

# **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**

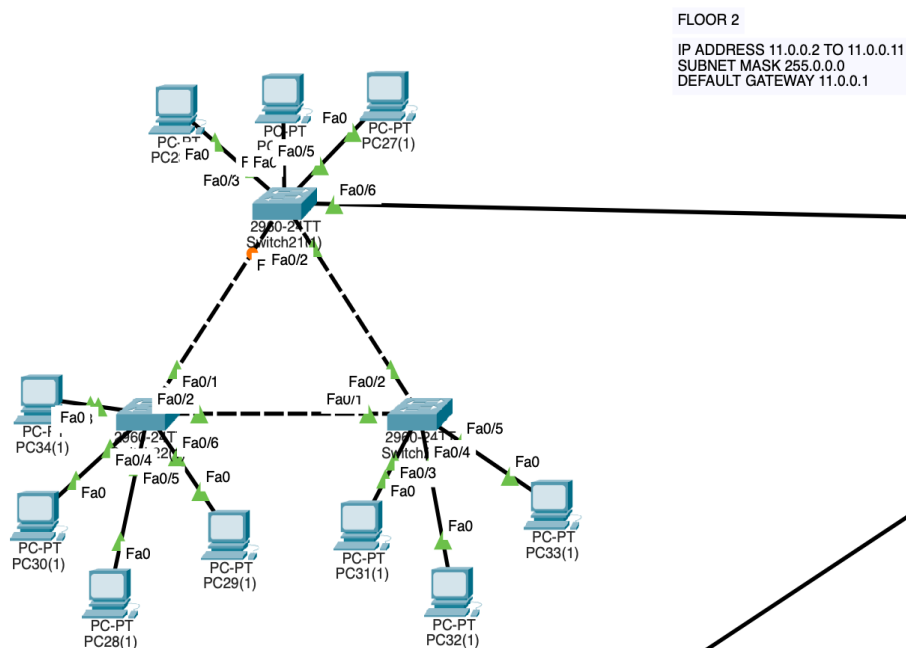
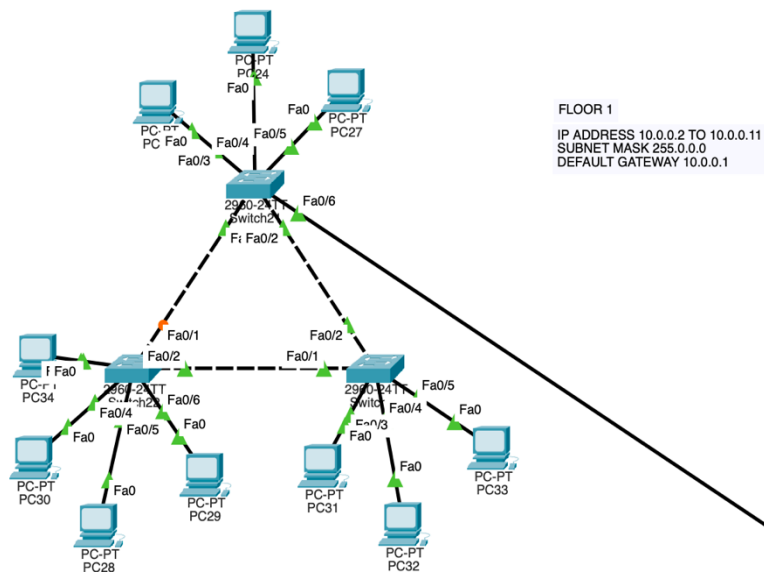
## Project17:

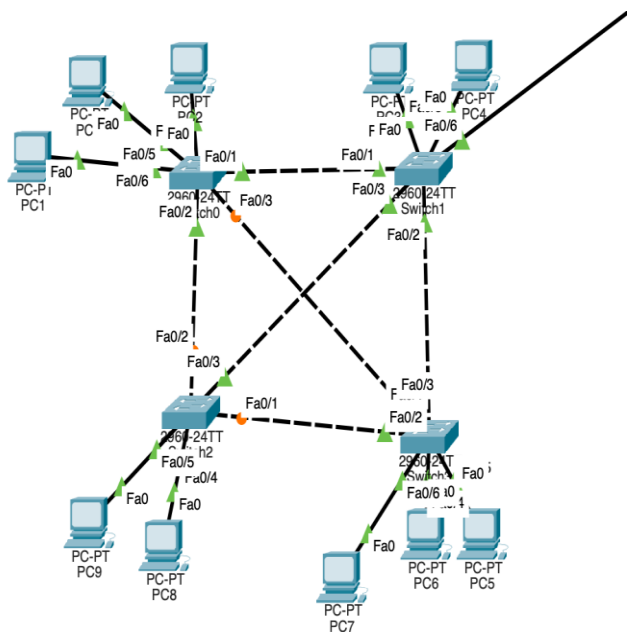
You are hired as a network engineer for **LT Network Solutions**, a mid-sized enterprise with a **five-floor** office building. Each floor is equipped with **10 computers**, and the organization requires a well-structured network to ensure efficient communication and scalability.

### 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 A private IPv4 addresses for first three floors and then Class B 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 **static** 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.

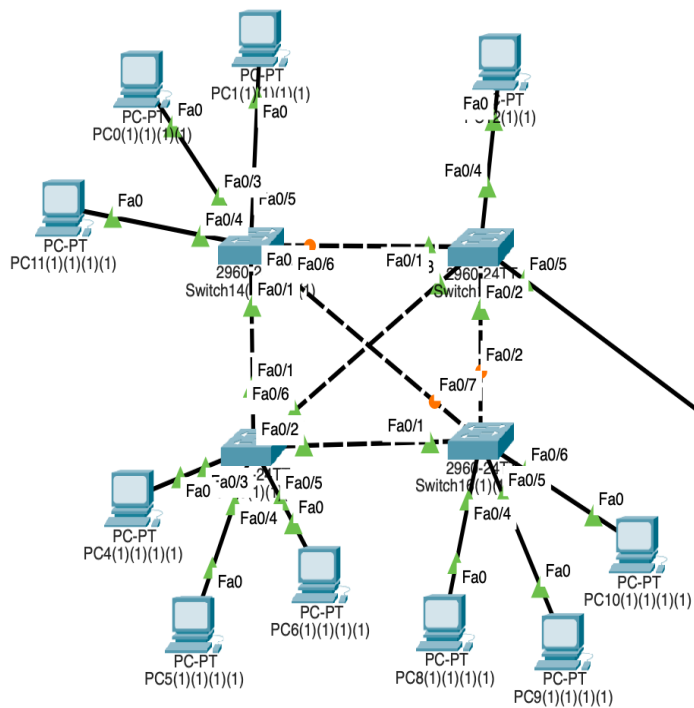
## 1. Physical Connection:





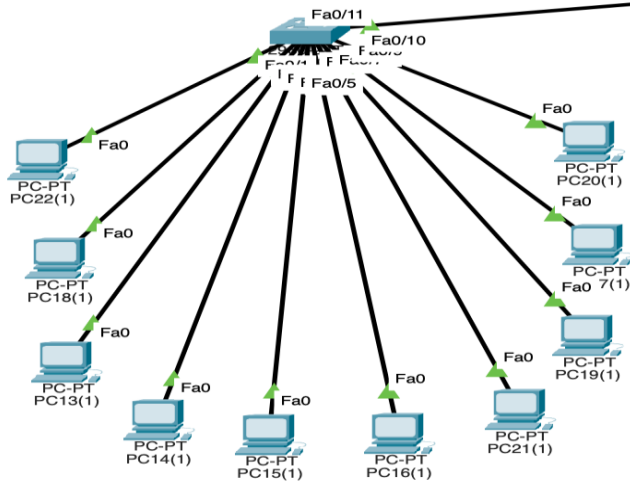
### FLOOR 3

IP ADDRESS 12.0.0.2 TO 12.0.0.11  
SUBNET MASK 255.0.0.0  
DEFAULT GATEWAY 12.0.0.1

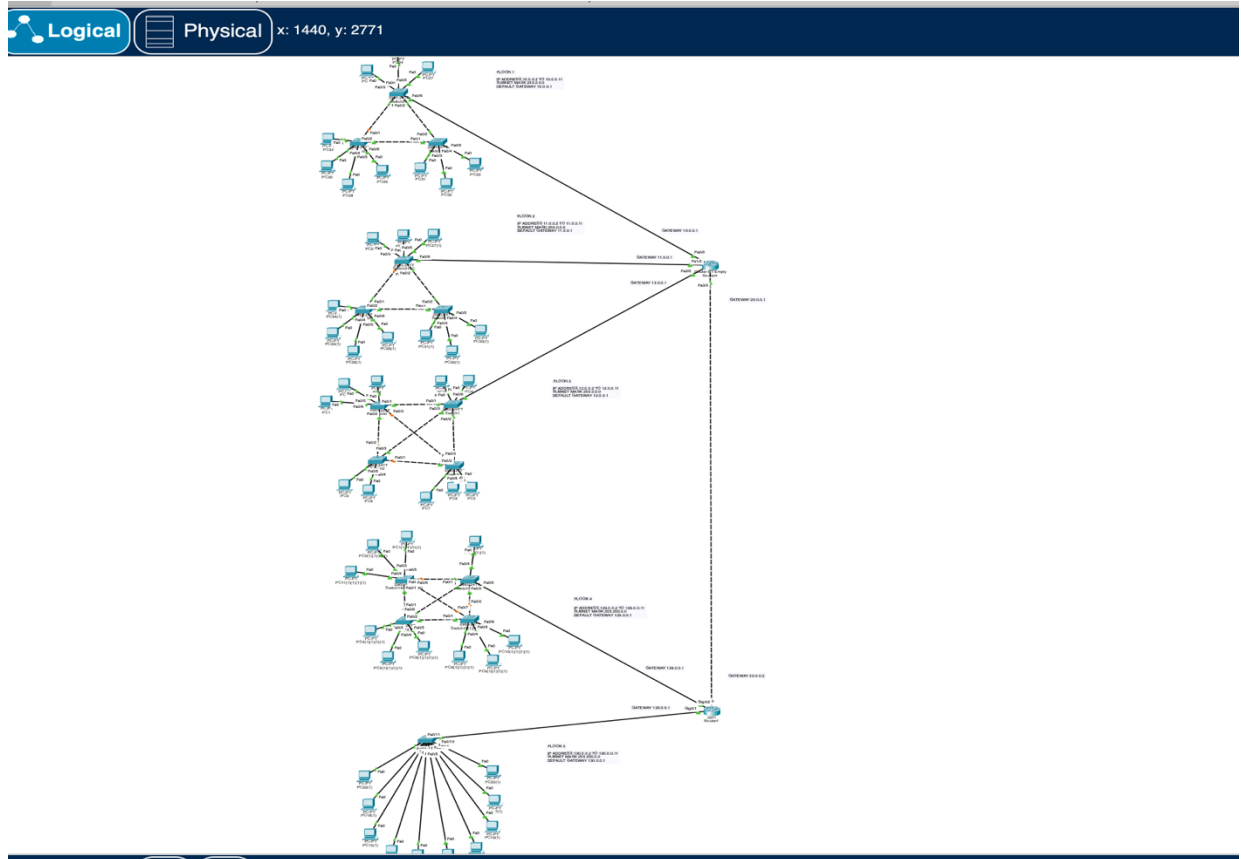


### FLOOR 4

IP ADDRESS 129.0.0.2 TO 129.0.0.11  
SUBNET MASK 255.255.0.0  
DEFAULT GATEWAY 129.0.0.1



FLOOR 5  
IP ADDRESS 130.0.0.2 TO 130.0.0.11  
SUBNET MASK 255.255.0.0  
DEFAULT GATEWAY 130.0.0.1



## 2. Allocation of IP Address:

1<sup>st</sup> Floor:

The screenshot shows the 'IP Configuration' window for the 'FastEthernet0' interface. The 'Desktop' tab is selected. Under 'IP Configuration', 'Static' is selected. The IPv4 Address is 10.0.0.2, Subnet Mask is 255.0.0.0, Default Gateway is 10.0.0.1, and DNS Server is 0.0.0.0. Under 'IPv6 Configuration', 'Static' is selected. The IPv6 Address field is empty, Link Local Address is FE80::2D0:58FF:FEDB:3C0A, and Default Gateway and DNS Server fields are empty.

IP Configuration	
Interface: FastEthernet0	
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	10.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	/
Link Local Address	FE80::2D0:58FF:FEDB:3C0A
Default Gateway	
DNS Server	

2<sup>nd</sup> Floor:

The screenshot shows the 'IP Configuration' window for the 'FastEthernet0' interface. The 'Desktop' tab is selected. Under 'IP Configuration', 'Static' is selected. The IPv4 Address is 11.0.0.2, Subnet Mask is 255.0.0.0, Default Gateway is 11.0.0.1, and DNS Server is 0.0.0.0. Under 'IPv6 Configuration', 'Static' is selected. The IPv6 Address field is empty, Link Local Address is FE80::20C:85FF:FEE4:4423, and Default Gateway and DNS Server fields are empty.

IP Configuration	
Interface: FastEthernet0	
IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	11.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	11.0.0.1
DNS Server	0.0.0.0
IPv6 Configuration	
<input type="radio"/> Automatic	<input checked="" type="radio"/> Static
IPv6 Address	/
Link Local Address	FE80::20C:85FF:FEE4:4423
Default Gateway	
DNS Server	

802.1X

3rd Floor:

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

12.0.0.2

Subnet Mask

255.0.0.0

Default Gateway

12.0.0.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::260:5CFF:FEC7:AEA9

Default Gateway

DNS Server

4th Floor:

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

129.0.0.2

Subnet Mask

255.255.0.0

Default Gateway

129.0.0.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::20A:F3FF:FE4E:C68

Default Gateway

DNS Server

5<sup>th</sup> Floor:

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

130.0.0.2

Subnet Mask

255.255.0.0

Default Gateway

130.0.0.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::201:97FF:FE30:5C28

Default Gateway

DNS Server

802.1X



### 3. Static Routing:

#### 1<sup>st</sup> Router:

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

INTERFACE

FastEthernet0/0

FastEthernet1/0

FastEthernet2/0

FastEthernet3/0

FastEthernet4/0

Static Routes

Network

Mask

Next Hop

Add

Network Address

129.0.0.0/16 via 20.0.0.2

130.0.0.0/16 via 20.0.0.2

Remove

2<sup>nd</sup> Router:

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

ROUTING

Static

RIP

SWITCHING

VLAN Database

INTERFACE

GigabitEthernet0/0

GigabitEthernet0/1

GigabitEthernet0/2

Static Routes

Network

Mask

Next Hop

Add

Network Address

10.0.0.0/8 via 20.0.0.1

11.0.0.0/8 via 20.0.0.1

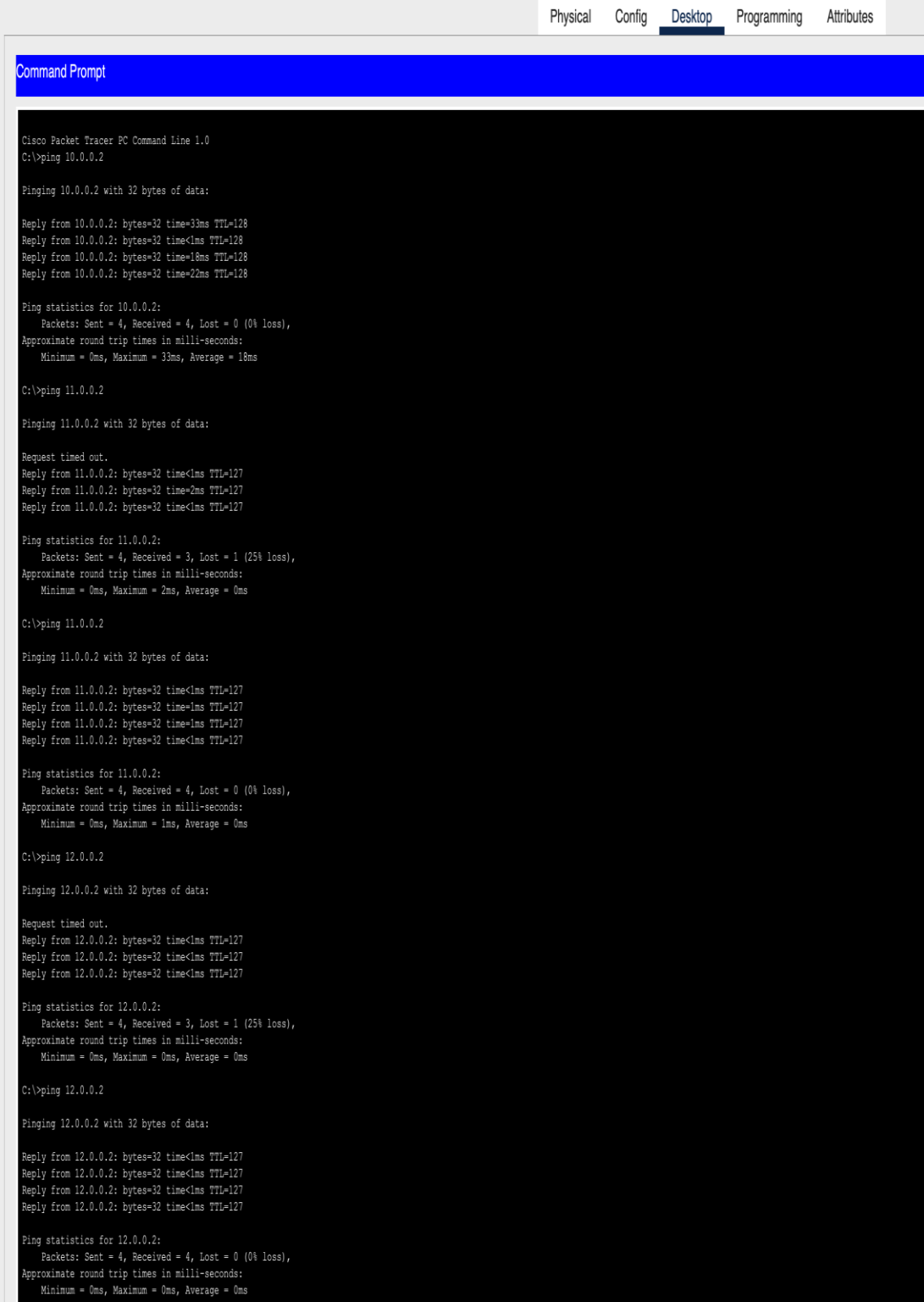
12.0.0.0/8 via 20.0.0.1

Remove

Enablement 100 Comments

## 4. Communication between all computers:

### 1<sup>st</sup> Floor PC to Floor to all PC's:



The screenshot shows the Cisco Packet Tracer interface with the 'Desktop' tab selected. A Command Prompt window is open, displaying the results of ping commands from a PC to three other PCs (10.0.0.2, 11.0.0.2, and 12.0.0.2). The results show successful communication with 10.0.0.2 and 12.0.0.2, but a 25% packet loss (1 out of 4 packets) when pinging 11.0.0.2.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time=33ms TTL=128
Reply from 10.0.0.2: bytes=32 time<1ms TTL=128
Reply from 10.0.0.2: bytes=32 time=18ms TTL=128
Reply from 10.0.0.2: bytes=32 time=22ms TTL=128

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 33ms, Average = 18ms

C:\>ping 11.0.0.2

Pinging 11.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 11.0.0.2: bytes=32 time<1ms TTL=127
Reply from 11.0.0.2: bytes=32 time=2ms TTL=127
Reply from 11.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 11.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 11.0.0.2

Pinging 11.0.0.2 with 32 bytes of data:

Reply from 11.0.0.2: bytes=32 time<1ms TTL=127
Reply from 11.0.0.2: bytes=32 time=1ms TTL=127
Reply from 11.0.0.2: bytes=32 time=1ms TTL=127
Reply from 11.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 11.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 12.0.0.2

Pinging 12.0.0.2 with 32 bytes of data:

Request timed out.
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 12.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 12.0.0.2

Pinging 12.0.0.2 with 32 bytes of data:

Reply from 12.0.0.2: bytes=32 time<1ms TTL=127
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127
Reply from 12.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 12.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

## Command Prompt

```
Ping statistics for 12.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 12.0.0.2
```

```
Pinging 12.0.0.2 with 32 bytes of data:
```

```
Reply from 12.0.0.1: bytes=32 time<1ms TTL=127
Reply from 12.0.0.1: bytes=32 time<1ms TTL=127
Reply from 12.0.0.1: bytes=32 time<1ms TTL=127
Reply from 12.0.0.1: bytes=32 time<1ms TTL=127
```

```
Ping statistics for 12.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 128.0.0.2
```

```
Pinging 128.0.0.2 with 32 bytes of data:
```

```
Request timed out.
Request timed out.
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
```

```
Ping statistics for 128.0.0.2:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms
```

```
C:\>ping 128.0.0.2
```

```
Pinging 128.0.0.2 with 32 bytes of data:
```

```
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
Reply from 128.0.0.1: bytes=32 time<1ms TTL=126
```

```
Ping statistics for 128.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 130.0.0.2
```

```
Pinging 130.0.0.2 with 32 bytes of data:
```

```
Request timed out.
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
```

```
Ping statistics for 130.0.0.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
C:\>ping 130.0.0.2
```

```
Pinging 130.0.0.2 with 32 bytes of data:
```

```
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
Reply from 130.0.0.1: bytes=32 time<1ms TTL=126
```

```
Ping statistics for 130.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
C:\>
```

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

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 130.0.0.2

Pinging 130.0.0.2 with 32 bytes of data:

Reply from 130.0.0.2: bytes=32 time=1ms TTL=128
Reply from 130.0.0.2: bytes=32 time=20ms TTL=128
Reply from 130.0.0.2: bytes=32 time=20ms TTL=128
Reply from 130.0.0.2: bytes=32 time=3ms TTL=128

Ping statistics for 130.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 20ms, Average = 11ms

C:\>ping 129.0.0.2

Pinging 129.0.0.2 with 32 bytes of data:

Reply from 129.0.0.2: bytes=32 time<1ms TTL=127
Reply from 129.0.0.2: bytes=32 time<1ms TTL=127
Reply from 129.0.0.2: bytes=32 time<1ms TTL=127
Reply from 129.0.0.2: bytes=32 time<1ms TTL=127

Ping statistics for 129.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 12.0.0.2

Pinging 12.0.0.2 with 32 bytes of data:

Reply from 12.0.0.2: bytes=32 time<1ms TTL=126
Reply from 12.0.0.2: bytes=32 time<1ms TTL=126
Reply from 12.0.0.2: bytes=32 time<1ms TTL=126
Reply from 12.0.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 12.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 6ms

C:\>ping 11.0.0.2

Pinging 11.0.0.2 with 32 bytes of data:

Reply from 11.0.0.2: bytes=32 time<1ms TTL=126
Reply from 11.0.0.2: bytes=32 time<1ms TTL=126
Reply from 11.0.0.2: bytes=32 time<1ms TTL=126
Reply from 11.0.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 11.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.2

Pinging 10.0.0.2 with 32 bytes of data:

Reply from 10.0.0.2: bytes=32 time<1ms TTL=126
Reply from 10.0.0.2: bytes=32 time<1ms TTL=126
Reply from 10.0.0.2: bytes=32 time<1ms TTL=126
Reply from 10.0.0.2: bytes=32 time<1ms TTL=126

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 0ms

C:\>
```