Group Assignment 1 - Group Lab Activity 1

TNE10006/TNE60006 S2 2022

Assignment Weight:
7.5%

Assignment Points:
100

Submission Due Date:

By the start of Lab Session Week 7.

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. Your group discussion time will be in the last 20 minutes of the lab session in Collaborate Ultra, Breakout groups.
3. Discuss and answer the questions in Group Assignment 1 in your breakout group.
4. Organise for your group to meet again to complete all the questions.
5. Each group will submit one completed Group Assignment 1
6. Submit Group Assignment 1, in the Canvas shell, under the Group Lab Activity 1
7. Late penalties will apply for submission after the due date.

Group Assignment 1 Questions:

- Section 1: Lab SU-5a Configuring Per-Interface Inter-VLAN Routing (15 marks)
- Section 2: Lab SU-5b – Configuring 802.1Q Trunk-Based Inter-VLAN Routing (9 marks)
- Section 3: Reflection on Labs SU-5a and SU-5b (26 marks)
- Section 4: Troubleshoot Inter-VLAN Routing Configuration (10 marks)
- Section 5: Verify VLAN Configuration, Port Assignment and Trunking (16 marks)
- Section 6: Troubleshooting and Re-configuration Commands (18 marks)
- Section 7: Connectivity Scenarios (6 marks)

Group Assignment 1:

Group Members	
Name	**Student Id:**
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Note: This submission was done by 1 person. Which is only me (Tran Duc Anh Dang).

Section 1: Lab SU-5a Connectivity Scenarios (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, it is able to ping as Gi1/0/5 has been set up in truck mode on both switches and allows VLANs to ping each other.

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

Yes, because Gi1/0/7 which is connected between S3 and PC-A is in the access mode and allows VLAN 10 traffic including S3 and PC-A to ping

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

No, since S3 (192.168.10.11/24) and PC-B (192.168.20.3/ 24) have different network ports, therefore they cannot ping each other. Furthermore, S3 and PC-B are in different VLAN and we have not configured the default gateway (R1) at this stage

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

Yes, as Gig1/0/5 has been set up as trunk mode allowing VLANs to carry packets, therefore S4 can ping PC-A through S3 (S4 pings S3) and because Gi1/0/7 which is connected between S3 and PC-A is in the access mode and allows VLAN 10 traffic including S3 and PC-A to ping

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

No, since those 2 PCs are in different VLANs and there aren’t any layer 3 router devices to support inter vlan.

Q2. After completing Step 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)

- 2 directly connected networks (C) in R1's routing table:
    1. 192.168.10.0/24 - Gi0/0/1
    2. 192.168.20.0/24 - Gi0/0/0

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

All devices will now be able to ping each other as layer 3 router has been configured and activated, therefore inter vlan communication is now possible. This result in devices with different vlans can now ping each other (PC-A pings PC-B)

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, the traffic transverse R1 as PC-A (Vlan 10) and PC-B (Vlan 20) have different vlans.

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 are in the same local network (192.168.10). Therefore, they don't need to traverse R1.

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 will be 1 directly connected network (C) left which is:

1. 192.168.20.0/24 - 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, as they are the same vlan with Gi1/0/5 is in trunk mode.

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, as they are on different vlans, therefore they aren't able to ping each other without any layer 3 routing devices.

Section 2: Lab SU-5b Connectivity Scenarios (9 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 networks (C) in R1's routing table:

1. Sub interface for Management VLAN 99: 192.168.1.1/24 is directly connected, Gi0/0/1.99
2. Sub interface for VLAN 10: 192.168.10.1/24 is directly connected, Gi0/0/1.10
3. Sub interface for VLAN 20: 192.168.20.1/24 is directly connected, Gi0/0/1.20
4. Loopback: 209.165.200.225/27 is directly connected, Lo0 (Loopback0)

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

Yes, S3 will be able to ping PC-A. While S3 Management ip address is belongs to vlan 99, and the connection interface between PC-A to S3 is Gi1/0/7 access port which only allows traffic from vlan 10 to communicate. Therefore, for S3 to ping PC-A, the ICMP packets from vlan 99 will move through the default gateway to R1's vlan 99 sub interface in port Gi0/0/1 and then the router removes vlan id 99 tag and attaches vlan id 10 tag and send it back through the sub interface vlan 10 in the same port.

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

Yes, S3 will be able to ping PC-B. While S3 Management ip address is belongs to vlan 99, and PC-B connects to the interface access port Gi1/0/24 which only allow for vlan 20 traffic to communicate. Therefore, for S3 to ping PC-B, the ICMP packets from vlan 99 will move through the default gateway to R1's vlan 99 sub interface in port Gi0/0/1 and then the router removes vlan id 99 tag and attaches vlan id 10 tag and send it back through the sub interface vlan 20 in the same port.

d) Would S4 ping PC-A? If yes, would this traffic traverse R1?
(1 mark)

Yes, S4 will be able to ping PC-A. While S4 Management ip address is belongs to vlan 99, and PC-A connects to the interface access port Gi1/0/7 which only allows traffic from vlan 10 to communicate. Therefore, for S4 to ping PC-A, the ICMP packets from vlan 99 will move through the default gateway to R1's vlan 99 sub interface in port Gi0/0/1 and then the router removes vlan id 99 tag and attaches vlan id 10 tag and send it back through the sub interface vlan 10 in the same port.

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

Yes, PC-A will be able to ping PC-B and because PC-A and PC-B are on different vlans. Therefore, they need a layer 3 routing device R1 to have inter vlan communication. Therefore, this traffic will tranverse R1

f) 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 source option from R1 is to verified and emphasized inter vlan communication and just to make sure devices are able to ping each other through layer 3 routing device.

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 is 1 directly connected network (C) in R1's routing table:

Loopback: 209.165.200.225/27, Lo0

Section 3: Reflection on Labs SU-5a and SU-5b (26 marks)

In this section you will need to reflect on what you have learned and apply that knowledge

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 and IP address to it?
(2 marks)

Creating an interface vlan is to enable remote access, therefore allocating an ip address is for an admin to configure and administer network remotely.

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

By using the default gateway address, packets coming from the switch are sent to distant networks. A switch can forwards packets that originate on the switch to distant networks by using a default gateway address.

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?
(2 marks)

1. It should be the same as the IP Address of the interface on the router

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

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

a) In labs SU-5a and SU-5b, you used two different approaches to configuring inter-vlan routing. Explain the difference(s) between the two.
(6 marks)

1. Per-interface inter-vlan routing:

- It is necessary to have many physical interfaces, each of which must be linked to a VLAN (separate network) and configured with the appropriate IP address and subnet mask. Inter-VLAN routeing demonstrated in this technique that it is possible by coupling several physical router interfaces to numerous switch ports.

- In lab SU-5a, we require a router with two distinct interfaces (Gi0/0/1 and Gi0/0/0) to link with each switch in order to connect to the Inter-Vlan network, which has two separate VLANs. This indicates that in order to interact over various VLANs, we need at least 5 distinct interfaces connected to the router if we have 5 or more VLANs. Due to its inefficiency, expense, and current lack of application in networks, this approach

2. Router on stick inter-vlan routing:

- Router-on-a-Stick only requires one physical router interface in the Inter-VLAN network using 802.1Q Trunk VLAN, as opposed to connecting numerous physical interfaces on the router and switch.

- Each switch in lab SU-5b will have a trunk connection with a different switch, and those switches will be linked to the router by a single trunk connection. We just need one physical interface (Gi0/0/1) to connect to the inter-vlan network. Instead, we link the three separate VLANs 10, 20, and management VLAN 99 over 802.1Q Trunk VLAN using sub-interfaces (Gi0/0/1.99, Gi0/0/1.10, and Gi0/0/1.20).

Summary, if per-interface uses multiple physical interfaces to carry out the routing, the router on stick uses sub-interfaces of a single physical interface.

b) 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)

- Router: For it to carry traffic for multiple vlan, sub-interfaces through 802.1Q trunk must be used (use default gateway, trunk port)

- Switch: For it to carry traffic to for multiple vlan, trunk port for the connection between each switch must be used if we want to connect them together.

c) What are the benefits of using the “router-on-a-stick” topology for inter-vlan routing?
(6 marks)

- Easier to control Multiple VLANs can be connected to using a single LAN, hence the number of VLANs is not constrained by the number of router LAN ports.

- Simultaneously increases the number of networks and decreases their size.

- Cost-effective: Need only one physical connection (LAN). It opens a lot of router ports. lowering the cost of management and operation through cabling and streamlining the network configuration.

- Monitoring of packets: Easily determines if a packet has reached its destination or not. Therefore, network managers may fix faults when they occur.

- High level security: Users can only access the VLAN; only network administrators have access to various broadcast domains. Thus, sending private information is simple.

- Sensitive data may be handled easily and without compromise.

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

- Without a backup, the router might become the network's bottleneck if it malfunctions.

- Only a limited number of VLANs can be supported because there is only one 1 physical link

- Packet dropping is fairly common since there is only one physical trunk port that carries traffic for all of the network's VLANs, which causes traffic congestion and bottleneck throughput.

- No limitations on number of vlans even though there's a single link

- More complex configuration

- All VLANs contend for the same physical interface bandwidth. Fault on a single link impacts all VLANs."

e) 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.
- In R1, after show ip route, there are also 2 local (L) routes for lab 5a and 4 local (l) routes for lab 5b. Once each individual interface has been set up and turned on, it is added. The address given to the router's interfaces is identified by the local (L) route. Instead of searching via connected (C) networks for all the IP addresses, it enables the router to detect when it gets a packet for the interface effectively.

Section 4: Troubleshoot Inter-VLAN Routing Configuration (10 marks)

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

Q1. Regarding R1's routing table,

a) Were there any networks missing? If so, which networks?
(2 marks)

Yes, 3 networks are missing:

VLAN 1: 192.168.1.0/24

VLAN 10: 192.168.10.0/24

VLAN 20: 192.168.20.0/24

- Even if we use **no shutdown** on interface of G0/0/1, VLAN 10: 192.168.10.0/24 is still missing

b) After all router interfaces were enabled, were there any networks that should not have been present? If so, which networks?
(2 marks)

Yes. The internal loopback network is the only external network that should exist since the port is not enabled. One network should not have been displayed if we do not use a shutdown command for Routing 1: the 192.168.11.1 network. That should be changed to 192.168.10.1/24. (VLAN 10).

Q2. Regarding R1's interface configuration

a) Were all interfaces, loopback and sub-interfaces configured correctly? If not, list the configuration issues you found.
(6 marks)

Not everything was set up properly. Although Loopback was set up correctly, the interfaces and sub-interfaces were not:

- Int G0/0/1 should have been switched on without a shutdown command, but this was not done. As a result, none of the sub-interfaces from port G0/0/1, such as G0/0/1.1, G0/0/1.10, or G0/0/1.20, are in use.

Section 5: Verify VLAN Configuration, Port Assignment and Trunking (16 marks)

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

Q1. Regarding S3's VLAN Database,

a) Were there any VLANs numbers or names missing in the output? If so, list them.
(2 marks)

Yes, as there is one missing: VLAN 20 – Engineering. Except for interface VLAN 1 as it has not been enabled with **no shutdown** command.

b) Were all access ports assigned to the correct VLANs? If not, list the missing or incorrect assignments.
(2 marks)

No, not all access ports were assigned to the correct vlan.

- Interface G1/0/7, access mode meant to be enabled and assigned to VLAN 10 which this is currently default assigned to VLAN 1.
- Interface G1/0/5 and G1/0/11 currently is on **switchport mode access** but it is meant to be in trunk mode.

Q2. Regarding S4's VLAN Database,

a) Were there any VLANs numbers or names missing in the output? If so, list them.
(2 marks)

Yes. Switchport access VLAN 10 without configuring it in Switch 4, therefore it's automatically created VLAN 10 under the name VLAN0010 instead of R&D. Furthermore, VLAN 1 should be up running, as **no shutdown** command is required to use.

b) Were all access ports assigned to the correct VLANs? If not, list the missing or incorrect assignments.
(2 marks)

No, not all access ports were assigned to the correct vlan.

- Interface G1/0/24 should be assigned to VLAN 20 rather than VLAN 10.

- Interface G0/0/1 is disabled and should be enabled

- Sub-interface G0/0/1.1 is configured with the wrong encapsulation ID:11 instead of 1

- Sub interface G0/0/1.10 is configured with the wrong ip address: 192.168.11.1/24 instead of 192.168.10.1/24

Q3. Regarding Trunking configuration,

a) Based on the topology diagram, which port(s) on S3 should operate in trunking mode? (2 marks)

   G1/0/11 and G1/0/5 should be in trunk mode.

b) Based on the topology diagram, which port(s) on S4 should operate in trunking mode? (2 marks)

   G1/0/5 should be in trunk mode.

c) Were all ports that should operate in truncking mode configured correctly? If not, list the configuration issues you found
(4 marks)

   S3: G1/0/5 should be in trunk mode rather than access mode.

   S4: Correct.

Section 6: Troubleshooting and Re-configuration Commands (18 marks)

Q1. 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.
(3 marks for each correct issue)

Note: VLAN 10 name on S4 is wrong but it is not required to re-configured.

Device	Configuration Issue	Troubleshooting Command(s)	Re-Configuration Command(s)
R1	192.168.1.1 192.168.10.1 192.168.20.1 Those from the routeing table, they were absent. - G0/0/1 interface is not active	sh ip route	R1(config)#int g0/0/1 R1(config-if)#no shutdown R1(config-if)#exit
R1	- Wrong ip address has been assigned to sub-interface G0/0/1.10.	sh run	R1(config)#int g0/0/1.10 R1(config-if)#ip address 192.168.10.1 255.255.255.0 R1(config-if)#exit
R1	- Sub-interface of G0/0/1.1 encapsulation dot1Q	sh run	R1(config)#int g0/0/1.1 R1(config-if)#encapsulation dot1Q 1 R1(config-if)#exit

	has been misconfigured		
S3	- G1/0/7 hasn't been assigned to vlan 10 as an access port	sh vl br	S3(config)#int g1/0/7 S3(config-if)#switchport mode access S3(config-if)#switchport access VLAN 10 S3(config-if)#exit
S3	- Vlan 20 is missing	sh vl br	S3(config)#vlan 20 S3(config-if)#name Engineering S3(config-if)#exit
S3	- Interface G1/0/5 is incorrectly configured as access mode	sh int trunk	S3(config)# int gi1/0/5 S3(config-if)# switchport mode trunk S3(config-if)#exit
S4	- G1/0/24 hasn't been assigned to vlan 20 as an access port	sh ip int br	S4(config)#int g1/0/24 S4(config-if)#switchport mode access S4(config-if)#switchport access VLAN 20 S4(config-if)#exit
S3 S4	- Vlan 1 interface has not been enabled	sh ip int br	S3(config)#int vlan 1 S3(config-if)#no shutdown S3(config-if)#exit

			---------- S4(config)#int vlan 1 S4(config-if)#no shutdown S4(config-if)#exit

Section 7: Connectivity Scenarios (6 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 are able to ping each other and this traffic doesn't need to tranverse R1 as both ip address on either switch are in management vlan 1, and the connection between S3 and S4 are connected by trunk port.

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

Yes, as S3's default gateway is the router sub-interface G0/0/1.1. The packets from VLAN 1 are sent to R1's VLAN 1 sub-interface at port G0/0/1 via the default gateway in order for S3 to ping. The router then detaches the VLAN ID 1 tag and affixes the destination's VLAN ID. As a result, S3 may ping the loopback interface and all router sub-interfaces.

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

Yes, as S4's default gateway is the router sub-interface G0/0/1.1. The packets from VLAN 1 are sent to R1's VLAN 1 sub-interface at port G0/0/1 via the default gateway in order for S4 to ping. The router then detaches the VLAN ID 1 tag and affixes the destination's VLAN ID. As a result, S4 may ping the loopback interface and all router sub-interfaces.

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

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

G0/0/1.10 sub-interface on R1 for VLAN 10 has the following IP address: 192.168.10.1. Therefore the default gateway on PC-A should be 192.168.10.1

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

G0/0/1.20 sub-interface on R1 for VLAN 10 has the following IP address: 192.168.20.1. Therefore the default gateway on PC-B should be 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)

Yes, both can ping each other and as PC-A (VLAN 10) and PC-B (VLAN 20) are on separate VLANs. They must thus pass via the layer 3 routeing device (R1) to communicate between VLANs. As a result, the packet travels through R1.