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) (Hiếu)

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)

```
S3> ena
S3# ping 192.168.10.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.12, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

S3#
```

```
S4> ena
S4# ping 192.168.10.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.11, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

S4#
```

=> S3 can ping S4 can ping each other because interface GigabitEthernet1/0/5 is configured as a trunk port.

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

```
S3# ping 192.168.10.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

S3#
```

```
C:\> ping 192.168.10.11

Pinging 192.168.10.11 with 32 bytes of data:

Reply from 192.168.10.11: bytes=32 time<1ms TTL=255
Reply from 192.168.10.11: bytes=32 time<1ms TTL=255
Reply from 192.168.10.11: bytes=32 time<1ms TTL=255
Reply from 192.168.10.11: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

=> S3 and PC-A can ping each other because both of them are in the same VLAN (VLAN 10)

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

```
S3# ping 192.168.20.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

S3#
```

=> S3 cannot ping PC-B because they are in different subnet.

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

```
S4# ping 192.168.10.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.3, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/1 ms

S4#
```

```
C:\> ping 192.168.10.12

Pinging 192.168.10.12 with 32 bytes of data:

Reply from 192.168.10.12: bytes=32 time<1ms TTL=255
Reply from 192.168.10.12: bytes=32 time<1ms TTL=255
Reply from 192.168.10.12: bytes=32 time<1ms TTL=255
Reply from 192.168.10.12: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.10.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

=> S4 and PC-A can ping eahc other because they are in the same VLAN (VLAN 10) and are connected by the trunk port interface GigabitEthernet1/0/5

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

```
C:\> ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

=> PC-A and PC-B cannot ping each other because PC-A is in VLAN 10 and PC-B is in VLAN 20 (different subnet).

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)

```
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0/1
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0/1
     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.20.1/32 is directly connected, GigabitEthernet0/0/0

R1#
```

=> There are two directly connected networks (C) in R1's routing table:

+ 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, all devices now can ping each other because all the vlans and networks are connected to the Router through interfaces and ports.

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)

```
C:\> ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Reply from 192.168.20.3: bytes=32 time<1ms TTL=127
Reply from 192.168.20.3: bytes=32 time=1ms TTL=127
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127
Reply from 192.168.20.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

```
Cisco Packet Tracer PC Command Line 1.0
C:\> ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:

Reply from 192.168.10.3: bytes=32 time<1ms TTL=127
Reply from 192.168.10.3: bytes=32 time<1ms TTL=127
Reply from 192.168.10.3: bytes=32 time=1ms TTL=127
Reply from 192.168.10.3: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

=> PC-A and PC-B now can ping each other. Although two PCs are in different vlans, the traffic must be routed through the router

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

=> When PC-A pings S3, this traffic would not traverse R1 because they are in the same vlan.

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)

```
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.20.1/32 is directly connected, GigabitEthernet0/0/0

R1#
```

=> There is one directly connected (C) networks would there be in R1's routing table: 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)

```
S3# ping 192.168.10.12

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.12, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

S3#
```

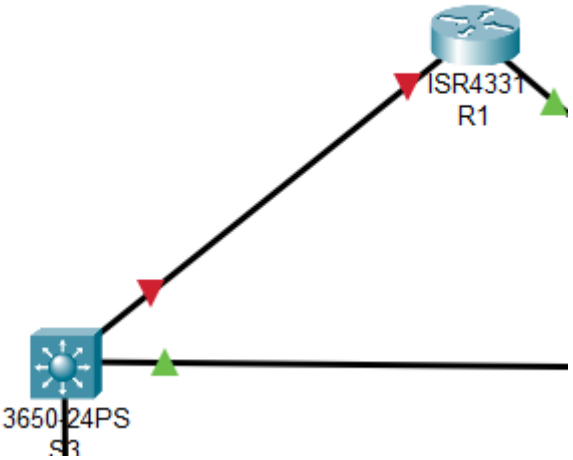
```
S4> ena
S4# ping 192.168.10.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.10.11, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

S4#
```

=> S3 and S4 can ping each other because they are connected through the trunk port interface Gi1/0/5.

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




```
C:\> ping 192.168.20.3

Pinging 192.168.20.3 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.20.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

=> PC-A and PC-B wouldn't ping each other because they are in different vlan. Moreover, the interface Gi1/0/11, which is connected between the router and Switch3, is off

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

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 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

b) 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.

c) 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.

d) 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,

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 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: **(Hoàng)**

a) On a layer 2 switch, what is the purpose of creating an interface VLAN and allocating and IP address to it?
(1 mark)

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

b) 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.

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 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: **(Hiếu)**

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

+ Cost-efficiency: It uses a single physical router interface, reducing hardware needs and costs compared to dedicating one interface per VLAN.

+ Simplified management: Centralizes inter-VLAN routing through one interface, streamlining configuration and management.

+ Scalability: Easily accommodates more VLANs without requiring additional physical router interfaces.

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

=> Yes. "Router-on-a-stick" can slow traffic, create a single point of failure, add slight delays, and make the router work harder compared to giving each network its own connection.

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)

=> Router: Divides its physical port into virtual subinterfaces, adding VLAN tags (802.1Q) to traffic for separation.

=> Switch: Sets the port to the router as a trunk, passing tagged VLAN traffic (802.1Q) and optionally handles an untagged native VLAN.

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)

```
R1> ena
R1# show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.20.1/32 is directly connected, GigabitEthernet0/0/0

R1#
```

=> No, other than directly connected (C) and local (L) networks, there are no other types of networks observed in R1's routing table.

=> The table only shows:

- **C (Connected):** 192.168.20.0/24 directly connected to GigabitEthernet0/0/0.
- **L (Local):** 192.168.20.1/32 directly connected to GigabitEthernet0/0/0.

Therefore, R1's routing table does not contain any static routes, dynamic routing protocol routes, or a default route in this particular instance.

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

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 there were networks missing from r1 routing table. They were 192.168.1.0/24, 192.168.10.0/24, 192.168.20.0/24.

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 192.168.10.0/24 is still missing and 192.168.11.0 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)

Interface gi0/0/1.1 is incorrectly assigned to vlan 11 instead of vlan 1

The ip of gi0/0/1.10 192.168.11.1 instead of 192.168.10.1

interface GigabitEthernet 0/0/1 was administratively

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)

Yes, VLAN 20 was missing.

b) Were all access ports on S3 assigned to the correct VLANs? If not, list the missing or incorrect assignments.
(1 mark)
No, GigabitEthernet1/0/7 was not assigned to VLAN 10.

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

Yes, VLAN 10 was missing

d) Were all access ports on S4 assigned to the correct VLANs? If not, list the missing or incorrect assignments.
(1 mark)
No, GigabitEthernet1/0/24 was assigned to VLAN 10 instead of VLAN 20

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

GigabitEthernet1/0/5 and 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)
GigabitEthernet1/0/5 and should operate in trunking mode.

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

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	Gi0/0/1 was down	show ip interface brief	interface gi0/0/1 no shutdown
r1	interface g0/0/1.10 have the incorrect ip address	show ip route	int gi0/0/1.10 ip address 192.168.10.1 255.255.255.0
r1	interface g0/0/1.1 assigned to wrong vlan	show interface gi0/0/0.1	int gi0/0/1.1 no encapsulation dot1q encapsulation dot1q 11
s3	no trunk identified	show int trunk	int gi1/0/5 Switchport mode dynamic desirable switchport mode trunk
s3	vlan 10 has no assigned port	show vlan brief	int gi1/0/7 switchport mode access switchport access vlan 10
s4	gi1/0/24 assigned to vlan 10 instead of 20	show vlan brief	int gi1/0/24 switchport access vlan 20

s4	vlan 1 is down	show ip interface brief	int vlan1 no shutdown
s3	vlan 1 is down	show ip interface brief	int vlan1 no shutdown

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

Q1. After fixing all configuration issues in Lab SU-6a, **(Đức Anh)**

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 s3 and s4 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 all configuration errors have been fixed and it's an trunk intervlan routing

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

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

⇒ It is 192.168.10.1

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

⇒ It is 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)

⇒ PC-A can ping to PC-B and the traffic will traverse R1 because they are not in the same VLAN and network. 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, **(Đăng)**

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

⇒ No, because in S3 without configuring VLAN20, PC A will not be able to communicate with PC B as they are on different networks.

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

⇒ Yes, because VLAN 10 still up and traffic can still traverse R1. The router R1 has a sub-interface in VLAN 10 (Gi0/0/1.10).

c) 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, **(Đăng)**

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

⇒ No. Both the switches cannot be able connect to the router so the communication between PC A and B will not be possible due to the default gateway is different.