

INTERNETWORKING ESSENTIALS CA1

BACHELOR OF TECHNOLOGY

IN

Computer Science & Engineering

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LOVELY PROFESSIONAL UNIVERSITY

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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.

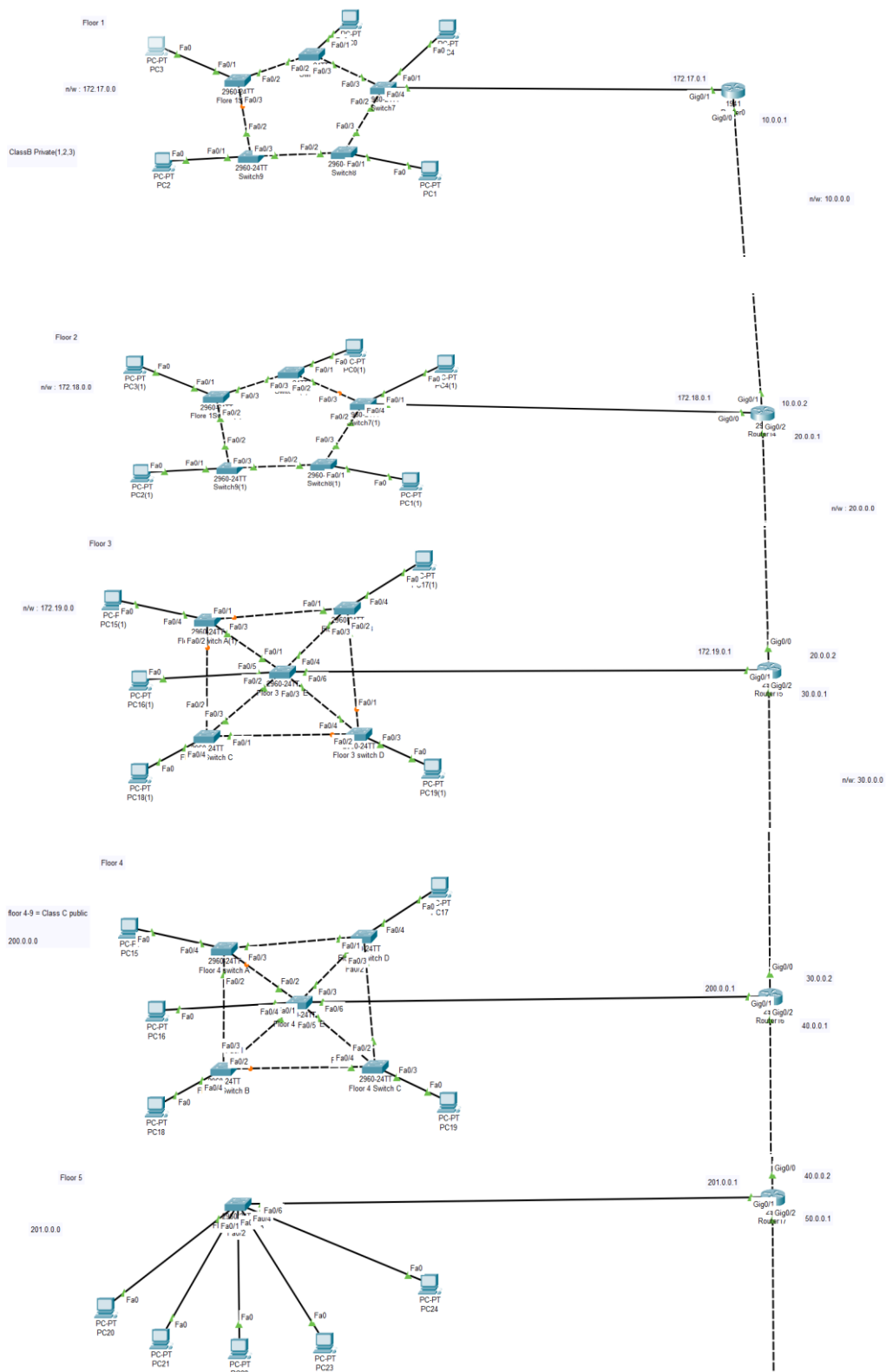
Network Design Requirements: 1. Topology Selection: Design a ring topology for first two floors, mesh topology for next two floors, and star topology for remaining floors, considering performance and fault tolerance.

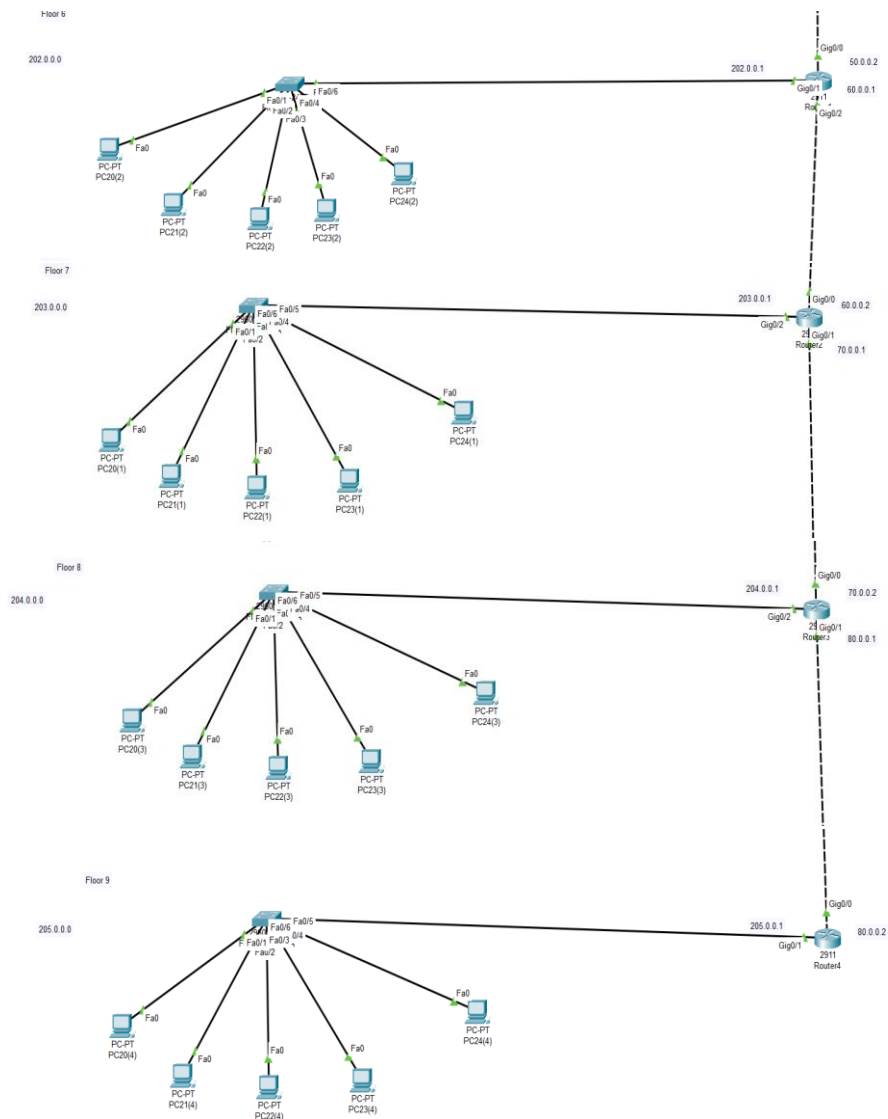
2. IP Addressing Scheme: The company has decided to use Class B private IPv4 addresses for first three floors and then Class C public IPv4 addresses for remaining floors following a classful addressing scheme. Allocate IP addresses properly for each floor, ensuring uniqueness.

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:





2. Allocation of IP Address:

1st Floor:

PC3

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address: 172.17.0.2

Subnet Mask: 255.255.0.0

Default Gateway: 172.17.0.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address: /

Link Local Address: FE80::20C:CFFF:FE72:33

Default Gateway: /

DNS Server: /

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username: /

Password: /

2nd Floor:

PC3(1)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.18.0.2

Subnet Mask 255.255.0.0

Default Gateway 172.18.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::2D0:58FF:FE18:39E0

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

3rd Floor:

PC15(1)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.19.0.2

Subnet Mask 255.255.0.0

Default Gateway 172.19.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::260:3EFF:FEAC:2BE3

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

4th Floor:

PC17

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 200.0.0.5

Subnet Mask 255.255.255.0

Default Gateway 200.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::201:C9FF:FE67:1E1E

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

5th Floor:

PC24

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 201.0.0.6

Subnet Mask 255.255.255.0

Default Gateway 201.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::201:64FF:FE25:DE32

Default Gateway

DNS Server

802.1X

6th Floor:

PC24(2)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 202.0.0.6

Subnet Mask 255.255.255.0

Default Gateway 202.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::207:ECFF:FEB9:C31B

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

7th Floor:

PC24(1)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 203.0.0.6

Subnet Mask 255.255.255.0

Default Gateway 203.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::290:2BFF:FE07:C637

Default Gateway

DNS Server

8th Floor:

PC20(3)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 204.0.0.2

Subnet Mask 255.255.255.0

Default Gateway 204.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::290:21FF:FE27:1C7

Default Gateway

DNS Server

9th Floor:

PC24(4)

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 205.0.0.6

Subnet Mask 255.255.255.0

Default Gateway 205.0.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::230:F2FF:FE65:E951

Default Gateway

DNS Server

3. Dynamic Routing: 1st Router:

The screenshot shows the configuration window for Router0. The 'Config' tab is active, and the 'RIP Routing' section is selected. The 'Network' field is empty, and the 'Add' button is visible. The 'Network Address' list contains two entries: 10.0.0.0 and 172.17.0.0. The 'Remove' button is at the bottom right. The 'Equivalent IOS Commands' section shows the following commands:

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#
```

2nd Router:

The screenshot shows the configuration window for Router14. The 'Config' tab is active, and the 'RIP Routing' section is selected. The 'Network' field is empty, and the 'Add' button is visible. The 'Network Address' list contains three entries: 10.0.0.0, 20.0.0.0, and 172.18.0.0. The 'Remove' button is at the bottom right. The 'Equivalent IOS Commands' section is empty.

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:

The screenshot shows the configuration window for Router2. The 'Config' tab is active, and the 'RIP' option under the 'ROUTING' section is selected. The 'RIP Routing' configuration area is visible, showing a list of network addresses: 60.0.0.0, 70.0.0.0, and 203.0.0.0. The 'Add' button is visible, and the 'Remove' button is at the bottom right.

Network Address
60.0.0.0
70.0.0.0
203.0.0.0

8th Router:

The screenshot shows the configuration window for Router3. The 'Config' tab is active, and the 'RIP' option under the 'ROUTING' section is selected. The 'RIP Routing' configuration area is visible, showing a list of network addresses: 70.0.0.0, 80.0.0.0, and 204.0.0.0. The 'Add' button is visible, and the 'Remove' button is at the bottom right.

Network Address
70.0.0.0
80.0.0.0
204.0.0.0

Equivalent IOS Commands

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#
```

9th Router:

Router4

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

80.0.0.0

205.0.0.0

Remove

Equivalent IOS Commands

```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-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

Command Prompt

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

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

```
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<lms TTL=247
Reply from 10.0.0.1: bytes=32 time<lms TTL=247
Reply from 10.0.0.1: bytes=32 time<lms TTL=247
Reply from 10.0.0.1: bytes=32 time<lms 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<lms TTL=120
Reply from 172.18.0.4: bytes=32 time<lms TTL=120
Reply from 172.18.0.4: bytes=32 time<lms TTL=120
Reply from 172.18.0.4: bytes=32 time<lms 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<lms TTL=121
Reply from 172.19.0.4: bytes=32 time<lms TTL=121
Reply from 172.19.0.4: bytes=32 time<lms TTL=121
Reply from 172.19.0.4: bytes=32 time<lms 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<lms TTL=122
Reply from 200.0.0.2: bytes=32 time<lms 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:\>
```


Command Prompt

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<lms TTL=123

Reply from 201.0.0.2: bytes=32 time<lms TTL=123

Reply from 201.0.0.2: bytes=32 time<lms TTL=123

Reply from 201.0.0.2: bytes=32 time<lms 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<lms TTL=124

Reply from 202.0.0.2: bytes=32 time<lms TTL=124

Reply from 202.0.0.2: bytes=32 time<lms TTL=124

Reply from 202.0.0.2: bytes=32 time<lms 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<lms TTL=125

Reply from 203.0.0.2: bytes=32 time<lms TTL=125

Reply from 203.0.0.2: bytes=32 time<lms TTL=125

Reply from 203.0.0.2: bytes=32 time<lms 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<lms TTL=126

Reply from 204.0.0.2: bytes=32 time<lms TTL=126

Reply from 204.0.0.2: bytes=32 time<lms TTL=126

Reply from 204.0.0.2: bytes=32 time<lms 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.