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. 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)

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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 we configured trunking on interface g1/0/5. Which created a trunk link between S3 and S4.

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

   ● Yes, because the g1/0/7 interface is in VLAN 10 and so is the PC, additionally, they are also on the same subnet.

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

   ● No, because they do not belong on the same subnet and a routing table was not created.

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

   ● Yes, because they are on the same subnet.

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

   ● No, since they belong on different subnet and the router has not been configured with a routing table yet.

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)

   ● 2 networks, they are:
       ○ 192.168.10.0/24
       ○ 192.168.20.0/24

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

   ● Yes, since we have configured a routing table for the router, we have set up the inter-vlan, which allow all devices to ping one another.

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 PC-A and PC-B belongs to different VLAN, they need to rely on the routing table on the router to be able to communicate.

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, since they both belong to VLAN 10, they don't need to rely on Router.

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)

- 1 network, its IP is: 192.168.20.0/24

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 still have the trunk link.

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, since PC-A communication to Router is cut off, it can no longer send packets to the Router, thus the router cannot route packets to PC-B.

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)

- 4 networks, they are:
  - 192.168.1.0/24
  - 192.168.10.0/24
  - 192.168.20.0/24
  - 209.165.200.0/24

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

- Yes, but it would not need to traverse R1

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

- Yes, and this traffic traverse R1 due to the fact that these devices are in different VLANs.

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

- To verify connectivity and test reachability from the router's perspective (i.e. from its interfaces).

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)

- Only the Loopback network, its IP: 209.165.200.0/24

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 and IP address to it?
    (1 mark)

●   To assists management functions and enables the switch to act as a default gateway for devices within the VLAN.

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

●   It allows the switch to forward traffic to destinations outside its own subnet or VLAN.

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 default gateway IP address should be that of the router connecting the switch to other networks.

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 main advantage of this topology is the fact that it utilizes only a single physical interface, this leads to the following benefits.
    ○   **Cost-effectiveness**: reducing hardware costs compared to per-interface routing, which necessitates dedicated interfaces for each VLAN.
    ○   **Simplified configuration**: as only one physical interface needs to be configured for routing, it is easier to set up and manage configurations compared to configuring multiple interfaces for per-interface routing.
    ○   **Efficient resource utilization**: the router's resources are efficiently utilized by allowing it to handle inter-VLAN traffic through a single interface, freeing up additional resources for other tasks.

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

- Since only one physical interface is used, it can be the drawback of this topology due to the following reasons:
  - **Potential performance bottleneck**: it may become a performance bottleneck, especially in high-traffic environments, whereas per-interface topology could potentially avoid this problem.

  - **Limited bandwidth**: The single physical interface used in "router-on-a-stick" is limited by its bandwidth capacity, which may not be sufficient for handling large amounts of inter-VLAN traffic compared to per-interface routing, which allows for dedicated interfaces with varying bandwidth capacities.

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)

- In a router-on-a-stick topology, the link between the switch and the router is usually a trunk link.
- The trunk link allows the router to receive and forward the specified VLAN (VLAN 99, in this case) over the trunk link. The switch must also be configured to allow VLAN 99 on the trunk link for communication to work properly.

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, Local route

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)

- + 192.168.1.0/24 on GigabitEthernet0/0/1/1.1
- + 192.168.11.0/24 on GigabitEthernet0/0/1/1.10
- + 192.168.20.0/24 on GigabitEthernet0/0/1.20

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)

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

● Interface g0/0/1.1 is assigned to VLAN 11 instead of VLAN 1

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)

● VLAN20

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

● VLAN10 should be assigned with GigabitEthernet 1/0/7

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

● vlan10

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

● Interface GigabitEthernet should be assigned to VLAN 10

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

● Interface GigabitEthernet1/0/5 and interface GigabitEthernet1/0/11 should operate in trunking mode

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

● Interface GigabitEthernet1/0/5

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

● No, Interface GigabitEthernet1/0/5 and interface GigabitEthernet1/0/11 should operate in trunking 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	Main interface g0/0/1 is down, hence its sub-interfaces are down too	R1# show ip route	R1(config)# Interface g0/0/1 R1(config-if)# no shutdown
R1	Ip of interface g0/0/1.10 is 192.168.11.1 instead of the correct 192.168.10.1	R1# show ip route	R1(config)# Interface g0/0/1.10 R1(config-if)# ip address 192.168.10.1
R1	Encapsulation of interface g0/0/1.1 is 11 instead of the correct 1	R1# show running-config	R1(config)# Interface g0/0/1.1 R1(config-if) encapsulation dot1q 1
S3	Interface Gig1/0/7 should be in VLAN10 instead of the default VLAN1	S3# show vlan brief	S3(config)# interface g1/0/7 S3(config-if)# switchport mode access S3(config-if)# switchport access vlan 10
S3	g1/0/5 should also be present as trunk port but isn't	S3# show interface trunk	S3(config)# interface g1/0/5 S3(config-if)# switchport mode trunk
S4	Interface g1/0/24 should be in VLAN20 instead of VLAN10	S4# show vlan brief	S4(config)# interface g1/0/24 S4(config-if)# switchport mode access S4(config-if)# switchport access vlan 20

| S4 | VLAN 10 missing name R&D | S4# show vlan brief | S4(config)# vlan 10 S4(config-vlan)# name R&D |

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 each other.
- No, because both switches are on the same subnet.

b) Can S3 and S4 ping all router sub-interfaces and loopback interface? Give reasons for your answer. (1 mark)
- Yes, because the R1 has been correctly configured and it's a trunk based inter-VLAN routing.

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)

- It's 192.168.10.1

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

- It's 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, because the R1 interfaces are correctly configured.
- Yes, because the two PCs are not in the same VLAN, so the R1 is necessary.

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, because they are not on the same network, and without VLAN 20, there is no route from PC-B to R1.

b) Would PC-A ping R1's loopback interface? Give reasons for your answer. (1 mark)

- Yes, because PC-A is in VLAN 10, which is routed to R1, and an inter-VLAN route is setup.

    c) Would PC-B ping R1's loopback interface? Give reasons for your answer.(1 mark)

- No because they are not in the same network and without VLAN 20 there is no route from PC-B to R1

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)

- Yes, because there is inter-VLAN route and both PCs have default gateway set up.