

Helwan National University (HNU)
Course Code: COM204
Course Name: Computer Networks
Instructor: Prof. Mahmoud El-Mesalawy
Teaching Assistant: Eng. Adham Ehab
Academic Year: 2024/2025
Project Title: Designing a Computer Network for Helwan National University (HNU).



Submitted by:

Name: Abanoub Shenouda Samy Zaky

ID: 932230001

Faculty: Faculty of Computer Science and Information Technology

University: Helwan National University (HNU)

Instructor:

Prof. Dr. Mahmoud El-Mesalawy

Teaching Assistant: Eng. Adham Ehab

Submission Date:

Wed 25/12/2024

Project Description:

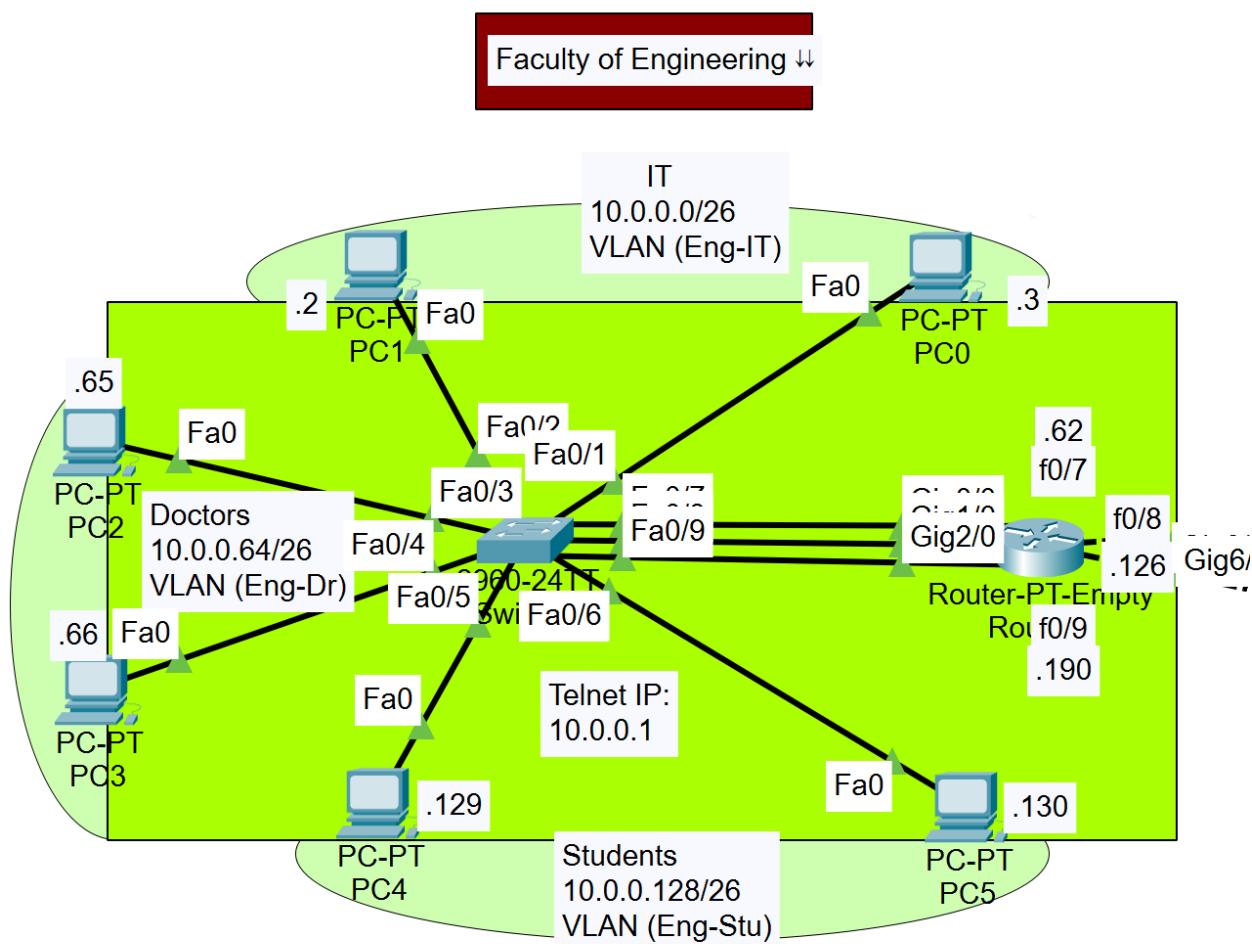
This project aims to design a **logical network topology** to connect three main buildings:

- Faculty of Engineering
- Faculty of Computer Science and Information Technology
- Faculty of Medicine

In addition to the **Administration Building** using **Cisco Packet Tracer**.



Faculty of Engineering - Network Topology



- **Subnet:** 10.0.0.0/26
- **Connected Devices:**
 - **End Devices (PCs):**

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○ **Subnetting Configuration:**

Devices	Default Gateway	Subnet Mask	VLAN	Broadcast
PC0: IP 10.0.0.3, PC1: IP 10.0.0.2	10.0.0.62	255.255.255.192	Eng-IT	10.0.0.63
PC2: IP 10.0.0.65, PC3: IP 10.0.0.66	10.0.0.126	255.255.255.192	Eng-Dr	10.0.0.127
PC4: IP 10.0.0.129, PC5: IP 10.0.0.130	10.0.0.190	255.255.255.192	Eng-Stu	10.0.0.191

● **Passwords:**

○ **-Admin password:**

⇒admin1312

○ **-User Access Verification password:**

⇒93223

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- **Subnetting for 3 Networks in Faculty Engineering:**

- First, we determined that we need to create 3 networks in the first building. The starting network address will be 10.0.0.0/26. This means that each subnet will have 62 usable devices, calculated as $2^6 - 2 = 62$.

- **VLAN 10:**

- **Network Address:** 10.0.0.0/26
 - **First Usable IP Address:** 10.0.0.1
 - **Last Usable IP Address:** 10.0.0.62
 - **Broadcast Address:** 10.0.0.63

- **VLAN 20:**

- **Network Address:** 10.0.0.64/26
 - **First Usable IP Address:** 10.0.0.65
 - **Last Usable IP Address:** 10.0.0.126
 - **Broadcast Address:** 10.0.0.127

- **VLAN 30:**

- **Network Address:** 10.0.0.128/26
 - **First Usable IP Address:** 10.0.0.129
 - **Last Usable IP Address:** 10.0.0.190
 - **Broadcast Address:** 10.0.0.191

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○ **Switch (2960-24TT):**

▪ **Fast Ethernet Ports:**

- F0/1, F0/2, F0/3, F0/4, F0/5, F0/6 connect to **6 PCs**.

▪ **Switch Configuration:**

- Changing the name of the switch:

Switch name: Faculty-Engineering-Switch

A screenshot of a terminal window titled "Switch0". The window has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" being the active tab. Below the tabs is the text "IOS Command Line Interface". The terminal window displays the following configuration commands:

```
Switch>enable
Switch#config terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Switch(config)#hostname Faculty-Engineering-Switch
Faculty-Engineering-Switch(config)#exit
Faculty-Engineering-Switch#
%SYS-5-CONFIG_I: Configured from console by console
exit
```

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- Creating The VLANs and Connecting ports to VLANs:

Switch0

Physical Config **CLI** Attributes

IOS Command Line Interf

```
Faculty-Engineering-Switch>enable
Faculty-Engineering-Switch#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Faculty-Engineering-Switch(config)#interface range f0/1, f0/2, f0/7
Faculty-Engineering-Switch(config-if-range)#switchport mode access
Faculty-Engineering-Switch(config-if-range)#switchport access vlan 10
Faculty-Engineering-Switch(config-if-range)#interface range f0/3, f0/4, f0/8
Faculty-Engineering-Switch(config-if-range)#switchport mode access
Faculty-Engineering-Switch(config-if-range)#switchport access vlan 20
Faculty-Engineering-Switch(config-if-range)#interface range f0/5, f0/6, f0/9
Faculty-Engineering-Switch(config-if-range)#switchport mode access
Faculty-Engineering-Switch(config-if-range)#switchport access vlan 30
Faculty-Engineering-Switch(config-if-range)#do show vlan brief



| VLAN | Name               | Status | Ports                                                                                                                                          |
|------|--------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | default            | active | Fa0/10, Fa0/11, Fa0/12, Fa0/13<br>Fa0/14, Fa0/15, Fa0/16, Fa0/17<br>Fa0/18, Fa0/19, Fa0/20, Fa0/21<br>Fa0/22, Fa0/23, Fa0/24, Gig0/1<br>Gig0/2 |
| 10   | Eng-IT             | active | Fa0/1, Fa0/2, Fa0/7                                                                                                                            |
| 20   | Eng-Dr             | active | Fa0/3, Fa0/4, Fa0/8                                                                                                                            |
| 30   | Eng-Stu            | active | Fa0/5, Fa0/6, Fa0/9                                                                                                                            |
| 1002 | fdmi-default       | active |                                                                                                                                                |
| 1003 | token-ring-default | active |                                                                                                                                                |
| 1004 | fdmnet-default     | active |                                                                                                                                                |
| 1005 | trnet-default      | active |                                                                                                                                                |


Faculty-Engineering-Switch(config-if-range)#

```

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- Changing the name of the VLANs:

A screenshot of a terminal window titled "Switch0". The window has tabs at the top: "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the tabs, it says "IOS Command Line Interface". The terminal displays the following configuration commands:

```
Faculty-Engineering-Switch(config)#vlan 10
Faculty-Engineering-Switch(config-vlan)#name Eng-IT
Faculty-Engineering-Switch(config-vlan)#vlan 20
Faculty-Engineering-Switch(config-vlan)#name Eng-Dr
Faculty-Engineering-Switch(config-vlan)#vlan 30
Faculty-Engineering-Switch(config-vlan)#name Eng-Stu
Faculty-Engineering-Switch(config-vlan)#exit
```

- **Router:**

- Gigabit Ethernet Port (Gig0/0, Gig1/0, Gig2/0) connects to the switch.
- Fast Ethernet ports (f0/7, f0/8, f0/9) are ready for further configurations.
- Definition of networks:
 - IT: 10.0.0.0/26
 - Doctors: 10.0.0.64/26
 - Students: 10.0.0.128/26



■ Static Routing:

- Connected Faculty Engineering with Faculty CS.
- $10.0.0.0 \rightleftarrows 11.0.0.0$

Router0

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Abanoub-Engineering(config)#ip route 11.0.0.0 255.255.255.192 giga
% Incomplete command.
Abanoub-Engineering(config)#ip route 11.0.0.0 255.255.255.192 gigabitEthernet 3/0
Abanoub-Engineering(config)#exit
Abanoub-Engineering#
%SYS-5-CONFIG_I: Configured from console by console

Abanoub-Engineering#write memory
Building configuration...
[OK]
Abanoub-Engineering#show ip route
Codes: C - connected, S - static, I - IGRP, 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

  10.0.0.0/26 is subnetted, 3 subnets
C    10.0.0.0 is directly connected, GigabitEthernet0/0
C    10.0.0.64 is directly connected, GigabitEthernet1/0
C    10.0.0.128 is directly connected, GigabitEthernet2/0
  11.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R    11.0.0.0/8 [120/1] via 20.0.0.2, 00:00:16, GigabitEthernet3/0
S    11.0.0.0/26 is directly connected, GigabitEthernet3/0
R    12.0.0.0/8 [120/2] via 20.0.0.2, 00:00:16, GigabitEthernet3/0
          [120/2] via 23.0.0.2, 00:00:02, GigabitEthernet6/0
  20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R    20.0.0.0/8 is possibly down, routing via 23.0.0.2, GigabitEthernet6/0
C    20.0.0.0/26 is directly connected, GigabitEthernet3/0
R    21.0.0.0/8 [120/1] via 20.0.0.2, 00:00:16, GigabitEthernet3/0
R    22.0.0.0/8 [120/1] via 23.0.0.2, 00:00:02, GigabitEthernet6/0
  23.0.0.0/26 is subnetted, 1 subnets
C    23.0.0.0 is directly connected, GigabitEthernet6/0
```



■ **Dynamic Routing:**

- Using RIP:

A screenshot of a terminal window titled "Router0" showing the IOS Command Line Interface. The window has a purple header bar with the title and standard window controls. The main area displays the following configuration commands:

```
Abanoub-Engineering>enable
Abanoub-Engineering#config terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Abanoub-Engineering(config)#router rip
Abanoub-Engineering(config-router)#version 2
Abanoub-Engineering(config-router)#network 10.0.0.0
Abanoub-Engineering(config-router)#network 20.0.0.0
Abanoub-Engineering(config-router)#network 23.0.0.0
Abanoub-Engineering(config-router)#

```

The interface shows standard Cisco-style command-line syntax and configuration levels.

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▪ Routing Table:

Routing Table for Router0

Type	Network	Port	Next Hop IP	Metric
C	10.0.0.0/26	GigabitEthernet0/0 ---	0/0	
C	10.0.0.64/26	GigabitEthernet1/0 ---	0/0	
C	10.0.0.128/26	GigabitEthernet2/0 ---	0/0	
R	11.0.0.0/8	GigabitEthernet3/0	20.0.0.2	120/1
S	11.0.0.0/26	GigabitEthernet3/0 ---	1/0	
R	12.0.0.0/8	GigabitEthernet3/0	20.0.0.2	120/2
R	12.0.0.0/8	GigabitEthernet6/0	23.0.0.2	120/2
R	20.0.0.0/8	GigabitEthernet6/0	23.0.0.2	120/3
C	20.0.0.0/26	GigabitEthernet3/0 ---	0/0	
R	21.0.0.0/8	GigabitEthernet3/0	20.0.0.2	120/1
R	22.0.0.0/8	GigabitEthernet6/0	23.0.0.2	120/1
C	23.0.0.0/26	GigabitEthernet6/0 ---	0/0	
R	100.0.0.0/8	GigabitEthernet6/0	23.0.0.2	120/1



▪ Telnet Access:

- Telnet IP:

10.0.0.1

.1 ⇒ Because my ID ends with 001

A screenshot of a Windows-style terminal window titled "Switch0". The window has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" being the active tab. The title bar also shows "Switch0". The main area is labeled "IOS Command Line Interface". The terminal displays the following configuration commands:

```
Faculty-Engnieering-Switch#config terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Faculty-Engnieering-Switch(config)#interface vlan 10
Faculty-Engnieering-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10,
changed state to up

Faculty-Engnieering-Switch(config-if)#ip address
10.0.0.1 255.255.255.192
Faculty-Engnieering-Switch(config-if)#no shutdown
Faculty-Engnieering-Switch(config-if)#exit
Faculty-Engnieering-Switch(config)#line vty 0 4
Faculty-Engnieering-Switch(config-line)#password 93223
Faculty-Engnieering-Switch(config-line)#login
Faculty-Engnieering-Switch(config-line)#exit
Faculty-Engnieering-Switch(config)#enable
% Incomplete command.
Faculty-Engnieering-Switch(config)#enable secret
admin1312
Faculty-Engnieering-Switch(config)#service password-
encryption
```

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PC1

Physical Config Desktop Programming Attributes

Command Prompt X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 10.0.0.1
Trying 10.0.0.1 ...Open

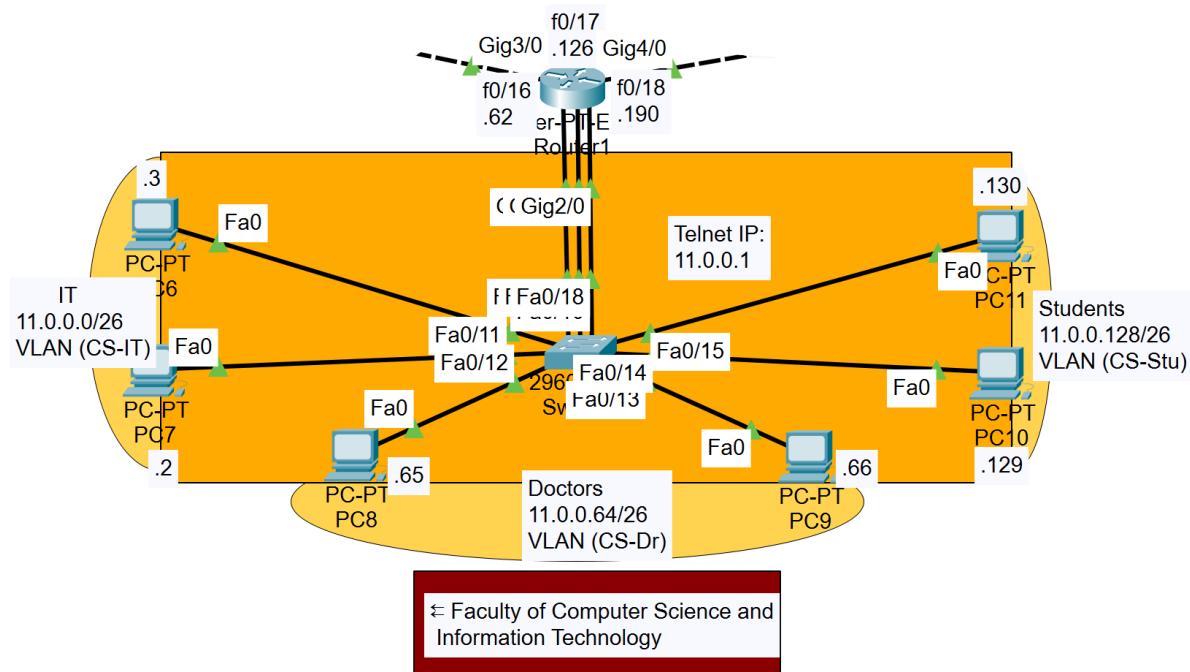
User Access Verification

Password:
Abanoub-Engnieering-Switch>enable
Password:
Abanoub-Engnieering-Switch#exit

[Connection to 10.0.0.1 closed by foreign host]
C:\>
```



Faculty of Computer Science and Information Technology - Network Topology



- **Subnet: 11.0.0.0/26**
- **Connected Devices:**
 - **End Devices (PCs):**

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○ **Subnetting Configuration:**

Devices	Default Gateway	subnet mask	VLAN	Broadcast
PC6: IP 11.0.0.3, PC7: IP 11.0.0.2	11.0.0.62	255.255.255.192	CS-IT	11.0.0.63
PC8: IP 11.0.0.65, PC9: IP 11.0.0.66	11.0.0.126	255.255.255.192	CS-Dr	11.0.0.127
PC10: IP 11.0.0.129, PC11: IP 11.0.0.130	11.0.0.190	255.255.255.192	CS-Stu	11.0.0.191

● **Passwords:**

○ **-Admin password:**

⇒admin1312

○ **-User Access Verification password:**

⇒93223

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- **Subnetting for 3 Networks in Faculty CS:**

- First, we determined that we need to create 3 networks in the first building. The starting network address will be 11.0.0.0/26. This means that each subnet will have 62 usable devices, calculated as $2^6 - 2 = 62$.

- **VLAN 10:**

- **Network Address:** 11.0.0.0/26
 - **First Usable IP Address:** 11.0.0.1
 - **Last Usable IP Address:** 11.0.0.62
 - **Broadcast Address:** 11.0.0.63

- **VLAN 20:**

- **Network Address:** 11.0.0.64/26
 - **First Usable IP Address:** 11.0.0.65
 - **Last Usable IP Address:** 11.0.0.126
 - **Broadcast Address:** 11.0.0.127

- **VLAN 30:**

- **Network Address:** 11.0.0.128/26
 - **First Usable IP Address:** 11.0.0.129
 - **Last Usable IP Address:** 11.0.0.190
 - **Broadcast Address:** 11.0.0.191

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- **Switch (2960-24TT):**

- **Fast Ethernet Ports:**

- F0/10, F0/11, F0/12, F0/13, F0/14, F0/15 connect to **6 PCs**.

- **Switch Configuration:**

- Changing the name of the switch:

A screenshot of a terminal window titled "Switch1". The window has tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" being the active tab. Below the tabs, it says "IOS Command Line Interface". The terminal window displays the following configuration commands:

```
Switch>enable
Switch#config terminal
Enter configuration commands, one per line. End with
CTRL/Z.
Switch(config)#hostname Faculty-ComputerScience-Switch
Faculty-ComputerScience-Switch(config)#exit
Faculty-ComputerScience-Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

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- Creating The VLANs and Connecting ports to VLANs:

Switch1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

Faculty-ComputerScience-Switch>enable
Faculty-ComputerScience-Switch#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Faculty-ComputerScience-Switch(config)#interface range f0/10, f0/11, f0/16
Faculty-ComputerScience-Switch(config-if-range)#switchport mode access
Faculty-ComputerScience-Switch(config-if-range)#switchport access vlan 10
Faculty-ComputerScience-Switch(config-if-range)#interface range f0/12, f0/13, f0/17
Faculty-ComputerScience-Switch(config-if-range)#switchport mode access
Faculty-ComputerScience-Switch(config-if-range)#switchport access vlan 20
Faculty-ComputerScience-Switch(config-if-range)#interface range f0/14, f0/15, f0/18
Faculty-ComputerScience-Switch(config-if-range)#switchport mode access
Faculty-ComputerScience-Switch(config-if-range)#switchport access vlan 30
Faculty-ComputerScience-Switch(config-if-range)#do show vlan brief



| VLAN Name               | Status | Ports                                                                                                                                 |
|-------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1 default               | active | Fa0/1, Fa0/2, Fa0/3, Fa0/4<br>Fa0/5, Fa0/6, Fa0/7, Fa0/8<br>Fa0/9, Fa0/19, Fa0/20, Fa0/21<br>Fa0/22, Fa0/23, Fa0/24, Gig0/1<br>Gig0/2 |
| 10 CS-IT                | active | Fa0/10, Fa0/11, Fa0/16                                                                                                                |
| 20 CS-Dr                | active | Fa0/12, Fa0/13, Fa0/17                                                                                                                |
| 30 CS-Stu               | active | Fa0/14, Fa0/15, Fa0/18                                                                                                                |
| 1002 fddi-default       | active |                                                                                                                                       |
| 1003 token-ring-default | active |                                                                                                                                       |
| 1004 fddinet-default    | active |                                                                                                                                       |
| 1005 trnet-default      | active |                                                                                                                                       |


Faculty-ComputerScience-Switch(config-if-range)#
  
```

- Changing the name of the VLANs:

Switch1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

Faculty-ComputerScience-Switch(config)#vlan 10
Faculty-ComputerScience-Switch(config-vlan)#name CS-IT
Faculty-ComputerScience-Switch(config-vlan)#vlan 20
Faculty-ComputerScience-Switch(config-vlan)#name CS-Dr
Faculty-ComputerScience-Switch(config-vlan)#vlan 30
Faculty-ComputerScience-Switch(config-vlan)#name CS-Stu
Faculty-ComputerScience-Switch(config-vlan)#exit
  
```

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○ **Router:**

- Gigabit Ethernet Port (Gig0/0, Gig1/0, Gig2/0) connects to the switch.
- Fast Ethernet ports (f0/16, f0/17, f0/18) are configured for future device connections.
- Definition of networks:
 - IT: 11.0.0.0/26
 - Doctors: 11.0.0.64/26
 - Students: 11.0.0.128/26



■ **Static Routing:**

- Connected Faculty CS with Faculty Engineering.
- $11.0.0.0 \leftrightarrow 10.0.0.0$

Router1

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Abanoub-ComputerScience(config)#ip route 10.0.0.0 255.255.255.192 gigabitEthernet 3/0
Abanoub-ComputerScience(config)#exit
Abanoub-ComputerScience#
%SYS-5-CONFIG_I: Configured from console by console

Abanoub-ComputerScience#write memory
Building configuration...
[OK]
Abanoub-ComputerScience#show ip route
Codes: C - connected, S - static, I - IGRP, 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

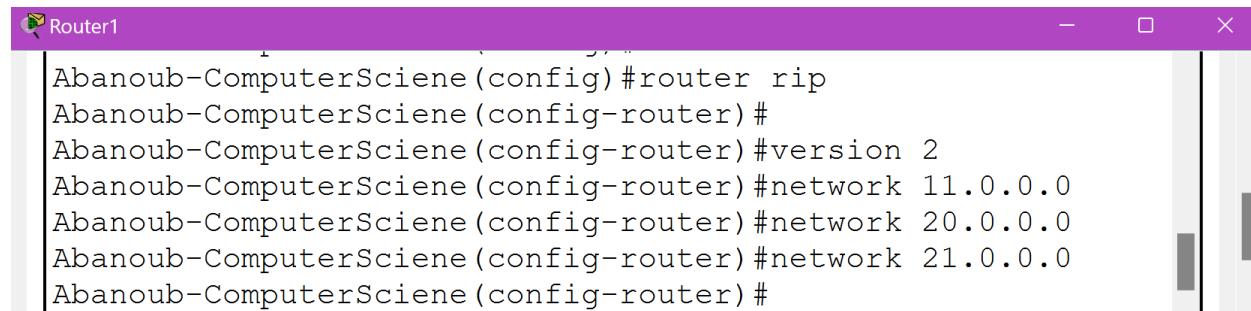
Gateway of last resort is not set

      10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
R        10.0.0.0/8 [120/1] via 20.0.0.1, 00:00:15, GigabitEthernet3/0
S        10.0.0.0/24 is directly connected, GigabitEthernet3/0
S        10.0.0.0/26 is directly connected, GigabitEthernet3/0
      11.0.0.0/26 is subnetted, 3 subnets
C          11.0.0.0 is directly connected, GigabitEthernet0/0
C          11.0.0.64 is directly connected, GigabitEthernet1/0
C          11.0.0.128 is directly connected, GigabitEthernet2/0
R        12.0.0.0/8 [120/1] via 21.0.0.1, 00:00:24, GigabitEthernet4/0
      20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
R        20.0.0.0/8 is possibly down, routing via 20.0.0.1, GigabitEthernet3/0
C        20.0.0.0/26 is directly connected, GigabitEthernet3/0
      21.0.0.0/26 is subnetted, 1 subnets
C          21.0.0.0 is directly connected, GigabitEthernet4/0
R        22.0.0.0/8 [120/1] via 21.0.0.1, 00:00:24, GigabitEthernet4/0
R        23.0.0.0/8 [120/1] via 20.0.0.1, 00:00:15, GigabitEthernet3/0
R        100.0.0.0/8 [120/2] via 20.0.0.1, 00:00:15, GigabitEthernet3/0
```



▪ **Dynamic Routing:**

- Using RIP:



A screenshot of a Windows-style terminal window titled "Router1". The window contains the following configuration commands for RIP:

```
Abanoub-ComputerSciene(config)#router rip
Abanoub-ComputerSciene(config-router)#
Abanoub-ComputerSciene(config-router)#version 2
Abanoub-ComputerSciene(config-router)#network 11.0.0.0
Abanoub-ComputerSciene(config-router)#network 20.0.0.0
Abanoub-ComputerSciene(config-router)#network 21.0.0.0
Abanoub-ComputerSciene(config-router)#

```

▪ **Routing Table:**

Routing Table for Router1					
Type	Network	Port	Next Hop IP	Metric	
R	10.0.0.0/8	GigabitEthernet3/0	20.0.0.1	120/1	
S	10.0.0.0/24	GigabitEthernet3/0	---	1/0	
S	10.0.0.0/26	GigabitEthernet3/0	---	1/0	
C	11.0.0.0/26	GigabitEthernet0/0	---	0/0	
C	11.0.0.64/26	GigabitEthernet1/0	---	0/0	
C	11.0.0.128/26	GigabitEthernet2/0	---	0/0	
R	12.0.0.0/8	GigabitEthernet4/0	21.0.0.1	120/1	
R	20.0.0.0/8	GigabitEthernet4/0	21.0.0.1	120/3	
C	20.0.0.0/26	GigabitEthernet3/0	---	0/0	
C	21.0.0.0/26	GigabitEthernet4/0	---	0/0	
R	22.0.0.0/8	GigabitEthernet4/0	21.0.0.1	120/1	
R	23.0.0.0/8	GigabitEthernet3/0	20.0.0.1	120/1	
R	100.0.0.0/8	GigabitEthernet3/0	20.0.0.1	120/2	
R	100.0.0.0/8	GigabitEthernet4/0	21.0.0.1	120/2	



▪ **Telnet Access:**

- Telnet IP:

11.0.0.1

.1 ⇒ Because my ID ends with 001

A screenshot of a terminal window titled "Switch1". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". The title bar also shows "IOS Command Line Interface". The main area displays the following Cisco IOS configuration command history:

```
Faculty-Computer-Science-Switch(config)#interface vlan 10
Faculty-Computer-Science-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10,
changed state to up

Faculty-Computer-Science-Switch(config-if)#ip address 11.0.0.1 255.255.255.192
Faculty-Computer-Science-Switch(config-if)#no shutdown
Faculty-Computer-Science-Switch(config-if)#exit
Faculty-Computer-Science-Switch(config)#line vty 0 4
Faculty-Computer-Science-Switch(config-line)#password 93223
Faculty-Computer-Science-Switch(config-line)#login
Faculty-Computer-Science-Switch(config-line)#exit
Faculty-Computer-Science-Switch(config)#enable secret admin1312
Faculty-Computer-Science-Switch(config)#service
password-encryption

^
% Invalid input detected at '^' marker.

Faculty-Computer-Science-Switch(config)#service
password-encryption
Faculty-Computer-Science-Switch(config)#exit
Faculty-Computer-Science-Switch#
```

Helwan National University (HNU)

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Course Name: Computer Networks

Instructor: Prof. Mahmoud El-Mesalawy

Teaching Assistant: Eng. Adham Ehab

Academic Year: 2024/2025

Project Title: Designing a Computer Network for Helwan National University (HNU).

A screenshot of a Windows desktop window titled "PC6". The window contains a terminal-like application with a blue header bar labeled "Command Prompt" and a red "X" button. The main area shows a Cisco Packet Tracer Command Line session. The output is as follows:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 11.0.0.1
Trying 11.0.0.1 ...Open

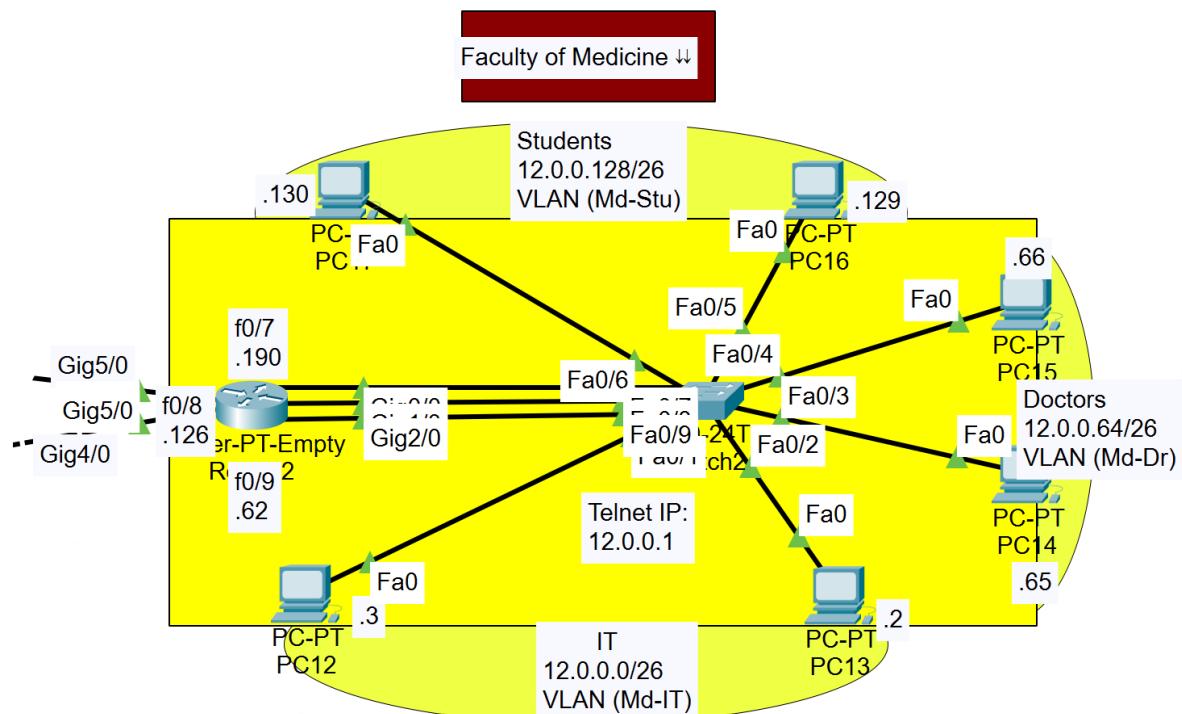
User Access Verification

Password:
Password:
Abanoub-ComputerScience-Switch>enable
Password:
Abanoub-ComputerScience-Switch#exit

[Connection to 11.0.0.1 closed by foreign host]
C:\>
```



Faculty of Medicine - Network Topology



- **Subnet:** 12.0.0.0/26
 - **Connected Devices:**
 - End Devices (PCs):

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Course Code: COM204

Course Name: Computer Networks

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Teaching Assistant: Eng. Adham Ehab

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Project Title: Designing a Computer Network for Helwan National University (HNU).



○ **Subnetting Configuration:**

Devices	Default Gateway	subnet mask	VLAN	Broadcast
PC12: IP 12.0.0.3, PC13: IP 12.0.0.2	12.0.0.62	255.255.255.192	Md-IT	12.0.0.63
PC14: IP 12.0.0.65, PC15: IP 12.0.0.66	12.0.0.126	255.255.255.192	Md-Dr	12.0.0.127
PC16: IP 12.0.0.129, PC17: IP 12.0.0.130	12.0.0.190	255.255.255.192	Md-Stu	12.0.0.191

● **Passwords:**

○ **-Admin password:**

⇒admin1312

○ **-User Access Verification password:**

⇒93223

Helwan National University (HNU)

Course Code: COM204

Course Name: Computer Networks

Instructor: Prof. Mahmoud El-Mesalawy

Teaching Assistant: Eng. Adham Ehab

Academic Year: 2024/2025

Project Title: Designing a Computer Network for Helwan National University (HNU).



- **Subnetting for 3 Networks in Faculty Engineering:**

- First, we determined that we need to create 3 networks in the first building. The starting network address will be 12.0.0.0/26. This means that each subnet will have 62 usable devices, calculated as $2^6 - 2 = 62$.

- **VLAN 10:**

- **Network Address:** 12.0.0.0/26
 - **First Usable IP Address:** 12.0.0.1
 - **Last Usable IP Address:** 12.0.0.62
 - **Broadcast Address:** 12.0.0.63

- **VLAN 20:**

- **Network Address:** 12.0.0.64/26
 - **First Usable IP Address:** 12.0.0.65
 - **Last Usable IP Address:** 12.0.0.126
 - **Broadcast Address:** 12.0.0.127

- **VLAN 30:**

- **Network Address:** 12.0.0.128/26
 - **First Usable IP Address:** 12.0.0.129
 - **Last Usable IP Address:** 12.0.0.190
 - **Broadcast Address:** 12.0.0.191

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Teaching Assistant: Eng. Adham Ehab

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Project Title: Designing a Computer Network for Helwan National University (HNU).



○ **Switch (2960-24TT):**

▪ **Fast Ethernet Ports:**

- F0/1, F0/2, F0/3, F0/4, F0/5, F0/6 connect to **6 PCs**.

▪ **Switch Configuration:**

- Changing the name of the switch:

A screenshot of a terminal window titled "Switch2". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the tabs, it says "IOS Command Line Interface". The terminal window displays the following configuration commands:

```
Switch>enable
Switch#config terminal
Enter configuration commands, one per line. End with
CTRL/Z.
Switch(config) #hostname Faculty-Medicine-Switch
Faculty-Medicine-Switch(config)#exit
Faculty-Medicine-Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

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- Creating The VLANs and Connecting ports to VLANs:

Switch2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Faculty-Medicine-Switch>enable
Faculty-Medicine-Switch#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Faculty-Medicine-Switch(config)#interface range f0/1, f0/2, f0/9
Faculty-Medicine-Switch(config-if-range)#switchport mode access
Faculty-Medicine-Switch(config-if-range)#switchport access vlan 10
Faculty-Medicine-Switch(config-if-range)#interface range f0/3, f0/4, f0/8
Faculty-Medicine-Switch(config-if-range)#switchport mode access
Faculty-Medicine-Switch(config-if-range)#switchport access vlan 20
Faculty-Medicine-Switch(config-if-range)#interface range f0/5, f0/6, f0/7
Faculty-Medicine-Switch(config-if-range)#switchport mode access
Faculty-Medicine-Switch(config-if-range)#switchport access vlan 30
Faculty-Medicine-Switch(config-if-range)#do show vlan brief

VLAN Name Status Ports
----- -----
1 default active Fa0/10, Fa0/11, Fa0/12, Fa0/13
Fa0/14, Fa0/15, Fa0/16, Fa0/17
Fa0/18, Fa0/19, Fa0/20, Fa0/21
Fa0/22, Fa0/23, Fa0/24, Gig0/1
Gig0/2
10 Md-IT active Fa0/1, Fa0/2, Fa0/9
20 Md-Dr active Fa0/3, Fa0/4, Fa0/8
30 Md-Stu active Fa0/5, Fa0/6, Fa0/7
1002 fddi-default active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active
Faculty-Medicine-Switch(config-if-range)#

```

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- Changing the name of the VLANs:

Switch2

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Faculty-Medicine-Switch(config)#vlan 10
Faculty-Medicine-Switch(config-vlan)#name Md-IT
Faculty-Medicine-Switch(config-vlan)#vlan 20
Faculty-Medicine-Switch(config-vlan)#name Md-Dr
Faculty-Medicine-Switch(config-vlan)#vlan 30
Faculty-Medicine-Switch(config-vlan)#name Md-Stu
Faculty-Medicine-Switch(config-vlan)#exit
```



○ **Router:**

- Gigabit Ethernet Port (Gig0/0, Gig1/0, Gig2/0) connects to the switch.
- Fast Ethernet ports (f0/7, f0/8, f0/9) are configured for future device connections.
- Definition of networks:
 - IT: 12.0.0.0/26
 - Doctors: 12.0.0.64/26
 - Students: 12.0.0.128/26

▪ **Dynamic Routing:**

○ Using RIP:

A screenshot of a terminal window titled "Router2". The window has a purple header bar with the title "Router2" and standard window controls. Below the header is a navigation bar with tabs: "Physical", "Config", "CLI" (which is underlined), and "Attributes". The main area is labeled "IOS Command Line Interface". A scrollable text box displays the following configuration commands:

```
Abanoub-Medicine(config)#router rip
Abanoub-Medicine(config-router)#version 2
Abanoub-Medicine(config-router)#network 12.0.0.0
Abanoub-Medicine(config-router)#network 21.0.0.0
Abanoub-Medicine(config-router)#network 22.0.0.0
Abanoub-Medicine(config-router) #
```

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▪ Routing Table:

Routing Table for Router2

Type	Network	Port	Next Hop IP	Metric
R	10.0.0.0/8	GigabitEthernet5/0	22.0.0.2	120/2
R	10.0.0.0/8	GigabitEthernet4/0	21.0.0.2	120/2
R	11.0.0.0/8	GigabitEthernet4/0	21.0.0.2	120/1
C	12.0.0.0/26	GigabitEthernet2/0	---	0/0
C	12.0.0.64/26	GigabitEthernet1/0	---	0/0
C	12.0.0.128/26	GigabitEthernet0/0	---	0/0
R	20.0.0.0/8	GigabitEthernet4/0	21.0.0.2	120/1
C	21.0.0.0/26	GigabitEthernet4/0	---	0/0
C	22.0.0.0/26	GigabitEthernet5/0	---	0/0
R	23.0.0.0/8	GigabitEthernet5/0	22.0.0.2	120/1
R	100.0.0.0/8	GigabitEthernet5/0	22.0.0.2	120/1



▪ Telnet Access:

- Telnet IP:

12.0.0.1

.1 ⇒ Because my ID ends with 001

A screenshot of a terminal window titled "Switch2". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". The title bar also shows "IOS Command Line Interface". The terminal window displays the following configuration commands:

```
Faculty-Medicine-Switch>enable
Faculty-Medicine-Switch#config terminal
Enter configuration commands, one per line. End with
CTRL/Z.
Faculty-Medicine-Switch(config)#interface vlan 10
Faculty-Medicine-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10,
changed state to up

Faculty-Medicine-Switch(config-if)#ip address 12.0.0.1
255.255.255.192
Faculty-Medicine-Switch(config-if)#no shutdown
Faculty-Medicine-Switch(config-if)#exit
Faculty-Medicine-Switch(config)#line vty 0 4
Faculty-Medicine-Switch(config-line)#password 93223
Faculty-Medicine-Switch(config-line)#login
Faculty-Medicine-Switch(config-line)#exit
Faculty-Medicine-Switch(config)#enable secret admin1312
Faculty-Medicine-Switch(config)#service password-
encryption
Faculty-Medicine-Switch(config)#exit
Faculty-Medicine-Switch#
```

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Project Title: Designing a Computer Network for Helwan National University (HNU).



PC13

Physical Config Desktop Programming Attributes

Command Prompt X

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 12.0.0.1
Trying 12.0.0.1 ...Open

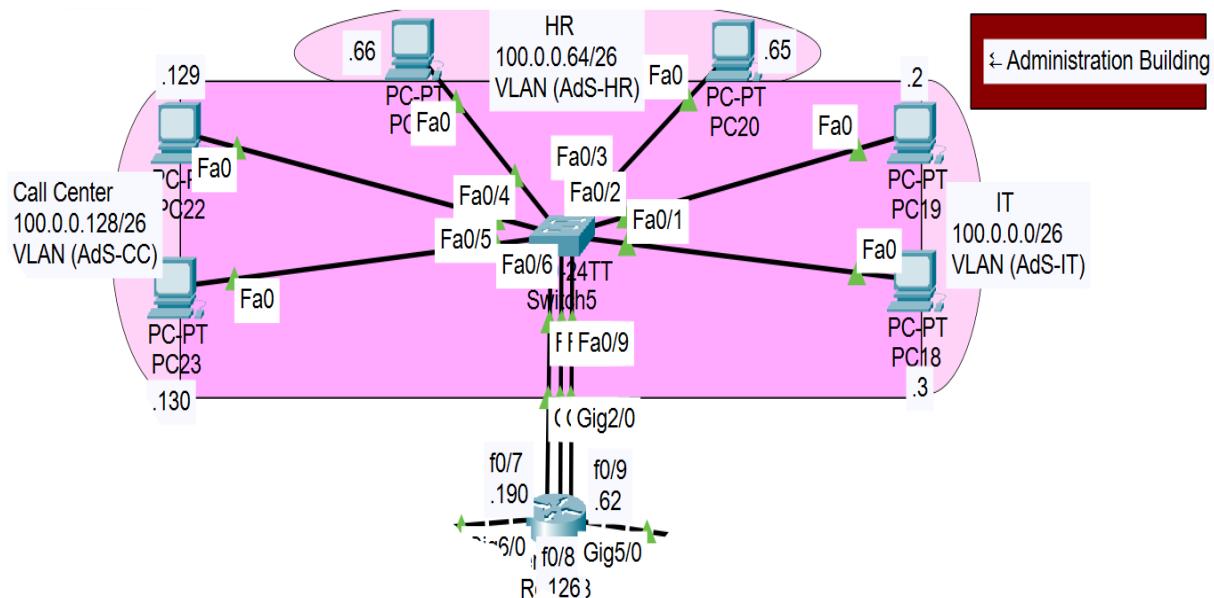
User Access Verification

Password:
Abanoub-Medicine-Switch>enable
Password:
Abanoub-Medicine-Switch#exit

[Connection to 12.0.0.1 closed by foreign host]
C:\>
```



Administration Building - Network Topology



- **Subnet: 100.0.0.0/26**
- **Connected Devices:**
 - **End Devices (PCs):**

Helwan National University (HNU)

Course Code: COM204

Course Name: Computer Networks

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Teaching Assistant: Eng. Adham Ehab

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Project Title: Designing a Computer Network for Helwan National University (HNU).



○ **Subnetting Configuration:**

Devices	Default Gateway	subnet mask	VLAN	Broadcast
PC12: IP 100.0.0.3, PC13: IP 100.0.0.2	100.0.0.62	255.255.255.192	AdS-IT	100.0.0.63
PC14: IP 100.0.0.65, PC15: IP 100.0.0.66	100.0.0.126	255.255.255.192	AdS-HR	100.0.0.127
PC16: IP 100.0.0.129, PC17: IP 100.0.0.130	100.0.0.190	255.255.255.192	AdS-CC	100.0.0.191

● **Passwords:**

○ **-Admin password:**

⇒admin1312

○ **-User Access Verification password:**

⇒93223

Helwan National University (HNU)

Course Code: COM204

Course Name: Computer Networks

Instructor: Prof. Mahmoud El-Mesalawy

Teaching Assistant: Eng. Adham Ehab

Academic Year: 2024/2025

Project Title: Designing a Computer Network for Helwan National University (HNU).



- **Subnetting for 3 Networks in Faculty Engineering:**

- First, we determined that we need to create 3 networks in the first building. The starting network address will be 100.0.0.0/26. This means that each subnet will have 62 usable devices, calculated as $2^6 - 2 = 62$.

- **VLAN 10:**

- **Network Address:** 100.0.0.0/26
 - **First Usable IP Address:** 100.0.0.1
 - **Last Usable IP Address:** 100.0.0.62
 - **Broadcast Address:** 100.0.0.63

- **VLAN 20:**

- **Network Address:** 100.0.0.64/26
 - **First Usable IP Address:** 100.0.0.65
 - **Last Usable IP Address:** 100.0.0.126
 - **Broadcast Address:** 100.0.0.127

- **VLAN 30:**

- **Network Address:** 100.0.0.128/26
 - **First Usable IP Address:** 100.0.0.129
 - **Last Usable IP Address:** 100.0.0.190
 - **Broadcast Address:** 100.0.0.191



○ **Switch (2960-24TT):**

▪ **Fast Ethernet Ports:**

- F0/1, F0/2, F0/3, F0/4, F0/5, F0/6 connect to **6 PCs**.

▪ **Switch Configuration:**

- Changing the name of the switch:

A screenshot of a terminal window titled "Switch5". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the tabs, it says "IOS Command Line Interface". The terminal window displays the following configuration command sequence:

```
Switch>enable
Switch#config terminal
Enter configuration commands, one per line. End with
CTRL/Z.
Switch(config)#hostname Administratoin-Building-Switch
Administratoin-Building-Switch(config)#exit
Administratoin-Building-Switch#
```

The command "hostname Administratoin-Building-Switch" is highlighted in blue.

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Project Title: Designing a Computer Network for Helwan National University (HNU).



- Creating The VLANs Connecting ports to VLANs:

Switch5

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Administratoin-Building-Switch>enable
Administratoin-Building-Switch#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Administratoin-Building-Switch(config)#interface range f0/1, f0/2, f0/9
Administratoin-Building-Switch(config-if-range)#switchport mode access
Administratoin-Building-Switch(config-if-range)#switchport access vlan 10
Administratoin-Building-Switch(config-if-range)#interface range f0/3, f0/4, f0/8
Administratoin-Building-Switch(config-if-range)#switchport mode access
Administratoin-Building-Switch(config-if-range)#switchport access vlan 20
Administratoin-Building-Switch(config-if-range)#interface range f0/5, f0/6, f0/7
Administratoin-Building-Switch(config-if-range)#switchport mode access
Administratoin-Building-Switch(config-if-range)#switchport access vlan 30
Administratoin-Building-Switch(config-if-range)#do show vlan brief

VLAN Name          Status      Ports
----  -----
1    default        active     Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                Gig0/2
10   AdS-IT         active     Fa0/1, Fa0/2, Fa0/9
20   AdS-HR         active     Fa0/3, Fa0/4, Fa0/8
30   AdS-CC         active     Fa0/5, Fa0/6, Fa0/7
1002 fddi-default  active
1003 token-ring-default  active
1004 fddinet-default  active
1005 trnet-default   active
Administratoin-Building-Switch(config-if-range) #
```

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Academic Year: 2024/2025

Project Title: Designing a Computer Network for Helwan National University (HNU).



- Changing the name of the VLANs:

A screenshot of a terminal window titled "Switch5". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". The main area shows the "IOS Command Line Interface". Inside a highlighted box, the following configuration commands are listed:

```
Administratoion-Building-Switch(config)#vlan 10
Administratoion-Building-Switch(config-vlan)#name AdS-IT
Administratoion-Building-Switch(config-vlan)#vlan 20
Administratoion-Building-Switch(config-vlan)#name AdS-HR
Administratoion-Building-Switch(config-vlan)#vlan 30
Administratoion-Building-Switch(config-vlan)#name AdS-CC
Administratoion-Building-Switch(config-vlan)#

```

- **Router:**

- Gigabit Ethernet Port (Gig0/0, Gig1/0, Gig2/0) connects to the switch.
- Fast Ethernet ports (f0/7, f0/8, f0/9) are configured for future device connections.
- **Definition of networks:**
 - IT: 100.0.0.0/26
 - HR: 100.0.0.64/26
 - Call Center: 100.0.0.128/26



▪ **Dynamic Routing:**

- Using RIP:

A screenshot of a computer screen showing the command-line interface (CLI) for Router3. The window title is "Router3". Below the title bar, there are tabs: "Physical", "Config", "CLI" (which is selected), and "Attributes". The main area is titled "IOS Command Line Interface". Inside this area, the following configuration commands are displayed:

```
Abanoub-AdminStration (config) #router rip
Abanoub-AdminStration (config-router) #version 2
Abanoub-AdminStration (config-router) #network 100.0.0.0
Abanoub-AdminStration (config-router) #network 22.0.0.0
Abanoub-AdminStration (config-router) #network 23.0.0.0
Abanoub-AdminStration (config-router) #
```

▪ **Routing Table:**

Routing Table for Router3

Type	Network	Port	Next Hop IP	Metric
R	10.0.0.0/8	GigabitEthernet6/0	23.0.0.1	120/1
R	11.0.0.0/8	GigabitEthernet6/0	23.0.0.1	120/2
R	11.0.0.0/8	GigabitEthernet5/0	22.0.0.1	120/2
R	12.0.0.0/8	GigabitEthernet5/0	22.0.0.1	120/1
R	20.0.0.0/8	GigabitEthernet6/0	23.0.0.1	120/1
R	21.0.0.0/8	GigabitEthernet5/0	22.0.0.1	120/1
C	22.0.0.0/26	GigabitEthernet5/0	---	0/0
C	23.0.0.0/26	GigabitEthernet6/0	---	0/0
C	100.0.0.0/26	GigabitEthernet2/0	---	0/0
C	100.0.0.64/26	GigabitEthernet1/0	---	0/0
C	100.0.0.128/26	GigabitEthernet0/0	---	0/0



▪ Telnet Access:

- Telnet IP:

100.0.0.1

.1 ⇒ Because my ID ends with 001

A screenshot of a terminal window titled "Switch5". The window has tabs for "Physical", "Config", "CLI" (which is selected), and "Attributes". Below the tabs, it says "IOS Command Line Interface". The terminal window displays a series of configuration commands entered via Telnet to a Cisco switch. The commands include enabling the switch, entering configuration mode, creating VLAN 10, setting the IP address to 100.0.0.1, and configuring VTY line 0 to 4 with password 93223 and login enabled. The session ends with the command "enable secret admin1312".

```
Administration-Switch>enable
Administration-Switch#config terminal
Enter configuration commands, one per line. End with
CNTL/Z.
Administration-Switch(config)#interface vlan 10
Administration-Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10,
changed state to up

Administration-Switch(config-if)#ip address 100.0.0.1
255.255.255.192
Administration-Switch(config-if)#no shutdown
Administration-Switch(config-if)#exit
Administration-Switch(config)#line vty 0 4
Administration-Switch(config-line)#password 93223
Administration-Switch(config-line)#login
Administration-Switch(config-line)#exit
Administration-Switch(config)#enable secret admin1312
Administration-Switch(config)#service password-
encryption
Administration-Switch(config)#exit
Administration-Switch#
```

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Teaching Assistant: Eng. Adham Ehab

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Project Title: Designing a Computer Network for Helwan National University (HNU).

A screenshot of a computer window titled "PC18". The window contains a terminal-like interface with a blue header bar labeled "Command Prompt" and an "X" button. The main area shows the following text:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>telnet 100.0.0.1
Trying 100.0.0.1 ...Open

User Access Verification

Password:
Administration-Switch>enable
Password:
Administration-Switch#
[Connection to 100.0.0.1 closed by foreign host]
C:\>
```

Helwan National University (HNU)

Course Code: COM204

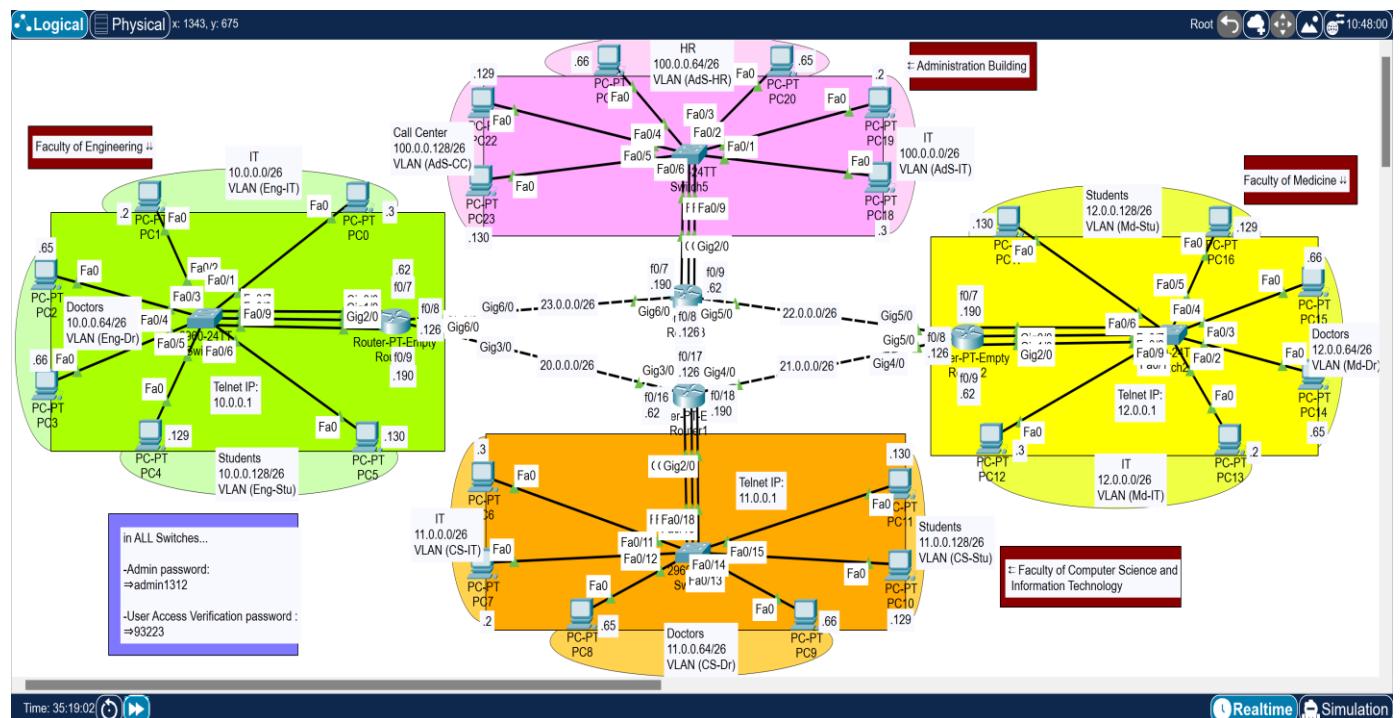
Course Name: Computer Networks

Instructor: Prof. Mahmoud El-Mesalawy

Teaching Assistant: Eng. Adham Ehab

Academic Year: 2024/2025

Project Title: Designing a Computer Network for Helwan National University (HNU).



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Modernizing University Connectivity: A Step Towards Digital Transformation

Project Overview

In today's fast-paced digital world, a reliable and efficient **network infrastructure** is the backbone of any institution. Helwan National University, in its ambitious plan to expand and modernize its campus, recognizes the need for a robust **network design** to connect its faculties and buildings seamlessly.

This project represents **Phase 1** of the network design, focusing on connecting the:

1. Faculty of Engineering
2. Faculty of Computer Science and Information Technology
3. Faculty of Medicine
4. Administration Building

The design leverages **modern networking technologies** to ensure:

- Efficient communication across buildings
- Secure remote management
- Optimized traffic flow using VLANs and routing protocols

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Key Objectives

- **Subnetting:** Efficient IP addressing to minimize waste
- **Switch and Router Configuration:** Creating a strong network backbone
- **Dynamic Routing:** Using RIP and OSPF for optimal performance
- **Secure Access:** Implementing **Telnet** for remote management

Why This Project?

This project isn't just about connecting buildings; it's about building a foundation for **future innovation**. By implementing a scalable and secure network, the university can support:

- **E-learning platforms**
- **High-speed internet access**
- **Research and collaboration tools**

A Glimpse into the Future

This design marks the beginning of a journey to transform Helwan University into a **digitally connected campus**, enabling students, Doctors, staff, and administration to **thrive** in a connected world.

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