

IP PHONES CONFIGURATIONS

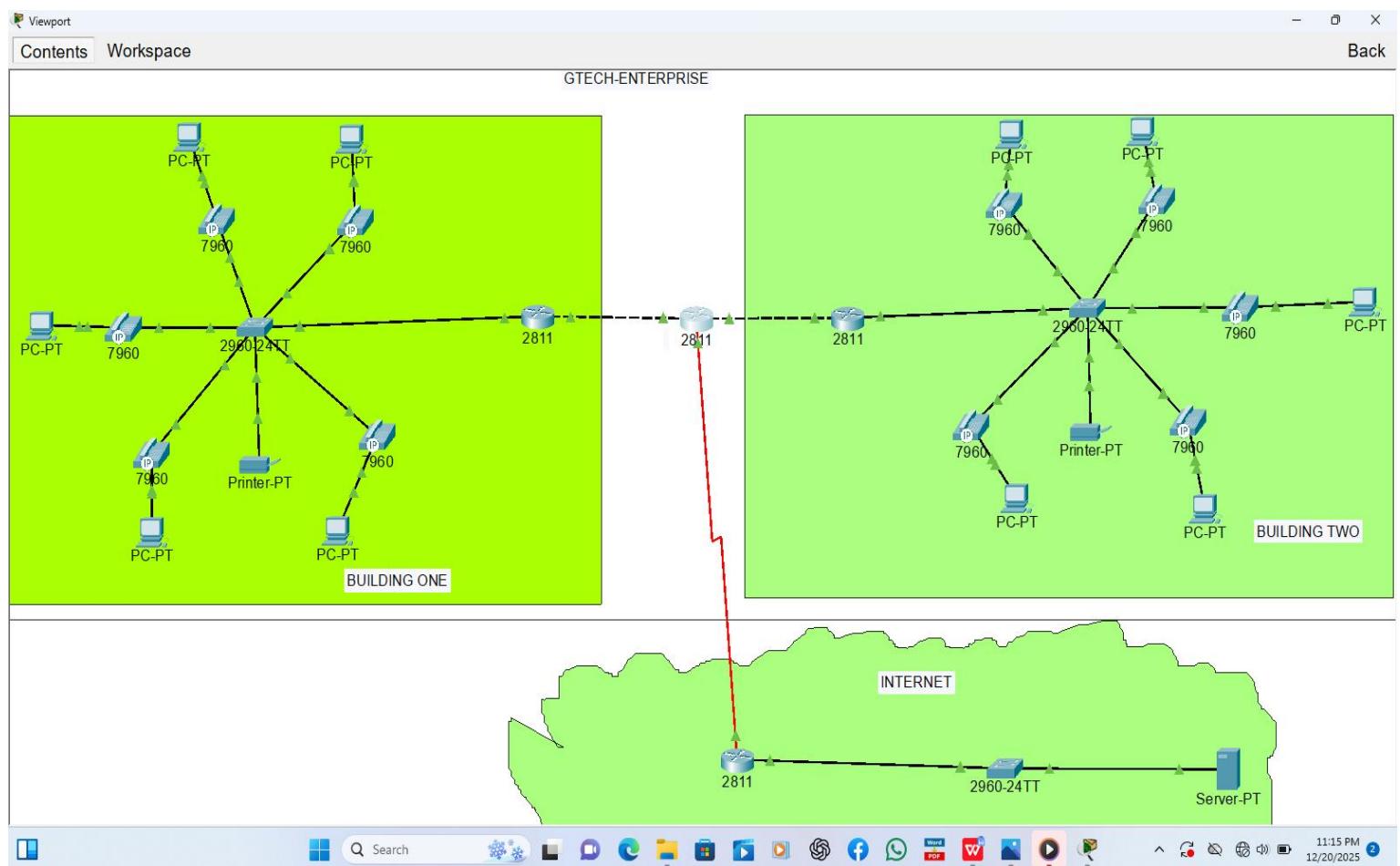
ACTIVITY

You are the network engineer for Gtech enterprise, they just brought you some ip phones , they are moving away from analog,they have two buildings building one has two departments Sales and Human Resource and building two has Finance and ICT, they doesn't have enough layer 2 switches they only have two which should accommodate the said departments per building.The network address is 192.168.0.0.

You are required to;

1. Subnet the network address use slash 28.
2. Create vlans for the departments(data vlan and voice vlan for ip phones).
3. DHCP on the routers LANs (Building 1 and 2).
4. Telephony-service
5. Dial-peer
6. Routing protocol RIP.
7. Access List Control.
8. Network Address Translation (NAT).

NETWORK TOPOLOGY



LAYER 2 CONFIGURATIONS

BUILDING ONE

```

Hostname BUILDING-1-MAIN-SW
Enable secret Admin2
Username Admin password Admin123
Line console 0
Login local
Line vty 0 15
Login local
Service password-encryption
Banner motd #ADMINS ONLY#
Vlan 10
Name DATA1
Vlan 15
Name VOICE1
Vlan 20
Name DATA2
Vlan 25
Name VOICE2
Int range fa0/2-4

```

```
Switchport mode access
Switchport access vlan 10
Switchport voice vlan 15
Exit
Int range fa0/5-7
Switchport mode access
Switchport access vlan 20
Switchport voice vlan 25
Int fa0/1
Switchport mode trunk
Do wr
BUILDING TWO
Hostname BUILDING-2-MAIN-SW
Enable secret Admin2
Username Admin password Admin123
Line console 0
Login local
Line vty 0 15
Login local
Service password-encryption
Banner motd #ADMINS ONLY#
Vlan 30
Name DATA3
Vlan 35
Name VOICE3
Vlan 40
Name DATA4
Vlan 45
Name VOICE4
Int range fa0/2-4
Switchport mode access
Switchport access vlan 30
Switchport voice vlan 35
Exit
Int range fa0/5-7
Switchport mode access
Switchport access vlan 40
Switchport voice vlan 45
Int fa0/1
Switchport mode trunk
Do wr
```

SUBNETTING

Vlan	Mask	Network	Usable Addresses	Broadcast
10	/28	192.168.0.0	192.168.0.1-192.168.0.14	192.168.0.15
15	/28	192.168.0.16	192.168.0.17-192.168.0.30	192.168.0.31
20	/28	192.168.0.32	192.168.0.33-192.168.0.46	192.168.0.47
25	/28	192.168.0.48	192.168.0.49-192.168.0.62	192.168.0.63
30	/28	192.168.0.64	192.168.0.65-192.168.0.78	192.168.0.79
35	/28	192.168.0.80	192.168.0.81-192.168.0.94	192.168.0.95
40	/28	192.168.0.96	192.168.0.97-192.168.0.110	192.168.0.111
45	/28	192.168.0.112	192.168.0.113-192.168.0.126	192.168.0.127

LAYER 3 CONFIGURATIONS

BUILDING ONE

Hostname BUILDING-1-MAIN-ROUTER

Enable secret Admin1

Username Admin password Admin123

Line console 0

Login local

Line vty 0 15

Login local

Service password-encryption

Banner motd #ADMINS ONLY#

Int range fa0/0

No shut

Description link to BUILDING1

Ex

SUB-INTERFACES

Int fa0/0.10

Encap dot1q 10

Ip add 192.168.0.1 255.255.255.240

Int fa0/0.15

Encap dot1q 15

Ip add 192.168.0.17 255.255.255.240

Int fa0/0.20

Encap dot1q 20

Ip add 192.168.0.33 255.255.255.240

Int fa0/0.25

Encap dot1q 25

Ip add 192.168.0.49 255.255.255.240

Ex

Do wr

DYNAMIC HOST CONFIGURATION

BUILDING ONE

DATA

Ip dhcp excluded-address 192.168.0.1 192.168.0.5

Ip dhcp pool VLAN10

Network 192.168.0.0 255.255.255.240

Default-router 192.168.0.1

Dns-server 8.8.8.8

Ex

Ip dhcp excluded-address 192.168.0.33 192.168.0.38

Ip dhcp pool VLAN20

Network 192.168.0.32 255.255.255.240

Default-router 192.168.0.33

Dns-server 8.8.8.8

Ex

VOICE

Ip dhcp excluded-address 192.168.0.17 192.168.0.22

Ip dhcp pool VLAN15

Network 192.168.0.16 255.255.255.240

Default-router 192.168.0.17

Option 150 ip 192.168.0.17

Ex

Ip dhcp excluded-address 192.168.0.49 192.168.0.54

Ip dhcp pool VLAN25

Network 192.168.0.48 255.255.255.240

Default-router 192.168.0.49

Option 150 ip 192.168.0.49

Ex

Do wr

!TELEPHONY-SERVICE

Telephony-service

Max-dn 5

Max-ephones 5

Auto assign 1 to 5

Ip source-address 192.168.0.17 port 2000

Ex

Do wr

Ephone-dn 1

Number 1001

Ephone-dn 2

Number 1002

Ephone-dn 3

Number 1003

Ephone-dn 4

Number 1004

Ephone-dn 5

Number 1005

Ex

Ephone 1

Type 7960

Button 1:1

Ephone 2

Type 7960

Button 1:2

Ephone 3

Type 7960

Button 1:3

Ephone 4

Type 7960

Button 1:4

Ephone 5

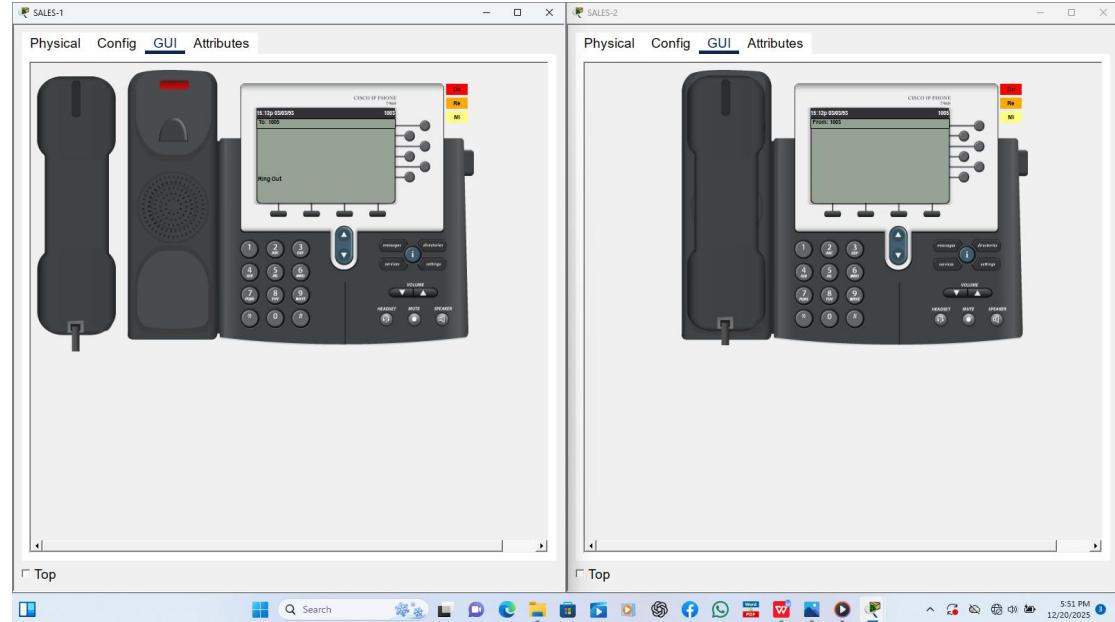
Type 7960

Button 1:5

Do wr

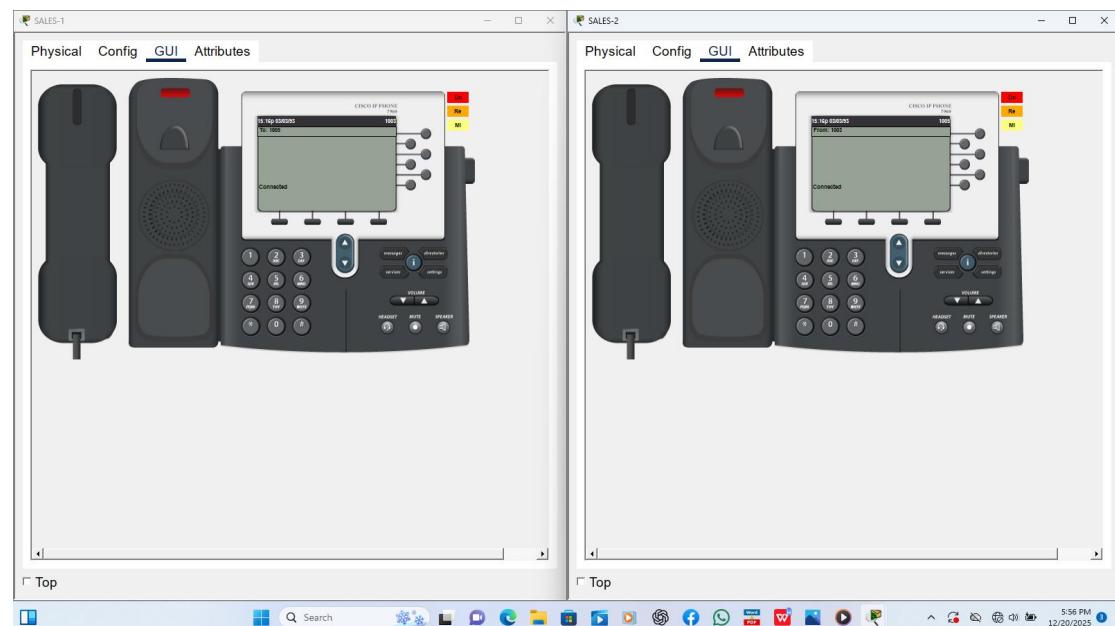
Before we go to building two let us try the calls between our phones, we will just do one

Call from SALES-1 TO SALES 2

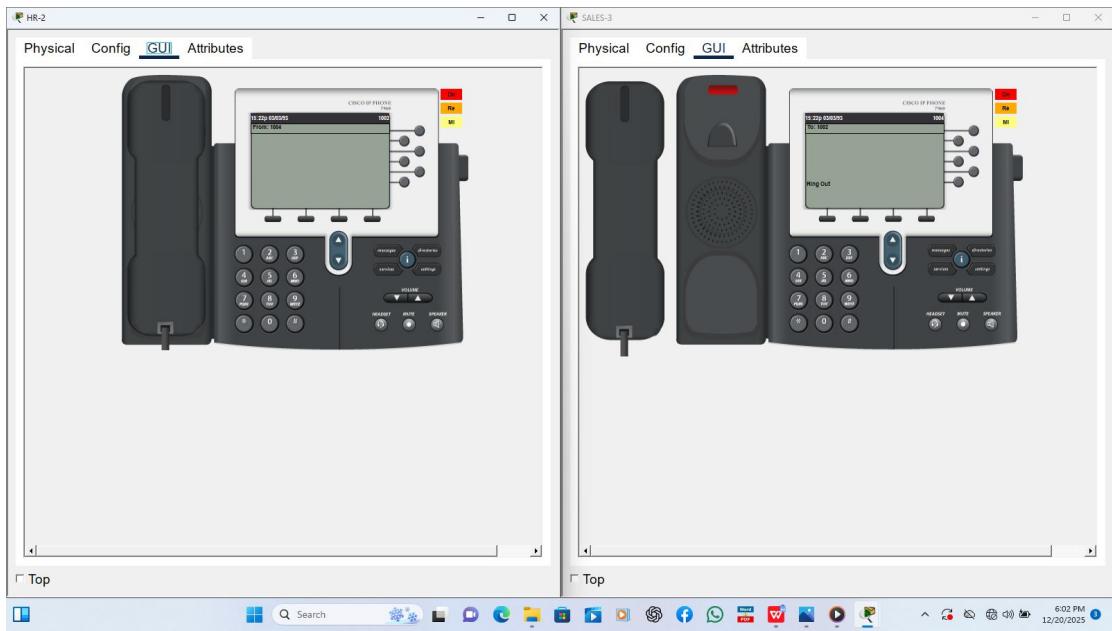


From the above picture we can see the phone ringing

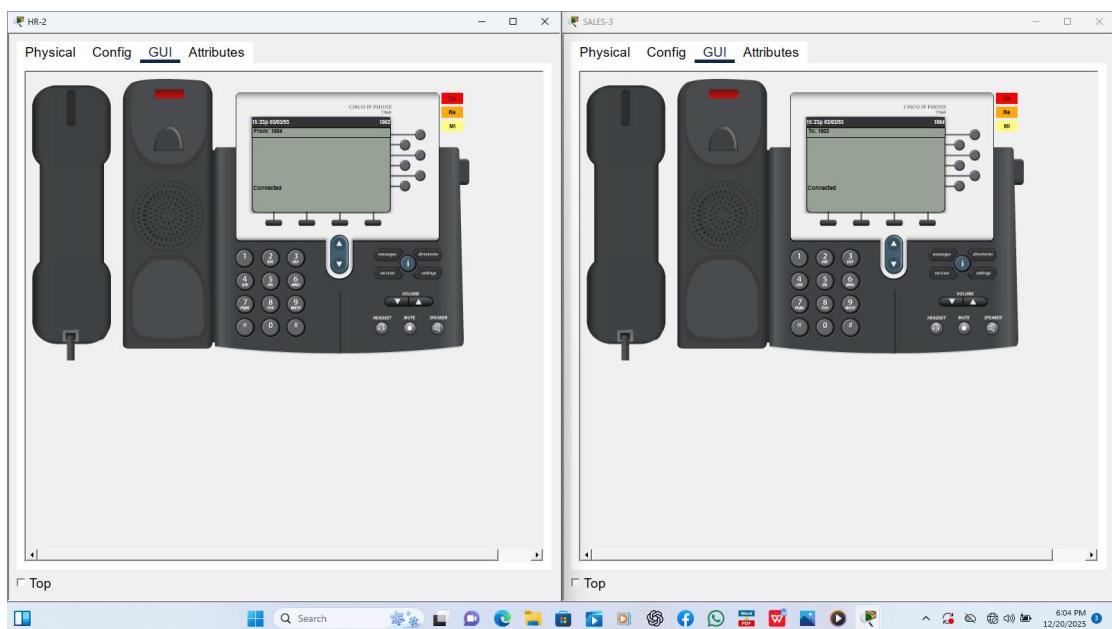
Now let SALES-2 answer



let us try calling HR, thus from SALES to HR (VLAN 15 TO VLAN 25)



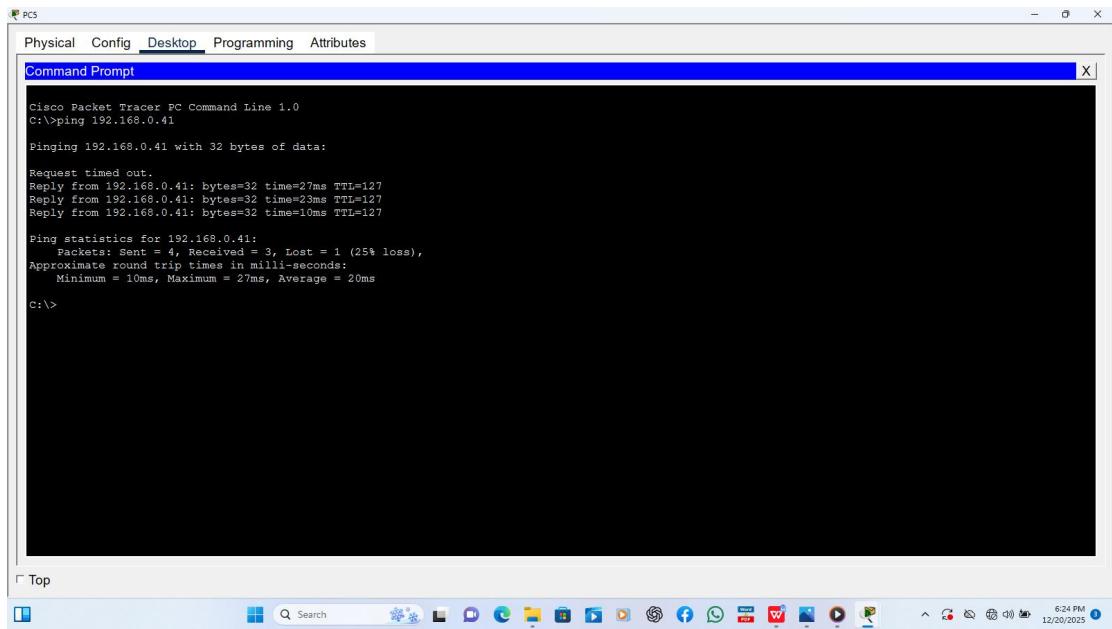
HR can answer the call



Let us try to ping from vlan 10 to vlan 20

Ping 192.168.0.41

OUTPUT



The screenshot shows a Cisco Packet Tracer window titled "Command Prompt". The menu bar includes "Physical", "Config", "Desktop", "Programming", and "Attributes", with "Config" being the active tab. The main window displays the output of a ping command:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.41

Pinging 192.168.0.41 with 32 bytes of data:
Request timed out.
Reply from 192.168.0.41: bytes=32 time=27ms TTL=127
Reply from 192.168.0.41: bytes=32 time=23ms TTL=127
Reply from 192.168.0.41: bytes=32 time=10ms TTL=127

Ping statistics for 192.168.0.41:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 27ms, Average = 20ms

C:\>
```

Ping was successful. On building one everything is working well let us go to building two

BUILDING TWO

Hostname BUILDING2-MAIN-ROUTER

Enable secret Admin1

Username Admin password Admin123

Line console 0

Login local

Line vty 0 15

Login local

Service password-encryption

Banner motd #ADMINS ONLY#

Int range fa0/0-1

No shut

Description link to BUILDING2

Ex

SUB-INTERFACES

Int fa0/0.30

Encap dot1q 30

Ip add 192.168.0.65 255.255.255.240

Int fa0/0.35

Encap dot1q 35

Ip add 192.168.0.81 255.255.255.240

Int fa0/0.40

Encap dot1q 40

Ip add 192.168.0.97 255.255.255.240

Int fa0/0.45

Encap dot1q 45

Ip add 192.168.0.113 255.255.255.240

Ex

Do wr

DYNAMIC HOST CONFIGURATION

!DATA

```
Ip dhcp excluded-address 192.168.0.65 192.168.0.70
Ip dhcp pool VLAN30
Network 192.168.0.64 255.255.255.240
Default-router 192.168.0.65
Dns-server 8.8.8.8
Ex
Ip dhcp excluded-address 192.168.0.97 192.168.0.102
Ip dhcp pool VLAN40
Network 192.168.0.96 255.255.255.240
Default-router 192.168.0.97
Dns-server 8.8.8.8
Ex
```

!VOICE

```
Ip dhcp excluded-address 192.168.0.81 192.168.0.86
Ip dhcp pool VLAN35
Network 192.168.0.80 255.255.255.240
Default-router 192.168.0.81
Option 150 ip 192.168.0.81
Ex
Ip dhcp excluded-address 192.168.0.113 192.168.0.118
Ip dhcp pool VLAN45
Network 192.168.0.112 255.255.255.240
Default-router 192.168.0.113
Option 150 ip 192.168.0.113
Ex
```

Do wr

After configuring the dhcp we can try to ping between the PCs.

We will ping from Vlan 30 to vlan 40

Ping 192.168.0.103

OUTPUT

The screenshot shows a Windows desktop environment with a Cisco Packet Tracer window open. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with 'Command Prompt' selected. The command prompt window displays the following output:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.103

Pinging 192.168.0.103 with 32 bytes of data:
Request timed out.
Reply from 192.168.0.103: bytes=32 time=10ms TTL=127
Reply from 192.168.0.103: bytes=32 time=10ms TTL=127
Reply from 192.168.0.103: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 6ms

C:\>ping 192.168.0.103

Pinging 192.168.0.103 with 32 bytes of data:
Reply from 192.168.0.103: bytes=32 time=1ms TTL=127
Reply from 192.168.0.103: bytes=32 time=10ms TTL=127
Reply from 192.168.0.103: bytes=32 time=10ms TTL=127
Reply from 192.168.0.103: bytes=32 time=13ms TTL=127

Ping statistics for 192.168.0.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 13ms, Average = 8ms

C:\>
```

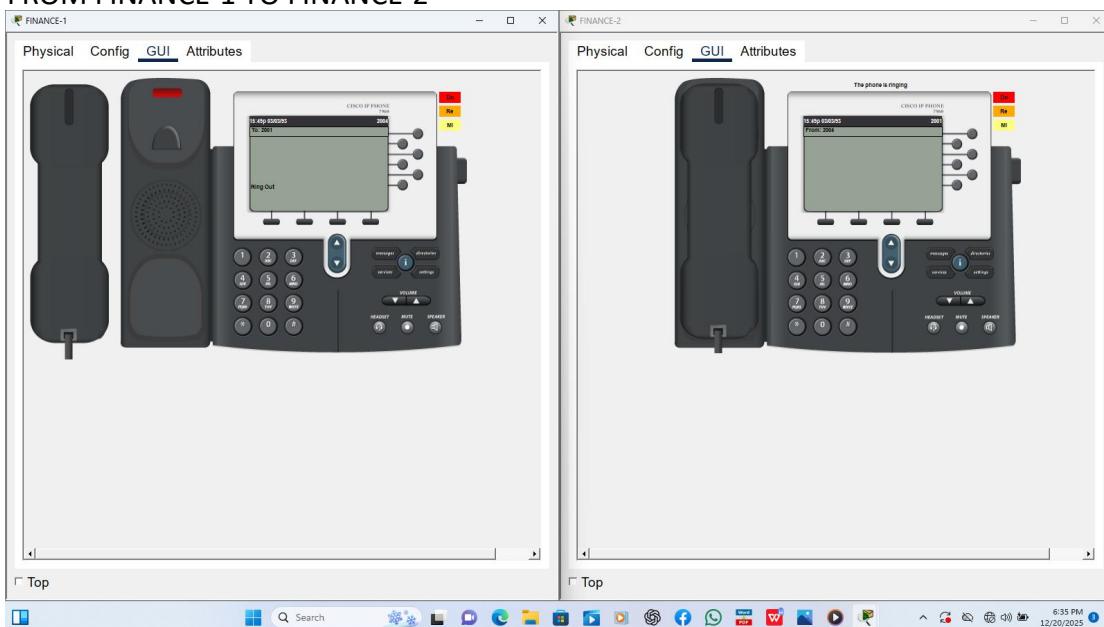
Let us configure telephony-service

!TELEPHONY-SERVICE

```
Telephony-service
Max-dn 5
Max-ephones 5
Auto assign 1 to 5
Ip source-address 192.168.0.113 port 2000
Ex
Do wr
Ephone-dn 1
Number 2001
Ephone-dn 2
Number 2002
Ephone-dn 3
Number 2003
Ephone-dn 4
Number 2004
Ephone-dn 5
Number 2005
Ex
Ephone 1
Type 7960
Button 1:1
Ephone 2
Type 7960
Button 1:2
Ephone 3
Type 7960
Button 1:3
Ephone 4
Type 7960
Button 1:4
Ephone 5
Type 7960
Button 1:5
Do wr
```

We are done with telephony service configurations, let us now do the testing, we will first do with Vlans then we will try between Vlans

FROM FINANCE-1 TO FINANCE-2

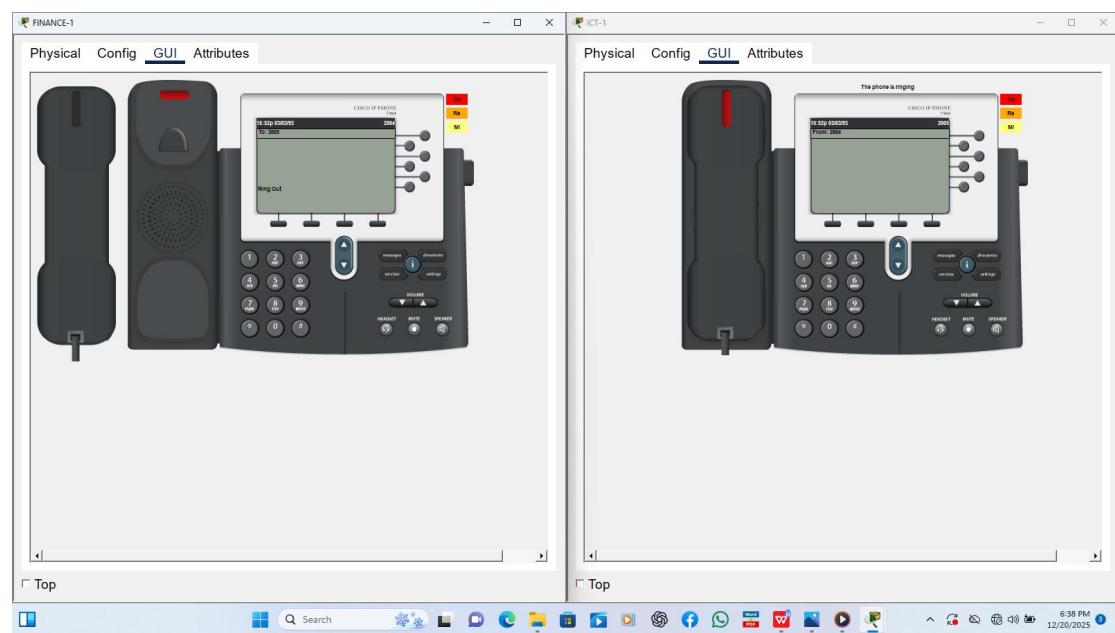


Let us answer,



It is working.

Let us do between vlans, thus from FINANCE to ICT

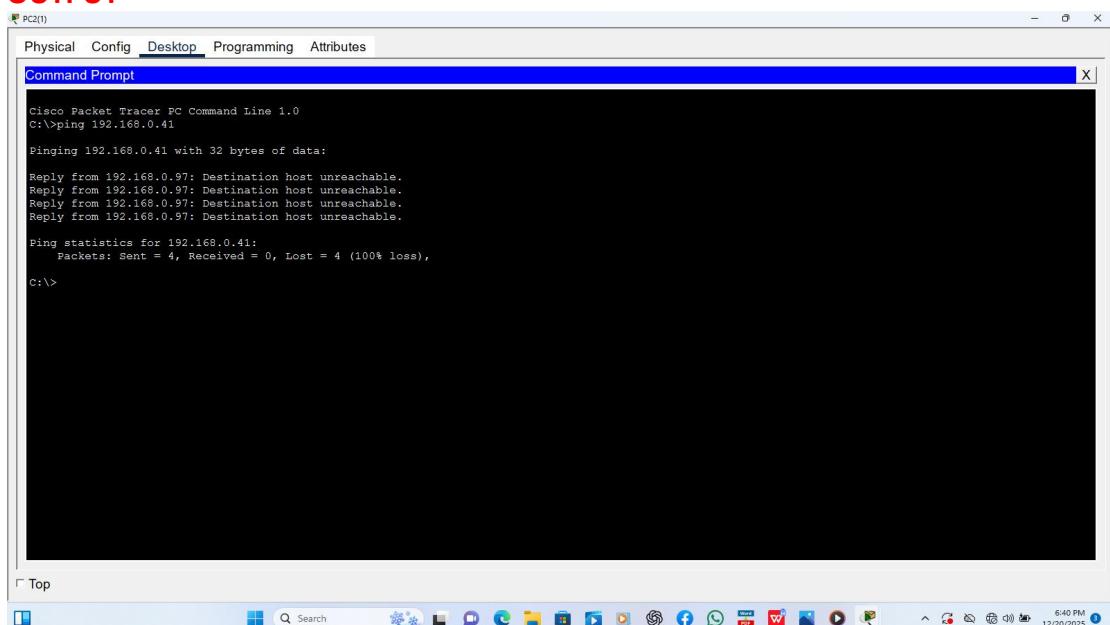


We can pick



We are done, let us try pinging from building two to building one

OUTPUT



Ping has failed, this is because of two reasons, one being that the data/packet is being blocked by the router or the router doesn't know how to reach the destination address. Given that we have not configured the ACLs on either router we can conclude that the reason is that the router doesn't know how to reach the destination address, we have ensure that the routers all have the ip addresses connecting each other, thereafter we configure the routing protocol.

We could use the same network address but for this project I will consider getting another address which is 10.0.0.0 for point to point, I will subnet that.

POINT TO POINT LINK

S/N	MASK	NETWORK	USABLE ADDRESSES
R1-R2	/30	10.0.0.0	10.0.0.1-10.0.0.2
R2-R3	/30	10.0.1.0	10.0.0.1-10.0.0.2

!ROUTER1(BUILDING1) TO EDGE ROUTER

Int fa0/1

Ip add 10.0.0.1 255.255.255.252

```

Ex
Do wr
!EDGE ROUTER
Int fa0/0
Ip add 10.0.0.2 255.255.255.252
Ex
Int fa0/1
Ip add 10.0.1.1 255.255.255.252
Ex
Int se0/3/0
Ip add 203.0.113.2 255.255.255.192
Do wr
!ROUTER2(BUILDING2 FROM EDGE ROUTER)
Int fa0/1
Ip add 10.0.0.2 255.255.255.252
Ex
Do wr

```

ROUTING PROTOCOL

For the routing protocol we are using Routing Information Protocol (RIP)because the network is small .

RIP CONFIGURATIONS

BUILDING ONE

```

!BUILDING-1-MAIN-ROUTER
Ip route 0.0.0.0 0.0.0.0 10.0.0.1
Router rip
Version 2
No auto-summary
Network 192.168.0.0
Network 192.168.0.16
Network 192.168.0.32
Network 192.168.0.48
Network 10.0.0.0
Do wr
Ex
!EDGE ROUTER
Router rip
Version 2
No auto-summary
Network 10.0.1.0
Network 10.0.0.0
Network 203.0.113.0
Do wr
Ex

```

BUILDING TWO

```

!BUILDING21-MAIN-ROUTER
Ip route 0.0.0.0 0.0.0.0 10.0.1.1
Router rip
Version 2
No auto-summary
Network 192.168.0.64
Network 192.168.0.80
Network 192.168.0.97
Network 192.168.0.112
Network 10.0.1.0
Do wr

```

We are done, now let us try to verify the configuration to see if the routers do know how reach each other.

I added a static route on building 1 router and building two router this is going to be used as gateway of last resort

BUILDING 1

Command

Show ip route

OUTPUT

```
BUILDING-1-MAIN-ROUTER
Physical Config CLI Attributes
IOS Command Line Interface

Password: Password:
BUILDING-1-MAIN-ROUTER#conf t
Enter configuration commands, one per line. End with CNTL/Z.
BUILDING-1-MAIN-ROUTER (config)#ip route 0.0.0.0 0.0.0.0 10.0.0.2
BUILDING-1-MAIN-ROUTER (config)#do wr
Building configuration...
[OK]
BUILDING-1-MAIN-ROUTER(config)#do sh 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 10.0.0.2 to network 0.0.0.0

  10.0.0.0/30 is subnetted, 2 subnets
C    10.0.0.0 is directly connected, FastEthernet0/1
R      10.0.1.0 [120/1] via 10.0.0.2, 00:00:02, FastEthernet0/1
  192.168.0.0/28 is subnetted, 8 subnets
C    192.168.0.0 is directly connected, FastEthernet0/0.10
C    192.168.0.16 is directly connected, FastEthernet0/0.15
C    192.168.0.32 is directly connected, FastEthernet0/0.20
C    192.168.0.48 is directly connected, FastEthernet0/0.25
C    192.168.0.64 [120/2] via 10.0.0.2, 00:00:02, FastEthernet0/1
R      192.168.0.80 [120/2] via 10.0.0.2, 00:00:02, FastEthernet0/1
R      192.168.0.96 [120/2] via 10.0.0.2, 00:00:02, FastEthernet0/1
R      192.168.0.112 [120/2] via 10.0.0.2, 00:00:02, FastEthernet0/1
S*   0.0.0.0/0 [1/0] via 10.0.0.2

BUILDING-1-MAIN-ROUTER(config)#
Copy Paste
Top
Q Search 10:21 PM 12/20/2025
```

!EDGE ROUTER

Command

Show ip route

OUTPUT

```
EDGE-ROUTER
Physical Config CLI Attributes
IOS Command Line Interface

EDGE-ROUTER#ex
EDGE-ROUTER#
%SYS-5-CONFIG_I: Configured from console by console

EDGE-ROUTER#EDGE ROUTER
EDGE-ROUTER#Command
EDGE-ROUTER#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

  10.0.0.0/30 is subnetted, 2 subnets
C    10.0.0.0 is directly connected, FastEthernet0/0
C    10.0.1.0 is directly connected, FastEthernet0/1
  192.168.0.0/28 is subnetted, 8 subnets
R      192.168.0.0 [120/1] via 10.0.0.1, 00:00:08, FastEthernet0/0
R      192.168.0.16 [120/1] via 10.0.0.1, 00:00:08, FastEthernet0/0
R      192.168.0.32 [120/1] via 10.0.0.1, 00:00:08, FastEthernet0/0
R      192.168.0.48 [120/1] via 10.0.0.1, 00:00:08, FastEthernet0/0
R      192.168.0.64 [120/1] via 10.0.1.2, 00:00:17, FastEthernet0/1
R      192.168.0.80 [120/1] via 10.0.1.2, 00:00:17, FastEthernet0/1
R      192.168.0.96 [120/1] via 10.0.1.2, 00:00:17, FastEthernet0/1
R      192.168.0.112 [120/1] via 10.0.1.2, 00:00:17, FastEthernet0/1

EDGE-ROUTER#OUTPUT
Translating "OUTPUT"...domain server (255.255.255.255) % Name lookup aborted
EDGE-ROUTER#
Copy Paste
Top
Q Search 7:16 PM 12/20/2025
```

Show ip route

OUTPUT

```
BUILDING2-MAIN-ROUTER>en
Password:
BUILDING2-MAIN-ROUTER#show ip route
Codes: * - 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 10.0.1.1 to network 0.0.0.0

 10.0.0.0/30 is subnetted, 2 subnets
R   10.0.0.0 [120/1] via 10.0.1.1, 00:00:18, FastEthernet0/1
C   10.0.1.0 is directly connected, FastEthernet0/1
 192.168.0.0/28 is subnetted, 8 subnets
R     192.168.0.0 [120/2] via 10.0.1.1, 00:00:18, FastEthernet0/1
R     192.168.0.16 [120/2] via 10.0.1.1, 00:00:18, FastEthernet0/1
R     192.168.0.32 [120/2] via 10.0.1.1, 00:00:18, FastEthernet0/1
R     192.168.0.48 [120/2] via 10.0.1.1, 00:00:18, FastEthernet0/1
C     192.168.0.64 is directly connected, FastEthernet0/0.30
C     192.168.0.80 is directly connected, FastEthernet0/0.35
C     192.168.0.96 is directly connected, FastEthernet0/0.40
C     192.168.0.112 is directly connected, FastEthernet0/0.45
 203.0.113.0/26 is subnetted, 1 subnets
R   203.0.113.0 [120/1] via 10.0.1.1, 00:00:18, FastEthernet0/1
S*   0.0.0.0/0 [1/0] via 10.0.1.1
                [1/0] via 203.0.113.2
BUILDING2-MAIN-ROUTER#
```

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Top



Let us try to ping across from building one to building two

Ping 192.168.0.103

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.103

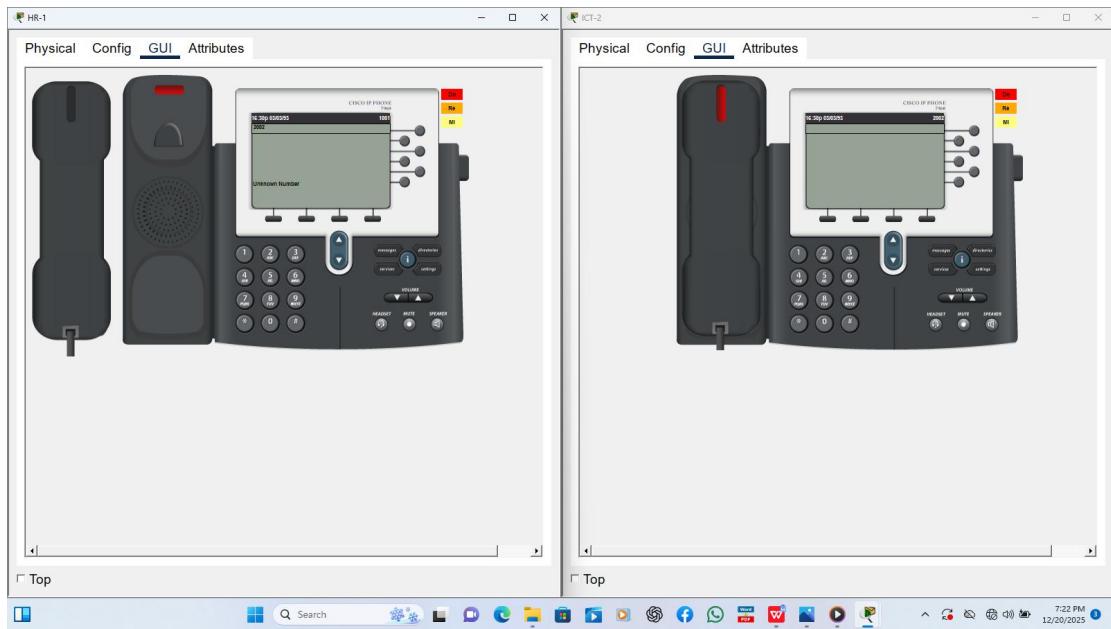
Pinging 192.168.0.103 with 32 bytes of data:
Reply from 192.168.0.103: bytes=32 time=22ms TTL=125
Reply from 192.168.0.103: bytes=32 time=10ms TTL=125
Reply from 192.168.0.103: bytes=32 time=10ms TTL=125
Reply from 192.168.0.103: bytes=32 time=18ms TTL=125

Ping statistics for 192.168.0.103:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 10ms, Maximum = 22ms, Average = 15ms
C:\>
```

Top



For the data vlans we are good, how about voice vlans, let us try to call from either building one or two



Unknown number.

Why unknown number? We did configured the routing protocol and from the vlangs output we can see the routing protocol is working but why with the voice vlan failing?

Well the case is different, we have to configure the dial-peer on the routers

!BUILDING ONE

Dial-peer voice 100 voip

Destination-pattern 2...

Session target ipv4:192.168.0.113

Do wr

!BUILDING TWO

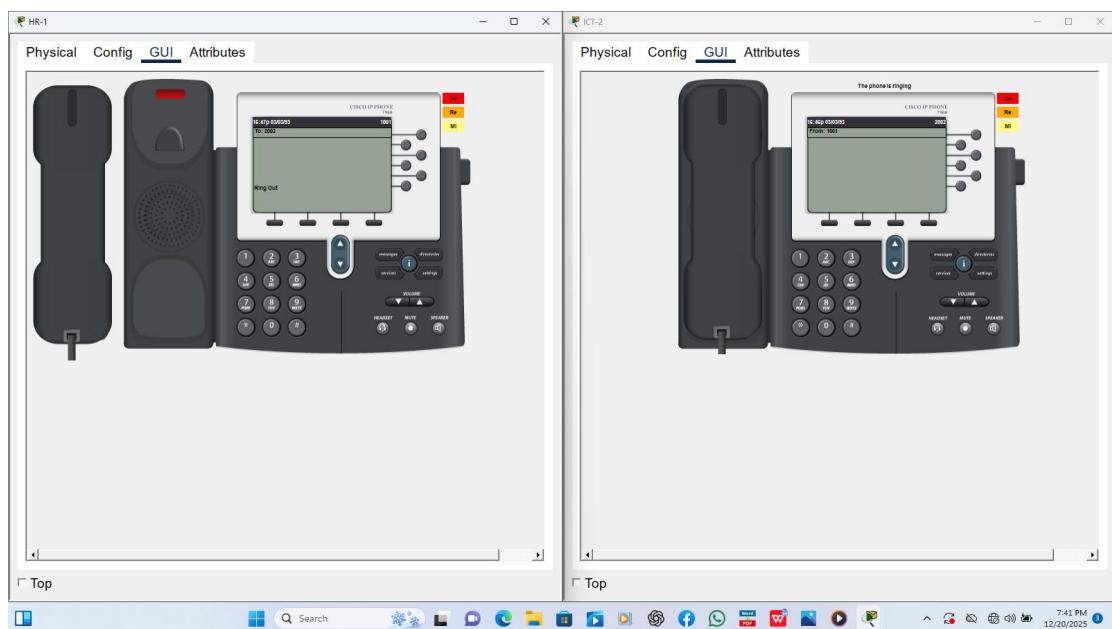
Dial-peer voice 200 voip

Destination-pattern 1...

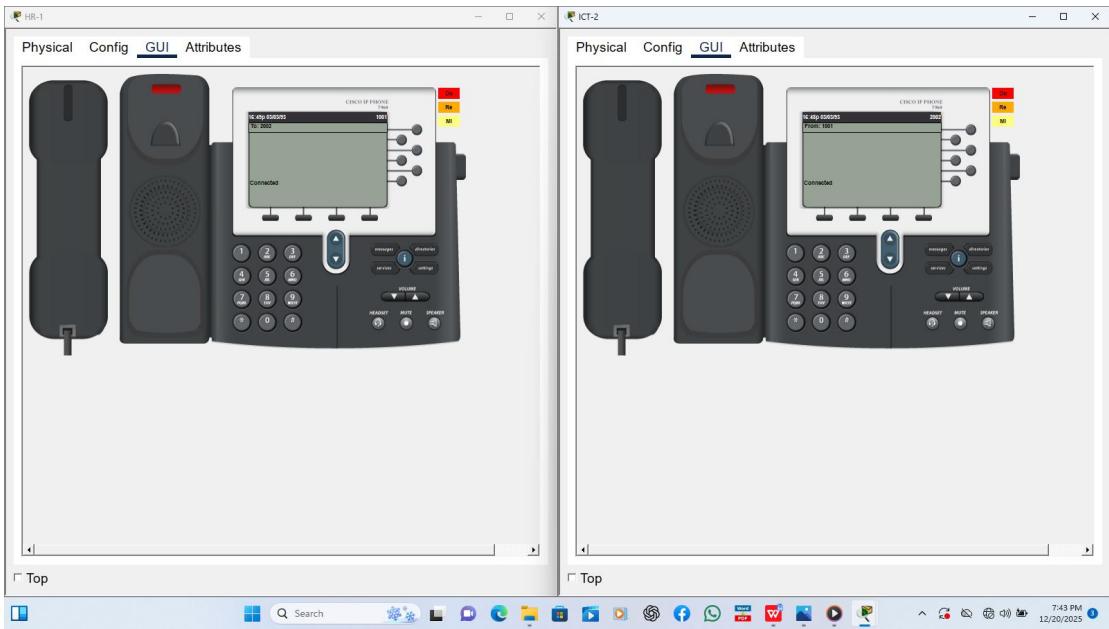
Session target ipv4:192.168.0.17

Do wr

Let us try again calling from HR-1 to ICT-2



It is now ringing, we can pick up the phone now



So far so good we are progressing well, the last thing now is to configure NAT (Network Address Translation)

Given that we have the edge router, it means that our NAT is going to be done there.

First we have to define our inside interfaces, we have interface fa0/0 going to building 1 and interface fa0/1 going to building 2

Let us get started

NAT CONFIGURATION

EDGE ROUTER

Int fa0/0

Ip nat inside

Ex

Int fa0/1

Ip nat insideex

Int se0/3/0

Ip nat outside

!We have defined our inside interfaces and outside interface

!Next we create access lists to tell the edge router which network to permit and translate

Access-list 1 permit 192.168.0.0 0.0.0.15

Access-list 1 permit 192.168.0.16 0.0.0.15

Access-list 1 permit 192.168.0.32 0.0.0.15

Access-list 1 permit 192.168.0.48 0.0.0.15

Access-list 1 permit 192.168.0.64 0.0.0.15

Access-list 1 permit 192.168.0.80 0.0.0.15

Access-list 1 permit 192.168.0.96 0.0.0.15

Access-list 1 permit 192.168.0.112 0.0.0.15

!We now link our inside nat to our access list

Ip nat inside source list 1 interface se0/3/0 overload

!Next is to configure ip route for unknown addresses

Ip route 0.0.0.0 0.0.0.0 203.0.113.1

Do wr

Let us ping the internet router and see if our nat is working

From building 1 pc

Ping 203.0.113.2

OUTPUT

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:
Reply from 10.0.0.1: bytes=32 time=1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time=1ms TTL=255
Reply from 10.0.0.1: bytes=32 time=1ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 3ms

C:\>
C:\>Ping 203.0.113.2

Pinging 203.0.113.2 with 32 bytes of data:
Reply from 203.0.113.2: bytes=32 time=1ms TTL=254
Reply from 203.0.113.2: bytes=32 time=17ms TTL=254
Reply from 203.0.113.2: bytes=32 time=18ms TTL=254
Reply from 203.0.113.2: bytes=32 time=15ms TTL=254

Ping statistics for 203.0.113.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 18ms, Average = 12ms

C:\>
```

We can aswell ping the gateway of external server

Ping 203.0.113.65

OUTPUT

```
Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 11ms, Average = 3ms

C:\>
C:\>Ping 203.0.113.2

Pinging 203.0.113.2 with 32 bytes of data:
Reply from 203.0.113.2: bytes=32 time=1ms TTL=254
Reply from 203.0.113.2: bytes=32 time=17ms TTL=254
Reply from 203.0.113.2: bytes=32 time=18ms TTL=254
Reply from 203.0.113.2: bytes=32 time=15ms TTL=254

Ping statistics for 203.0.113.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 18ms, Average = 12ms

C:\>
C:\>Ping 203.0.113.65

Pinging 203.0.113.65 with 32 bytes of data:
Request timed out.
Reply from 203.0.113.65: bytes=32 time=25ms TTL=253
Reply from 203.0.113.65: bytes=32 time=10ms TTL=253
Reply from 203.0.113.65: bytes=32 time=10ms TTL=253

Ping statistics for 203.0.113.65:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 25ms, Average = 17ms

C:\>
```

Top



Ping 203.0.113.70

OUTPUT

```
Reply from 203.0.113.2: bytes=32 time=13ms TTL=254

Ping statistics for 203.0.113.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 18ms, Average = 12ms

C:\>
C:\>Ping 203.0.113.65

Pinging 203.0.113.65 with 32 bytes of data:
Request timed out.
Reply from 203.0.113.65: bytes=32 time=25ms TTL=253
Reply from 203.0.113.65: bytes=32 time=18ms TTL=253
Reply from 203.0.113.65: bytes=32 time=10ms TTL=253

Ping statistics for 203.0.113.65:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 25ms, Average = 17ms

C:\>
C:\>Ping 203.0.113.70

Pinging 203.0.113.70 with 32 bytes of data:
Reply from 203.0.113.70: bytes=32 time=11ms TTL=125
Reply from 203.0.113.70: bytes=32 time=16ms TTL=125
Reply from 203.0.113.70: bytes=32 time=12ms TTL=125
Reply from 203.0.113.70: bytes=32 time=11ms TTL=125

Ping statistics for 203.0.113.70:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 16ms, Average = 12ms

C:\>
```

Top



Now from any building let us ping 203.0.113.65

After that we can issue the show ip nat translation command to verify our NAT configurations.

OUTPUT

```
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 203.0.113.1 to network 0.0.0.0

10.0.0.0/30 is subnetted, 2 subnets
C   10.0.0.0 is directly connected, FastEthernet0/0
C   10.0.1.0 is directly connected, FastEthernet0/1
192.168.0.0/28 is subnetted, 8 subnets
R   192.168.0.0 [120/1] via 10.0.0.1, 00:00:01, FastEthernet0/0
R   192.168.0.16 [120/1] via 10.0.0.1, 00:00:01, FastEthernet0/0
R   192.168.0.32 [120/1] via 10.0.0.1, 00:00:01, FastEthernet0/0
R   192.168.0.48 [120/1] via 10.0.0.1, 00:00:01, FastEthernet0/0
R   192.168.0.64 [120/1] via 10.0.1.2, 00:00:08, FastEthernet0/1
R   192.168.0.80 [120/1] via 10.0.1.2, 00:00:08, FastEthernet0/1
R   192.168.0.96 [120/1] via 10.0.1.2, 00:00:08, FastEthernet0/1
R   192.168.0.112 [120/1] via 10.0.1.2, 00:00:08, FastEthernet0/1
R   192.168.0.128 [120/1] via 10.0.1.2, 00:00:08, FastEthernet0/1
203.0.113.0/26 is subnetted, 5 subnets
C   203.0.113.0 is directly connected, Serial10/3/0
S*  0.0.0.0/0 [1/0] via 203.0.113.1

EDGE-ROUTER>show ip nat translation
EDGE-ROUTER>show ip nat translation
Pro Inside global     Inside local      Outside local      Outside global
icmp 203.0.113.2:17   192.168.0.41:17  203.0.113.65:17  203.0.113.65:17
icmp 203.0.113.2:18   192.168.0.41:18  203.0.113.65:18  203.0.113.65:18
icmp 203.0.113.2:19   192.168.0.41:19  203.0.113.65:19  203.0.113.65:19
icmp 203.0.113.2:20   192.168.0.41:20  203.0.113.65:20  203.0.113.65:20
```

There is our nat output, there are some terms in the output we can see inside global, inside local, outside local and outside global

INSIDE GLOBAL: The nat'd address as it appears from the outside

INSIDE LOCAL: The actual address of the inside host

OUTSIDE LOCAL: The address of the external device as seen by the inside host

OUTSIDE GLOBAL: The actual address of the external device

The above output shown is from building 1 let us try building 2

Ping 203.0.113.65

After the ping let us check our nat again

On the edge router "show ip nat translation"

OUTPUT

```
Press RETURN to get started.

EDGE-ROUTER>en
EDGE-ROUTER#conf t
Enter configuration commands, one per line. End with CNTL/Z.
EDGE-ROUTER(config)#
EDGE-ROUTER#
SYS-CONFIG: Configured from console by console
show ip nat translation
EDGE-ROUTER#show ip nat translation
Pro Inside global     Inside local      Outside local      Outside global
icmp 203.0.113.2:13   192.168.0.72:13  203.0.113.65:13  203.0.113.65:13
icmp 203.0.113.2:14   192.168.0.72:14  203.0.113.65:14  203.0.113.65:14
icmp 203.0.113.2:15   192.168.0.72:15  203.0.113.65:15  203.0.113.65:15
icmp 203.0.113.2:16   192.168.0.72:16  203.0.113.65:16  203.0.113.65:16
```

It is working perfect as well.

This marks the end of this project

The goal/achievements are;

- **Inter vlan routing**
- **DHCP configured**
- **Dynamic routing-RIP**
- **Telephony-service configured**
- **Dial-peer for voice communication between buildings**
- **Default routes on all the routers**
- **Network Address Translation (NAT)**