# INTERNETWORKING ESSENTIALS CA1

## BACHELOR OF TECHNOLOGY

IN

Computer Science & Engineering

By

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TO

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**LOVELY PROFESSIONAL UNIVERSITY**

**PUNJAB INDIA**

# Project16:

You are hired as a network engineer for Bit Network Solutions, a mid-sized enterprise with a nine-floor office building. Each floor is equipped with 5 computers, and the organization requires a well-structured network to ensure efficient communication and scalability.
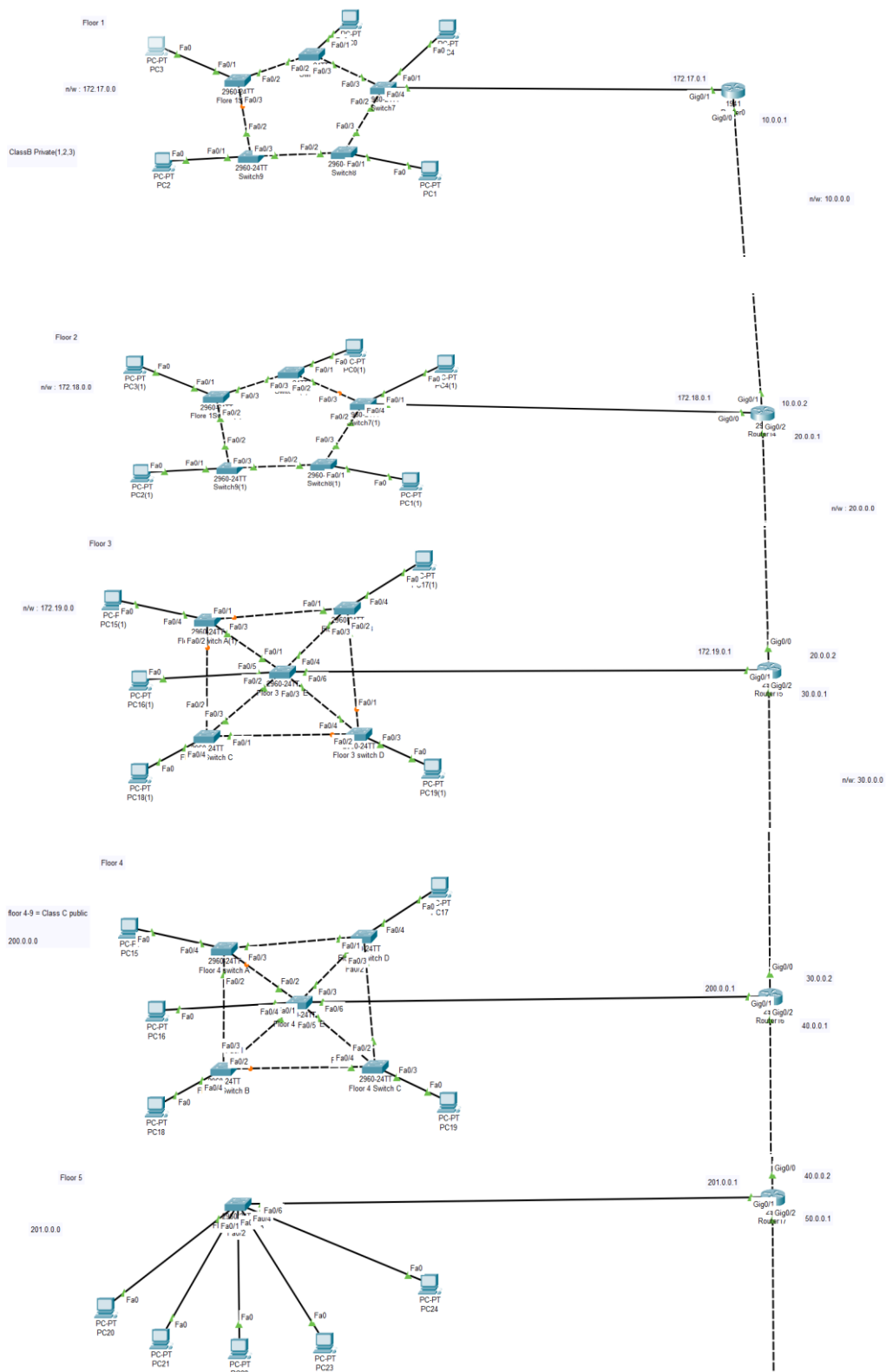
Network Design Requirements: 1. Topology Selection: Design a ring topology for first two floors, mesh topology for next two floors, and star topology for remaining floors, considering performance and fault tolerance.
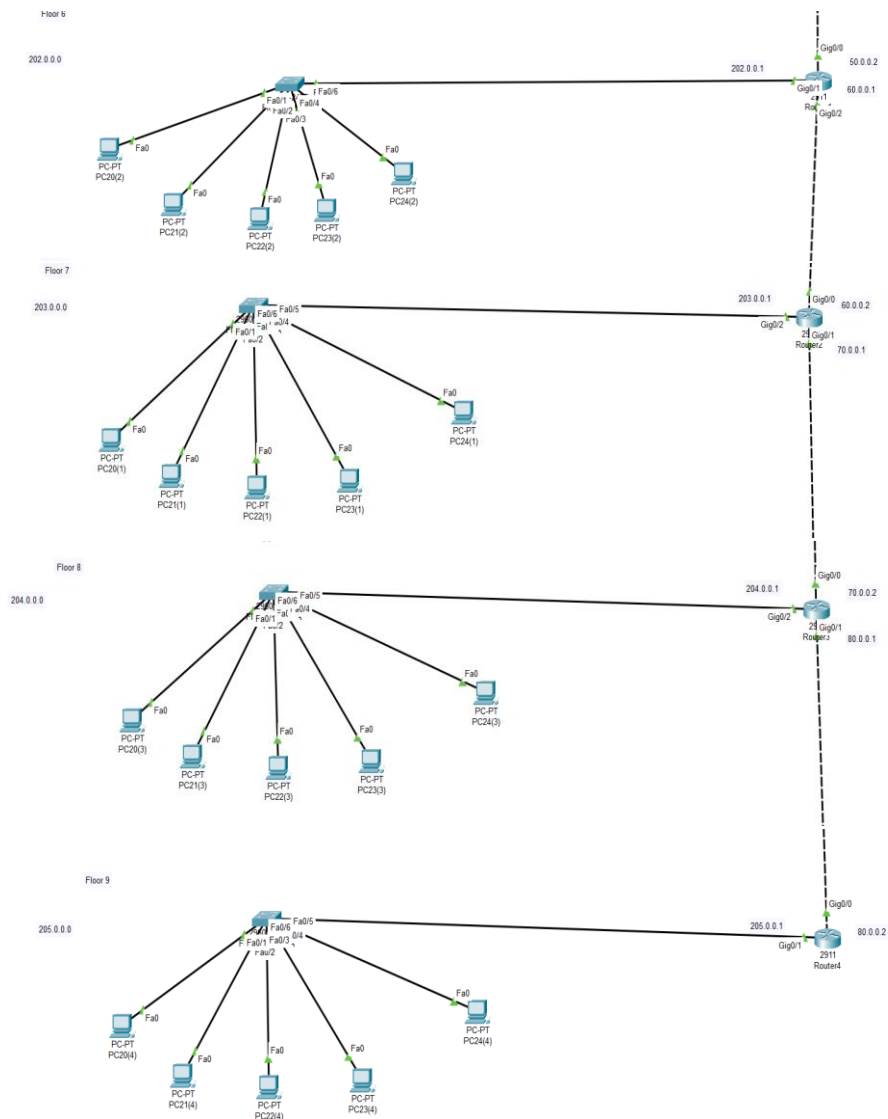
2. IP Addressing Scheme: The company has decided to use Class B private IPv4 addresses for first three floors and then Class C public IPv4 addresses for remaining floors following a classful addressing scheme. Allocate IP addresses properly for each floor, ensuring uniqueness.

3. Routing Strategy for Inter-Floor Communication & Connectivity: Recommend a routing approach that is dynamic for inter-floor communication.

• Design how the floors will be connected for seamless inter department communication.

• Suggest the appropriate network devices (e.g., switches, routers, access points) and their placement.

• If using dynamic routing, suggest an appropriate routing protocol (e.g., RIP, OSPF, or EIGRP) with justification.

• If using static routing, define the static routes for efficient data flow.

• Specify the number of default gateways along with IP addresses.

# 1. Physical Connection:

Floor 6

202.0.0.0

Gig0/0

202.0.0.1    50.0.0.2
Gig0/1
60.0.0.1
Gig0/2

Fa0/6
Fa0/1 Fa0/4
Fa0/2
Fa0/3

Fa0
PC-PT
PC20(2)

Fa0
PC-PT
PC21(2)

Fa0
PC-PT
PC22(2)

Fa0
PC-PT
PC23(2)

Fa0
PC-PT
PC24(2)

Floor 7

203.0.0.0

Gig0/0
203.0.0.1    60.0.0.2
Fa0/6 Fa0/5
Fa0/1 a0/4        Gig0/2
Fa0/2                    Gig0/1
Router2
70.0.0.1

Fa0
PC-PT
PC20(1)

Fa0
PC-PT
PC21(1)

Fa0
PC-PT
PC22(1)

Fa0
PC-PT
PC23(1)

Fa0
PC-PT
PC24(1)

Floor 8

204.0.0.0

Gig0/0
204.0.0.1    70.0.0.2
Fa0/6 Fa0/5
Fa0/1 a0/4        Gig0/2
a0/2                     Gig0/1
Router3
80.0.0.1

Fa0
PC-PT
PC20(3)

Fa0
PC-PT
PC21(3)

Fa0
PC-PT
PC22(3)

Fa0
PC-PT
PC23(3)

Fa0
PC-PT
PC24(3)

Floor 9

205.0.0.0

Gig0/0
205.0.0.1    80.0.0.2
Fa0/6 Fa0/5
F Fa0/1 Fa0/3 0/4     Gig0/1
a0/2                     2911
Router4

Fa0
PC-PT
PC20(4)

Fa0
PC-PT
PC21(4)

Fa0
PC-PT
PC22(4)

Fa0
PC-PT
PC23(4)

Fa0
PC-PT
PC24(4)

**2.** Allocation of IP Address:

1st Floor:

## 2nd Floor:



## 3rd Floor:

## 4th Floor:



## 5<sup>th</sup> Floor:

6th Floor:



7<sup>th</sup> Floor:

## 8th Floor:



## 9th Floor:

## 3. Dynamic Routing:
### 1st Router:



### 2nd Router:

## 3rd Router:

Router15       —   □   ✕

Physical   Config   CLI   Attributes

**GLOBAL**
Settings
Algorithm Settings
**ROUTING**
Static
RIP
**SWITCHING**
VLAN Database
**INTERFACE**
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2

RIP Routing

Network

Add

Network Address

20.0.0.0

30.0.0.0

172.19.0.0

Remove

Equivalent IOS Commands

## 4th Router:

Router16       —   □   ✕

Physical   Config   CLI   Attributes

**GLOBAL**
Settings
Algorithm Settings
**ROUTING**
Static
RIP
**SWITCHING**
VLAN Database
**INTERFACE**
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2

RIP Routing

Network

Add

Network Address

30.0.0.0

40.0.0.0

200.0.0.0

Remove

## 5th Router:

**Router17** — □ ✕

Physical   Config   CLI   Attributes

**GLOBAL**
Settings
Algorithm Settings
**ROUTING**
Static
RIP
**SWITCHING**
VLAN Database
**INTERFACE**
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2

RIP Routing

Network

Add

| Network Address |
|---|
| 40.0.0.0 |
| 50.0.0.0 |
| 201.0.0.0 |

Remove

## 6th Router:

**Router1** — □ ✕

Physical   Config   CLI   Attributes

**GLOBAL**
Settings
Algorithm Settings
**ROUTING**
Static
RIP
**SWITCHING**
VLAN Database
**INTERFACE**
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2

RIP Routing

Network

Add

| Network Address |
|---|
| 50.0.0.0 |
| 60.0.0.0 |
| 202.0.0.0 |

Remove

## 7th Router:



## 8th Router:

9<sup>th</sup> Router:

## 4. Communication between all computers:

## 1st Floor PC to Floor to all PC's:

```
Command Prompt
Invalid command.

C:\>ping 172.18.0.2

Pinging 172.18.0.2 with 32 bytes of data:

Reply from 172.18.0.2: bytes=32 time=26ms TTL=126
Reply from 172.18.0.2: bytes=32 time=1ms TTL=126
Reply from 172.18.0.2: bytes=32 time<1ms TTL=126
Reply from 172.18.0.2: bytes=32 time=2ms TTL=126

Ping statistics for 172.18.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 26ms, Average = 7ms

C:\>ping 172.19.0.2

Pinging 172.19.0.2 with 32 bytes of data:

Reply from 172.19.0.2: bytes=32 time=1ms TTL=125
Reply from 172.19.0.2: bytes=32 time<1ms TTL=125
Reply from 172.19.0.2: bytes=32 time<1ms TTL=125
Reply from 172.19.0.2: bytes=32 time<1ms TTL=125

Ping statistics for 172.19.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 200.0.0.2

Pinging 200.0.0.2 with 32 bytes of data:

Reply from 200.0.0.2: bytes=32 time<1ms TTL=124
Reply from 200.0.0.2: bytes=32 time<1ms TTL=124
Reply from 200.0.0.2: bytes=32 time<1ms TTL=124
Reply from 200.0.0.2: bytes=32 time<1ms TTL=124

Ping statistics for 200.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
                                             OmS, Average = OmS

C:\>ping 201.0.0.2

Pinging 201.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123

Ping statistics for 201.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 202.0.0.2

Pinging 202.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 202.0.0.2: bytes=32 time<1ms TTL=122
Reply from 202.0.0.2: bytes=32 time=1ms TTL=122
Reply from 202.0.0.2: bytes=32 time=6ms TTL=122

Ping statistics for 202.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 6ms, Average = 2ms

C:\>ping 203.0.0.2

Pinging 203.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 203.0.0.2: bytes=32 time<1ms TTL=121
Reply from 203.0.0.2: bytes=32 time<1ms TTL=121
Reply from 203.0.0.2: bytes=32 time<1ms TTL=121

Ping statistics for 203.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 204.0.0.2

Pinging 204.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 204.0.0.2: bytes=32 time<1ms TTL=120
Reply from 204.0.0.2: bytes=32 time<1ms TTL=120
Reply from 204.0.0.2: bytes=32 time<1ms TTL=120

Ping statistics for 204.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 205.0.0.2

Pinging 205.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 205.0.0.2: bytes=32 time=31ms TTL=119
Reply from 205.0.0.2: bytes=32 time<1ms TTL=119
Reply from 205.0.0.2: bytes=32 time=1ms TTL=119

Ping statistics for 205.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 31ms, Average = 10ms
```

# 9th floor PC to all floor PC's :

```
Command Prompt                                                        X

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.17.0.0

Pinging 172.17.0.0 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=247
Reply from 10.0.0.1: bytes=32 time<1ms TTL=247
Reply from 10.0.0.1: bytes=32 time<1ms TTL=247
Reply from 10.0.0.1: bytes=32 time<1ms TTL=247

Ping statistics for 172.17.0.0:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.18.0.4

Pinging 172.18.0.4 with 32 bytes of data:

Reply from 172.18.0.4: bytes=32 time<1ms TTL=120
Reply from 172.18.0.4: bytes=32 time<1ms TTL=120
Reply from 172.18.0.4: bytes=32 time<1ms TTL=120
Reply from 172.18.0.4: bytes=32 time<1ms TTL=120

Ping statistics for 172.18.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.19.0.4

Pinging 172.19.0.4 with 32 bytes of data:

Reply from 172.19.0.4: bytes=32 time<1ms TTL=121
Reply from 172.19.0.4: bytes=32 time<1ms TTL=121
Reply from 172.19.0.4: bytes=32 time<1ms TTL=121
Reply from 172.19.0.4: bytes=32 time<1ms TTL=121

Ping statistics for 172.19.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 200.0.0.2

Pinging 200.0.0.2 with 32 bytes of data:

Reply from 200.0.0.2: bytes=32 time=19ms TTL=122
Reply from 200.0.0.2: bytes=32 time<1ms TTL=122
Reply from 200.0.0.2: bytes=32 time<1ms TTL=122
Reply from 200.0.0.2: bytes=32 time=1ms TTL=122

Ping statistics for 200.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 19ms, Average = 5ms

C:\>
```

```
     Minimum = 0ms, Maximum = 19ms, Average = 5ms

C:\>ping 201.0.0.2

Pinging 201.0.0.2 with 32 bytes of data:

Reply from 201.0.0.2: bytes=32 time<1ms TTL=123
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123
Reply from 201.0.0.2: bytes=32 time<1ms TTL=123

Ping statistics for 201.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 202.0.0.2

Pinging 202.0.0.2 with 32 bytes of data:

Reply from 202.0.0.2: bytes=32 time<1ms TTL=124
Reply from 202.0.0.2: bytes=32 time<1ms TTL=124
Reply from 202.0.0.2: bytes=32 time<1ms TTL=124
Reply from 202.0.0.2: bytes=32 time<1ms TTL=124

Ping statistics for 202.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 203.0.0.2

Pinging 203.0.0.2 with 32 bytes of data:

Reply from 203.0.0.2: bytes=32 time<1ms TTL=125
Reply from 203.0.0.2: bytes=32 time<1ms TTL=125
Reply from 203.0.0.2: bytes=32 time<1ms TTL=125
Reply from 203.0.0.2: bytes=32 time<1ms TTL=125

Ping statistics for 203.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 204.0.0.2

Pinging 204.0.0.2 with 32 bytes of data:

Reply from 204.0.0.2: bytes=32 time<1ms TTL=126
Reply from 204.0.0.2: bytes=32 time<1ms TTL=126
Reply from 204.0.0.2: bytes=32 time<1ms TTL=126
Reply from 204.0.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 204.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 205.0.0.2

Pinging 205.0.0.2 with 32 bytes of data:

Reply from 205.0.0.2: bytes=32 time=32ms TTL=128
Reply from 205.0.0.2: bytes=32 time=4ms TTL=128
Reply from 205.0.0.2: bytes=32 time=3ms TTL=128
Reply from 205.0.0.2: bytes=32 time=17ms TTL=128

Ping statistics for 205.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

**5. Github Link:**

[k23hc64/InternetworkingEssential_project: 9 floors building communication between devices by floor to floor.](#)