Use the table provided to list the configuration issues you found in Lab SU-6a. For each issue, list the troubleshooting command(s) that helped you find it 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)
R1	Sub-if int gi0/0/1.10 has wrong ip address	R1#show ip interface brief	R1(config)#int gi 0/0/1.10 R1(config-subif)#encapsulation dot1Q 10 R1(config-subif)#ip address 192.168.10.1 255.255.255.0

R1	Sub-if in gi0/0/1.1 does not have VLAN 1	R1#show run	R1(config)#int gi 0/0/1.1 R1(config-subif)#encapsulation dot1Q 1 R1(config-subif)#ip address 192.168.1.1 255.255.255.0
S3	Port gi1/0/5 does not trunk	S3#show vlan brief	S3(config)#int gi1/0/5 S3(config)#switchport mode trunk
S3	Vlan 20 has no name	S3#show vlan brief	S3(config)#vlan 20 S3(config-vlan)#name Engineering
S3	Port gi1/0/7 does not access vlan 10	S3#show vlan brief	S3(config)#int gi1/0/7 S3(config-if)#switchport mode access S3(config-if)#switchport access vlan 10
S3	Vlan 1 is shutting down	S3#show ip int brief	S3(config)#int vlan 1 S3(config-if) no shutdown
S4	Wrong name of Vlan 10	S4#show vlan brief	S4(config)#vlan 10 S4(config-vlan)#name R&D
S4	Port gi1/0/24 does not access vlan 20	S4#show vlan brief	S4(config)#int gi 1/0/24 S4(config-if)#switchport mode access S4(config-if)#switchport access vlan 20
S4		S4#show ip int brief	S4(config)#int vlan 1

	Vlan 1 is shutting down		S4(config-if) no shutdown
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Section 5: Lab SU-6a Connectivity Scenarios (9 marks)

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

- a) Can S3 and S4 ping each other? If so, does this traffic traverse R1? Give reasons for your answers.
(1 mark)

Yes, they can ping together but it does not traffic traverse R1 because S3 and S4 interface to vlan 1

- b) Can S3 and S4 ping all router sub-interfaces and loopback interface? Give reasons for your answer.
(1 mark)

Yes, they can ping all router by sub-int and loopback because S3 is configured properly for the default gateway.

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

- a) What IP address would you configure on PC-A as the Default Gateway?
(1 mark)
192.168.10.1

- b) What IP address would you configure on PC-B as the Default Gateway?
(1 mark)
192.168.20.1

- c) Would PC-A and PC-B be able to ping each other? If so, would this traffic traverse R1? Give reasons for your answers.
(1 mark)
Pinging between PC-A and PC-B needs a layer 3 device, such as a router, as they are in

separate VLANs. Therefore, traffic must transit via R1.

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

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

(1 mark)

No, Router 1 is immediately configured with S3, which connects to PC-A via VLAN 10. If you wish to ping two computers, configure VLAN 20 on S3.

- b) Would PC-A ping R1's loopback interface? Give reasons for your answer.

(1 mark)

Yes, both are connected to Vlan 10 on switch 3

- c) Would PC-B ping R1's loopback interface? Give reasons for your answer.

(1 mark)

Yes, both are connected to vlan 20 on switch 4

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

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

(1 mark)

No, as PC-A and PC-B require a default gateway to interact. The default gateway is the router's IP address, which routes data across networks. If the default gateway is not specified, PC-A and PC-B cannot ping each other.