

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ISLAMIC UNIVERSITY OF TECHNOLOGY

A SUBSIDIARY ORGAN OF OIC

LAB REPORT 2

CSE 4512: COMPUTER NETWORKING LAB

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1. Lab Task

The primary objective of this laboratory assignment was to design and implement a subnetted network to divide certain network ranges among specific groups (Sales, Marketing, Engineering, Administration, and Management).

Problem Description

- **Topology:** Five individual groups, each containing a variable number of computers.
- **Addressing Scheme:** Each lab network must follow the pattern $192.i.(i+3 \% 14).0$, where i is the last two digits of the student ID.
- **Goal:** To demonstrate full global connectivity using efficient VLSM (Variable Length Subnet Masking).

Calculations for Student ID: 25

Network Prefix Generation:

- $i = 25$

- Third octet calculation: $(25 + 3) \text{ mod } 14 = 28 \text{ mod } 14 = 0$
- **Base Network:** 192.25.0.0

Host Requirements Calculation:

1. Engineering: $E(25) = (7 \times 25 + 3) \text{ mod } 41 + 10$
 $= (175 + 3) \text{ mod } 41 + 10 = 178 \text{ mod } 41 + 10 = 14 + 10 = 24 \text{ Hosts}$
2. Marketing: $M(25) = (5 \times 25 + 11) \text{ mod } 26 + 5$
 $= (125 + 11) \text{ mod } 26 + 5 = 136 \text{ mod } 26 + 5 = 6 + 5 = 11 \text{ Hosts}$
3. Sales: $S(25) = (11 \times 25 + 7) \text{ mod } 36 + 5$
 $= (275 + 7) \text{ mod } 36 + 5 = 282 \text{ mod } 36 + 5 = 30 + 5 = 35 \text{ Hosts}$
4. Administration: $A(25) = (3 \times 25 + 17) \text{ mod } 18 + 3$
 $= (75 + 17) \text{ mod } 18 + 3 = 92 \text{ mod } 18 + 3 = 2 + 3 = 5 \text{ Hosts}$
5. Management: $G(25) = (13 \times 25 + 1) \text{ mod } 9 + 2$
 $= (325 + 1) \text{ mod } 9 + 2 = 326 \text{ mod } 9 + 2 = 2 + 2 = 4 \text{ Hosts}$

2. Subnetting Worksheet

The subnets were assigned using VLSM, ordering departments from largest host requirement to smallest to prevent IP overlap.

Department	Devices Needed	Network Address	CIDR / Mask	Usable Host Range	Broadcast Address
Sales	35	192.25.0.0	/26 (255.255.255.192)	192.25.0.1 – 192.25.0.62	192.25.0.63
Engineering	24	192.25.0.64	/27 (255.255.255.224)	192.25.0.65 – 192.25.0.94	192.25.0.95

Marketing	11	192.25.0. 96	/28 (255.255.255. 240)	192.25.0. 97 – 192.25.0. 110	192.25.0. 111
Administration	5	192.25.0. 112	/29 (255.255.255. 248)	192.25.0. 113 – 192.25.0. 118	192.25.0. 119
Management	4	192.25.0. 120	/29 (255.255.255. 248)	192.25.0. 121 – 192.25.0. 126	192.25.0. 127
Router Link 1	2	192.25.0. 128	/30 (255.255.255. 252)	192.25.0. 129 – 192.25.0. 130	192.25.0. 131
Router Link 2	2	192.25.0. 132	/30 (255.255.255. 252)	192.25.0. 133 – 192.25.0. 134	192.25.0. 135

3. Procedure: Step-by-Step Implementation

The network was configured in a three-step process: Topology Setup, Router Configuration, and PC Configuration.

3.1 Building the Physical Topology

1. **Departments:** Five distinct LANs were created.
 - o Sales & Marketing were connected to Router 0.
 - o Engineering was connected to Router 1 (Central).
 - o Administration & Management were connected to Router 2.
2. **Interconnection:**
 - o Router 0 was connected to Router 1 via a serial/gigabit link.
 - o Router 1 was connected to Router 2 via a serial/gigabit link.

3.2 Configuring the Routers (CLI)

RIPv2 was used for dynamic routing. The `no auto-summary` command was crucial to ensure the subnets (VLSM) were advertised correctly instead of the classful /24 mask.

Router RIP Configuration

```
! Configure Routing
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# no auto-summary
Router(config-router)# network 192.25.0.0
```

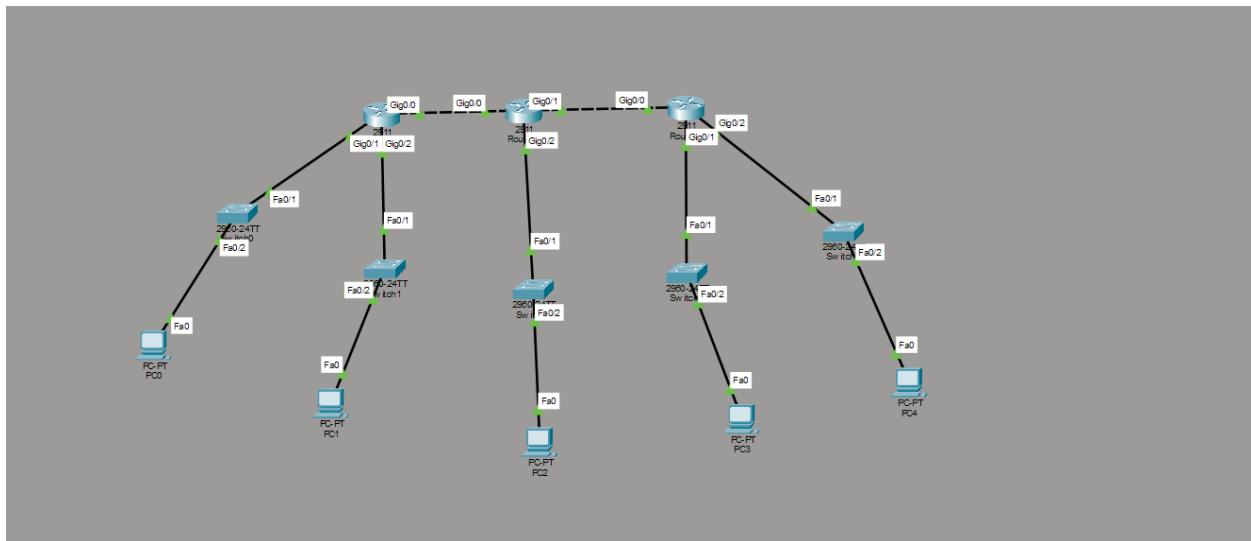
3.3 Configuring the PCs

PCs were assigned the **2nd useable IPS** in their respective subnets to avoid conflict with the gateway (first usable).

- **PC Sales:** IP 192.25.0.2, Gateway 192.25.0.1
- **PC Engineering:** IP 192.25.0.66, Gateway 192.25.0.65
- **PC Marketing:** IP 192.25.0.98, Gateway 192.25.0.97
- **PC Admin:** IP 192.25.0.114, Gateway 192.25.0.113
- **PC Management:** IP 192.25.0.126, Gateway 192.25.0.121

4. Observations & Results

Topology Screenshot



Connectivity Tests

Successful pings were observed between devices in different departments, confirming that the RIPv2 routing table successfully populated.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
Successful	PC0	PC1	ICMP	Color	0.000	N	0	(e...)	(delete)	
Successful	PC0	PC2	ICMP	Color	0.000	N	1	(e...)	(delete)	
Successful	PC0	PC4	ICMP	Color	0.000	N	2	(e...)	(delete)	
Successful	PC0	PC3	ICMP	Color	0.000	N	3	(e...)	(delete)	
Successful	PC0	PC1	ICMP	Color	0.000	N	4	(e...)	(delete)	

5. Challenges Faced

- VLSM Calculation:** Arranging the subnets to ensure no overlap occurred. Specifically, ensuring the Marketing subnet did not overlap with Sales was a critical step.
- Router Interface Limits:** Managing multiple departments on limited router interfaces required careful planning of which router hosted which department.
- RIPv2 Convergence:** Initially, pings failed (Request Timed Out) while the routers were exchanging tables. After 30 seconds, connectivity was established.