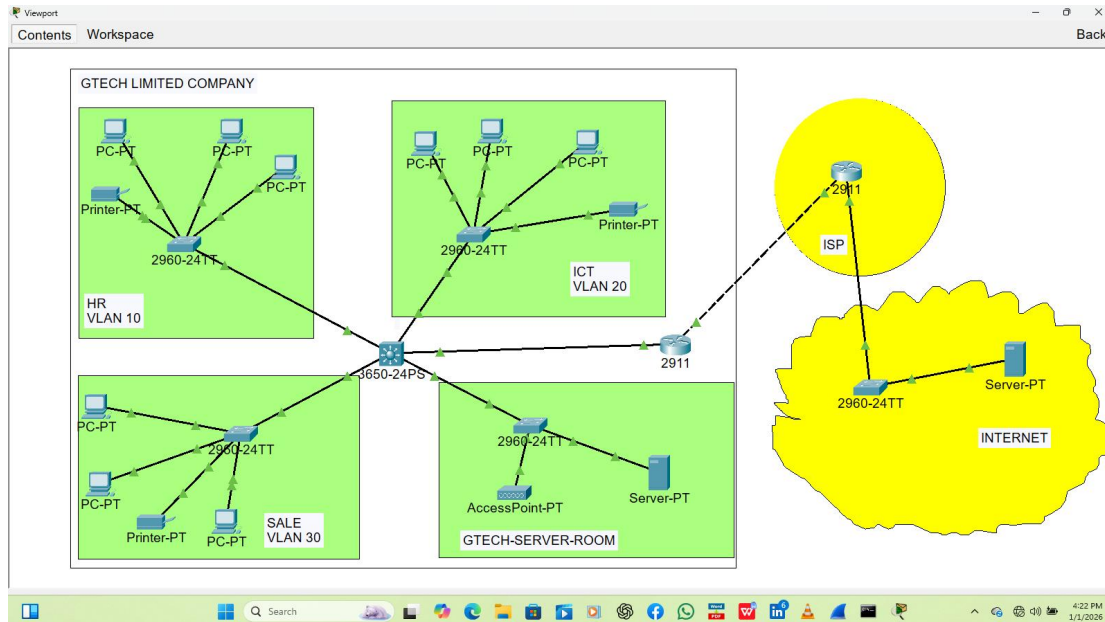


## SMALL NETWORK DESIGN- EXPANDED

Two months after setting up a server, GTECH did manage to buy more switches, they want us to put each vlan on a separate switch, they have 4 layer2 switches and a multilayer switch to do the routing and a router to do the NAT.

## NETWORK TOPOLOGY



## LAYER TWO CONFIGURATIONS

```
Enable secret Admin
Username Admin Password Admin123
Line console 0
Login local
Exit
Line vty 0 15
Login local
Exit
Service password-encryption
Banner motd # ADMINS ONLY#
DO WR
!VLAN 10
Vlan 10
Name HR
Ex
Hostname HR-SW
Int range fa0/1-24
Switchport mode access
Switchport access vlan 10
Ex
Int gig0/1
Switchport mode trunk
Do wr
Ex
```

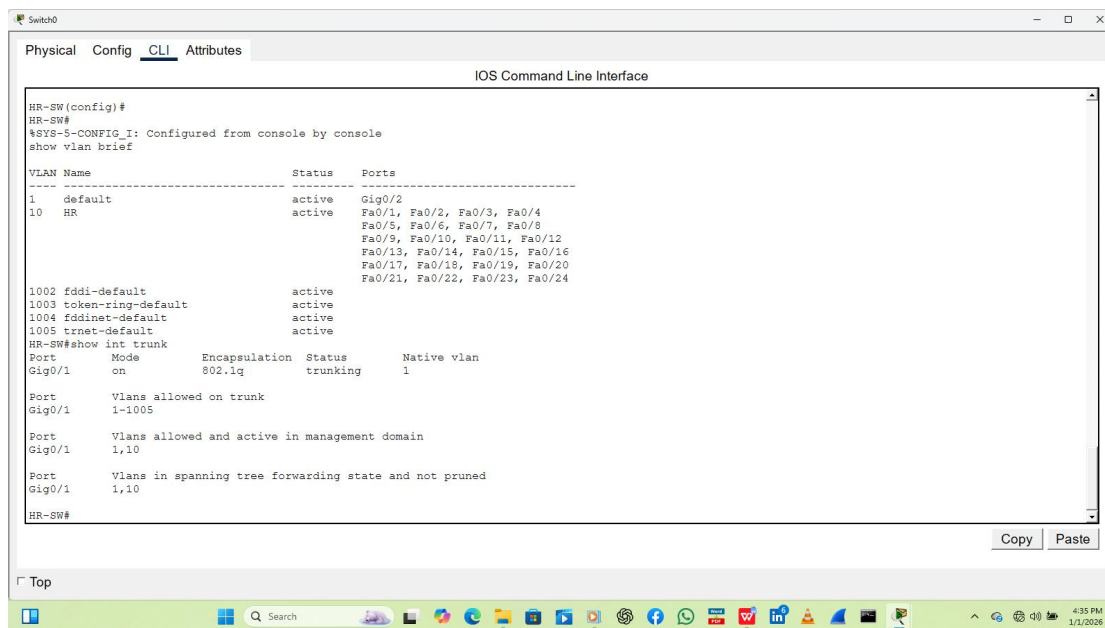
```
!VLAN 20
Vlan 20
Name ICT
Ex
Hostname ICT-SW
Int range fa0/1-24
Switchport mode access
Switchport access vlan20
Ex
Int gig0/1
Switchport mode trunk
Do wr
Ex
```

```
!VLAN 30
Vlan 30
Name SALES
Ex
Hostname SALES-SW
Int range fa0/1-24
Switchport mode access
Switchport access vlan 30
Ex
Int gig0/1
Switchport mode trunk
Do wr
Ex
```

```
!VLAN 40
Vlan 40
Name SERVER-ROOM
Ex
Hostname SERVER-ROOM-SW
Int range fa0/1-24
Switchport mode access
Switchport access vlan 40
Ex
Int gig0/1
Switchport mode trunk
Do wr
Ex
```

Let us verify our vlans

## Vlan 10 TRUNK INTERFACE



The screenshot shows the CLI of Switch0. The user has entered the command `show vlan brief`, which displays a table of VLANs. VLAN 10, named 'HR', is active and has ports Fa0/1 through Fa0/24 assigned to it. Below this, the user has entered `show int trunk`, which shows that Gig0/1 is configured as a trunk interface with encapsulation 802.1q and status 'trunking'. The native VLAN is 1. The output also shows the VLANs allowed on the trunk (1-1005) and the VLANs allowed and active in the management domain (1,10).

```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

HR-SW(config)#
HR-SW#
%SYS-5-CONFIG_I: Configured from console by console
show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Gig0/2
10   HR                      active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, 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

1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default        active
1005 trnet-default          active

HR-SW#show int trunk

Port      Mode      Encapsulation  Status      Native vlan
Gig0/1    on        802.1q         trunking    1

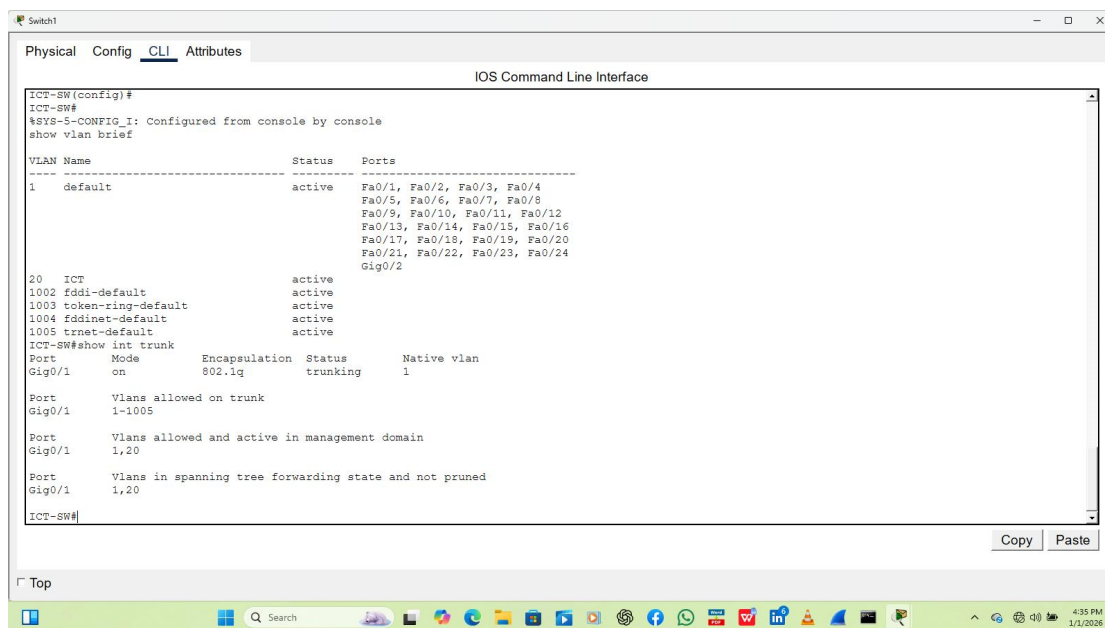
Port      Vlans allowed on trunk
Gig0/1    1-1005

Port      Vlans allowed and active in management domain
Gig0/1    1,10

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,10

HR-SW#
```

## VLAN 20 TRUNK INTERFACE



The screenshot shows the CLI of Switch1. The user has entered the command `show vlan brief`, which displays a table of VLANs. VLAN 20, named 'ICT', is active and has ports Fa0/1 through Fa0/24 assigned to it. Below this, the user has entered `show int trunk`, which shows that Gig0/1 is configured as a trunk interface with encapsulation 802.1q and status 'trunking'. The native VLAN is 1. The output also shows the VLANs allowed on the trunk (1-1005) and the VLANs allowed and active in the management domain (1,20).

```
Switch1
Physical Config CLI Attributes
IOS Command Line Interface

ICT-SW(config)#
ICT-SW#
%SYS-5-CONFIG_I: Configured from console by console
show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, 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
                                           Gig0/2

20   ICT                      active

1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default        active
1005 trnet-default          active

ICT-SW#show int trunk

Port      Mode      Encapsulation  Status      Native vlan
Gig0/1    on        802.1q         trunking    1

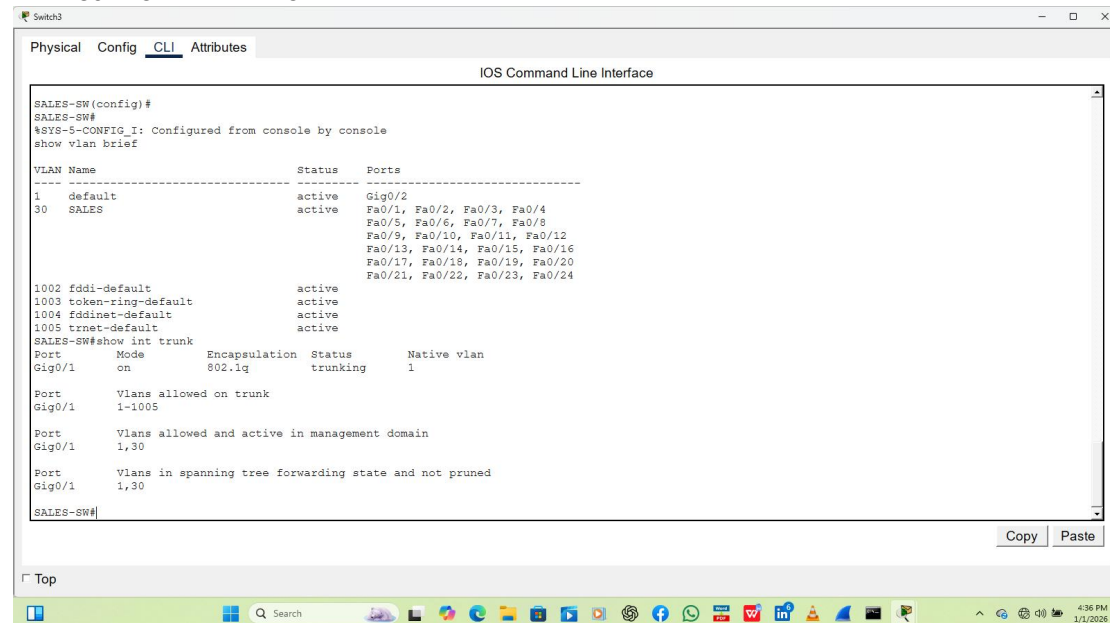
Port      Vlans allowed on trunk
Gig0/1    1-1005

Port      Vlans allowed and active in management domain
Gig0/1    1,20

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,20

ICT-SW#
```

## VLAN 30 TRUNK INTERFACE



The screenshot shows a network switch CLI window titled "Switch3". The "CLI" tab is selected. The command prompt is "SALES-SW(config)#". The user has entered the command "show vlan brief", which displays a table of VLANs. VLAN 30, named "SALES", is active and has ports Fa0/1 through Fa0/24 assigned to it. The user has also entered the command "show int trunk", which displays the status of the trunk interface Gig0/1. The output shows that the interface is in "trunking" mode, with a native VLAN of 1, and that VLANs 1 and 30 are allowed on the trunk.

```
SALES-SW(config)#
SALES-SW#
%SYS-5-CONFIG_I: Configured from console by console
show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Gig0/2
30   SALES                   active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, 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

1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default       active
1005 trnet-default         active

SALES-SW#show int trunk
Port      Mode      Encapsulation  Status      Native vlan
Gig0/1    on        802.1q         trunking    1

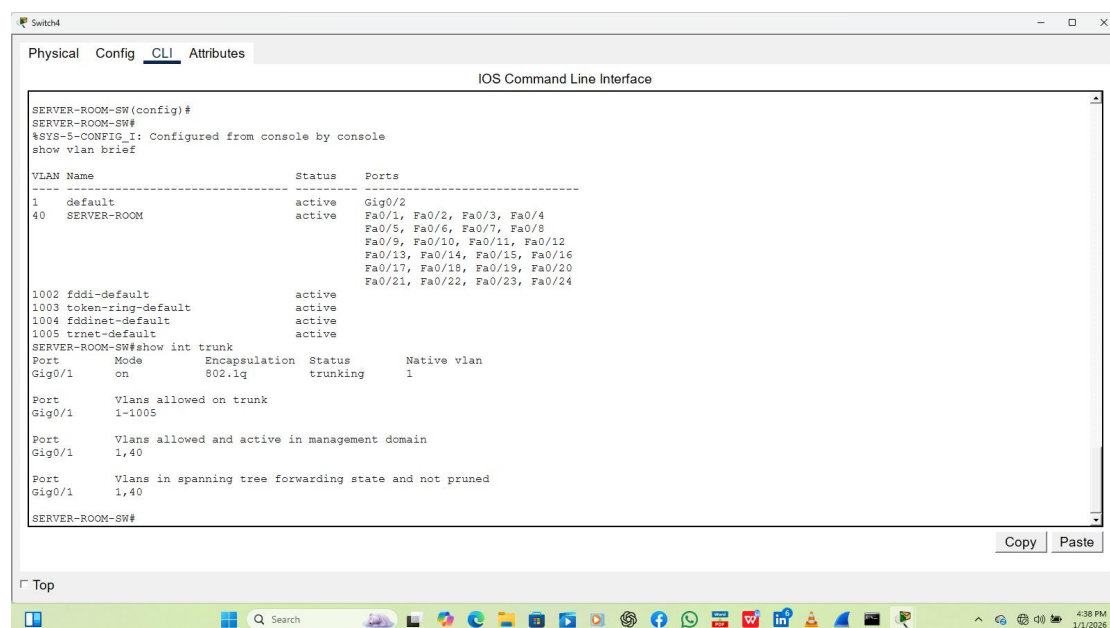
Port      Vlans allowed on trunk
Gig0/1    1-1005

Port      Vlans allowed and active in management domain
Gig0/1    1,30

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,30

SALES-SW#
```

## VLAN 40 AND TRUNK INTERFACE



The screenshot shows a network switch CLI window titled "Switch4". The "CLI" tab is selected. The command prompt is "SERVER-ROOM-SW(config)#". The user has entered the command "show vlan brief", which displays a table of VLANs. VLAN 40, named "SERVER-ROOM", is active and has ports Fa0/1 through Fa0/24 assigned to it. The user has also entered the command "show int trunk", which displays the status of the trunk interface Gig0/1. The output shows that the interface is in "trunking" mode, with a native VLAN of 1, and that VLANs 1 and 40 are allowed on the trunk.

```
SERVER-ROOM-SW(config)#
SERVER-ROOM-SW#
%SYS-5-CONFIG_I: Configured from console by console
show vlan brief

VLAN Name                Status    Ports
-----
1    default                active    Gig0/2
40   SERVER-ROOM            active    Fa0/1, Fa0/2, Fa0/3, Fa0/4
                                           Fa0/5, Fa0/6, Fa0/7, Fa0/8
                                           Fa0/9, 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

1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default       active
1005 trnet-default         active

SERVER-ROOM-SW#show int trunk
Port      Mode      Encapsulation  Status      Native vlan
Gig0/1    on        802.1q         trunking    1

Port      Vlans allowed on trunk
Gig0/1    1-1005

Port      Vlans allowed and active in management domain
Gig0/1    1,40

Port      Vlans in spanning tree forwarding state and not pruned
Gig0/1    1,40

SERVER-ROOM-SW#
```

We are good with layer two configurations(access switches)

Next lets go to our MLS

## MULTILAYER SWITCH CONFIGURATIONS

Hostname GTECH-MLS-SW

Enable secret Admin3

Username Admin Password Admin123

Line console 0

Login local

Exit

Line vty 0 15

Login local

Exit

```

Service password-encryption
Banner motd # ADMINS ONLY#
DO WR
Int range gig1/0/2-5
Switchport mode trunk
Ex
Vlan 10
Ex
Vlan 20
Ex
Vlan 30
Ex
Vlan 40
Ex
Int vlan 10
Ip add 192.168.0.1 255.255.255.240
No shut
Ex
Int vlan 20
Ip add 192.168.0.17 255.255.255.240
No shut
Ex
Int vlan 30
Ip add 192.168.0.33 255.255.255.240
No shut
Ex
Int vlan 40
Ip add 192.168.0.49 255.255.255.240
No shut
Ex
Do wr

```

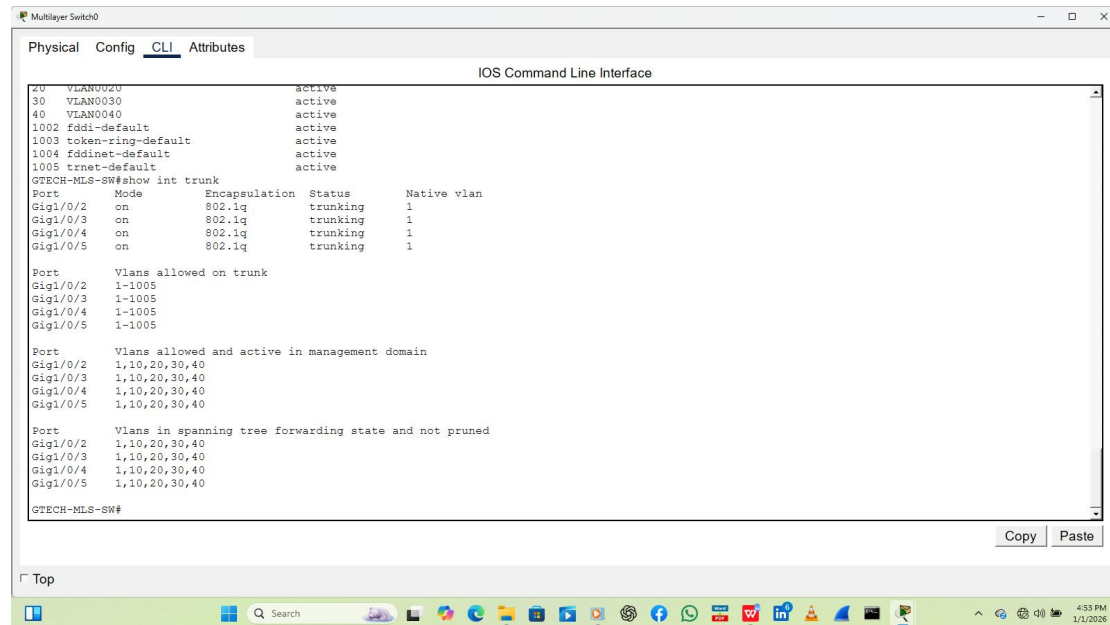
Let us verify our configurations, vlans, interfaces and trunk ports  
**VLANS TRUNK PORTS**

```

Multitool Switch0
Physical Config CLI Attributes
IOS Command Line Interface
GTECH-MLS-SW#
%SYS-5-CONFIG-I: Configured from console by console
GTECH-MLS-SW#show vlan brief
VLAN Name                Status    Ports
-----
1    default                active    Gig1/0/1, Gig1/0/6, Gig1/0/7, Gig1/0/8
Gig1/0/9, Gig1/0/10, Gig1/0/11, Gig1/0/12
Gig1/0/13, Gig1/0/14, Gig1/0/15, Gig1/0/16
Gig1/0/17, Gig1/0/18, Gig1/0/19, Gig1/0/20
Gig1/0/21, Gig1/0/22, Gig1/0/23, Gig1/0/24
Gig1/1/1, Gig1/1/2, Gig1/1/3, Gig1/1/4
10   VLAN0010                active
20   VLAN0020                active
30   VLAN0030                active
40   VLAN0040                active
1002 fddi-default          active
1003 token-ring-default    active
1004 fddinet-default       active
1005 trnet-default          active
GTECH-MLS-SW#show int trunk
Port      Mode      Encapsulation  Status  Native vlan
Gig1/0/2  on        802.1q         trunking  1
Gig1/0/3  on        802.1q         trunking  1
Gig1/0/4  on        802.1q         trunking  1
Gig1/0/5  on        802.1q         trunking  1
Port      Vlans allowed on trunk
Gig1/0/2  1-1005
Gig1/0/3  1-1005
Gig1/0/4  1-1005
Gig1/0/5  1-1005

```

## CONTINUATION



The screenshot shows the Multilayer Switch0 CLI interface. The 'CLI' tab is selected. The output of the 'show int trunk' command is displayed, showing the status of various interfaces. The output is as follows:

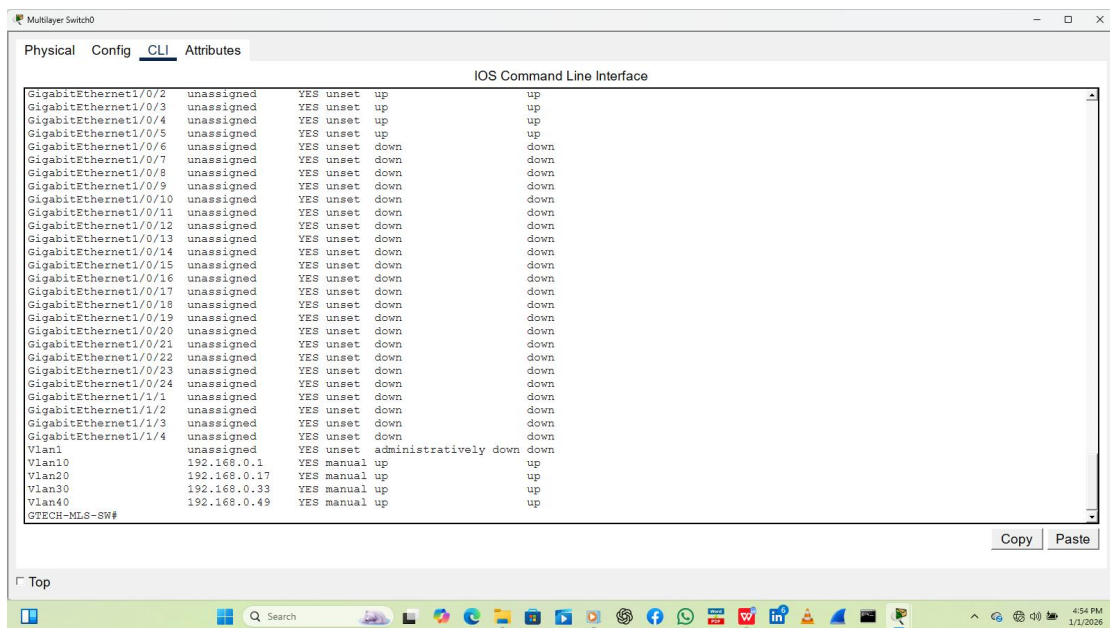
```
20 VLAN0020 active
30 VLAN0030 active
40 VLAN0040 active
1002 fddi-default active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default active
GTECH-MLS-SW#show int trunk
Port Mode Encapsulation Status Native vlan
Gig1/0/2 on 802.1q trunking 1
Gig1/0/3 on 802.1q trunking 1
Gig1/0/4 on 802.1q trunking 1
Gig1/0/5 on 802.1q trunking 1

Port Vlans allowed on trunk
Gig1/0/2 1-1005
Gig1/0/3 1-1005
Gig1/0/4 1-1005
Gig1/0/5 1-1005

Port Vlans allowed and active in management domain
Gig1/0/2 1,10,20,30,40
Gig1/0/3 1,10,20,30,40
Gig1/0/4 1,10,20,30,40
Gig1/0/5 1,10,20,30,40

Port Vlans in spanning tree forwarding state and not pruned
Gig1/0/2 1,10,20,30,40
Gig1/0/3 1,10,20,30,40
Gig1/0/4 1,10,20,30,40
Gig1/0/5 1,10,20,30,40
GTECH-MLS-SW#
```

## INTERFACES



The screenshot shows the Multilayer Switch0 CLI interface. The 'CLI' tab is selected. The output of the 'show int' command is displayed, showing the status of various interfaces. The output is as follows:

```
GigabitEthernet1/0/2 unassigned YES unset up up
GigabitEthernet1/0/3 unassigned YES unset up up
GigabitEthernet1/0/4 unassigned YES unset up up
GigabitEthernet1/0/5 unassigned YES unset up up
GigabitEthernet1/0/6 unassigned YES unset down down
GigabitEthernet1/0/7 unassigned YES unset down down
GigabitEthernet1/0/8 unassigned YES unset down down
GigabitEthernet1/0/9 unassigned YES unset down down
GigabitEthernet1/0/10 unassigned YES unset down down
GigabitEthernet1/0/11 unassigned YES unset down down
GigabitEthernet1/0/12 unassigned YES unset down down
GigabitEthernet1/0/13 unassigned YES unset down down
GigabitEthernet1/0/14 unassigned YES unset down down
GigabitEthernet1/0/15 unassigned YES unset down down
GigabitEthernet1/0/16 unassigned YES unset down down
GigabitEthernet1/0/17 unassigned YES unset down down
GigabitEthernet1/0/18 unassigned YES unset down down
GigabitEthernet1/0/19 unassigned YES unset down down
GigabitEthernet1/0/20 unassigned YES unset down down
GigabitEthernet1/0/21 unassigned YES unset down down
GigabitEthernet1/0/22 unassigned YES unset down down
GigabitEthernet1/0/23 unassigned YES unset down down
GigabitEthernet1/0/24 unassigned YES unset down down
GigabitEthernet1/1/1 unassigned YES unset down down
GigabitEthernet1/1/2 unassigned YES unset down down
GigabitEthernet1/1/3 unassigned YES unset down down
GigabitEthernet1/1/4 unassigned YES unset down down
Vlan1 unassigned YES unset administratively down down
Vlan10 192.168.0.1 YES manual up up
Vlan20 192.168.0.17 YES manual up up
Vlan30 192.168.0.33 YES manual up up
Vlan40 192.168.0.49 YES manual up up
GTECH-MLS-SW#
```

We are good so far, next we configure dhcp

## DHCP CONFIGURATIONS

Ip dhcp excluded-address 192.168.0.1 192.168.0.3  
Ip dhcp pool HR-pool  
Network 192.168.0.0 255.255.255.240  
Default-router 192.168.0.1  
Dns-server 8.8.8.8  
Ex  
Do wr  
Ip dhcp excluded-address 192.168.0.17 192.168.0.19  
Ip dhcp pool ICT-pool  
Network 192.168.0.16 255.255.255.240  
Default-router 192.168.0.17

Dns-server 8.8.8.8

Ex

Do wr

Ip dhcp excluded-address 192.168.0.33 192.168.0.35

Ip dhcp pool SALES-pool

Network 192.168.0.32 255.255.255.240

Default-router 192.168.0.33

Dns-server 8.8.8.8

Ex

Ip dhcp excluded-address 192.168.0.49 192.168.0.51

Ip dhcp pool SERVER-ROOM-pool

Network 192.168.0.48 255.255.255.240

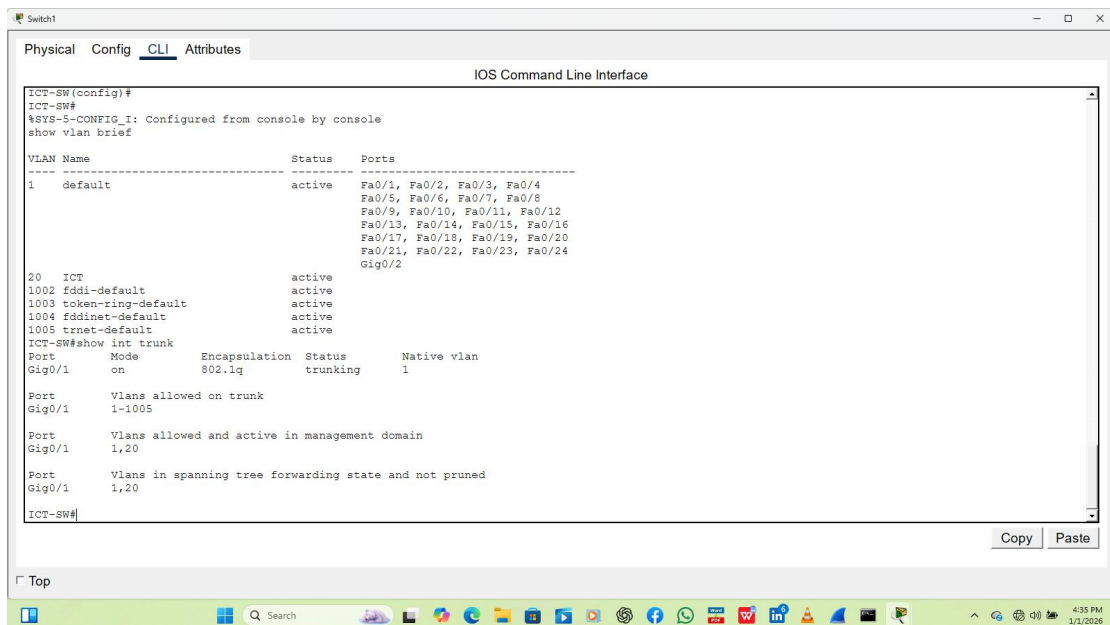
Default-router 192.168.0.49

Dns-server 8.8.8.8

Ex

We have a problem, vlan 20 Hosts are unable to get ip addresses despite the pool being well configured, lets us go and do a clear vlan verification on vlan 20

VLAN 20 and trunk port



The screenshot shows the CLI of a switch named 'Switch1'. The user is in the 'CLI' tab. The command 'show vlan brief' has been executed, displaying the following information:

VLAN	Name	Status	Ports
1	default	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, 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 Gig0/2
20	ICT	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

Below the table, the command 'show int trunk' is executed, showing the configuration for Gig0/1:

Port	Mode	Encapsulation	Status	Native vlan
Gig0/1	on	802.1q	trunking	1

The command 'show int trunk' also displays the following information:

Port	Vlans allowed on trunk
Gig0/1	1-1005

The command 'show int trunk' also displays the following information:

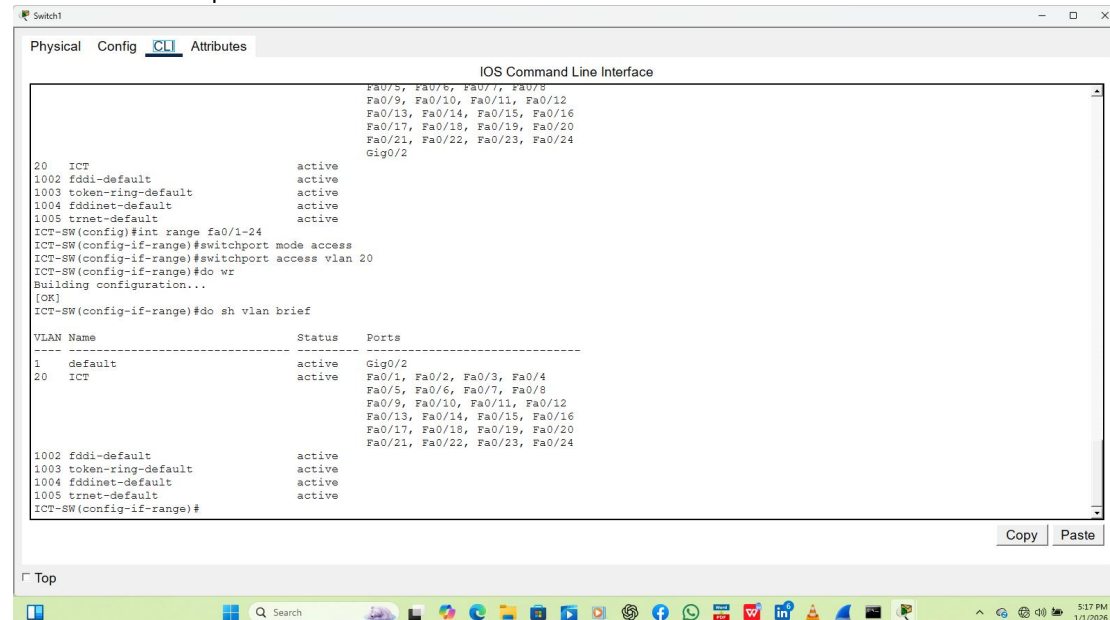
Port	Vlans allowed and active in management domain
Gig0/1	1,20

The command 'show int trunk' also displays the following information:

Port	Vlans in spanning tree forwarding state and not pruned
Gig0/1	1,20

We can see that the interfaces belong to the default vlan which is vlan 1, let us put all the interfaces into vlan 20

Vlan 20 and trunk port



The screenshot shows the CLI of a switch named 'Switch1'. The user is in the 'CLI' tab. The command 'show vlan brief' has been executed, displaying the following information:

VLAN	Name	Status	Ports
1	default	active	Gig0/2
20	ICT	active	Fa0/1, Fa0/2, Fa0/3, Fa0/4 Fa0/5, Fa0/6, Fa0/7, Fa0/8 Fa0/9, 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
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

Below the table, the command 'show int trunk' is executed, showing the configuration for Gig0/1:

Port	Mode	Encapsulation	Status	Native vlan
Gig0/1	on	802.1q	trunking	1

The command 'show int trunk' also displays the following information:

Port	Vlans allowed on trunk
Gig0/1	1-1005

The command 'show int trunk' also displays the following information:

Port	Vlans allowed and active in management domain
Gig0/1	1,20

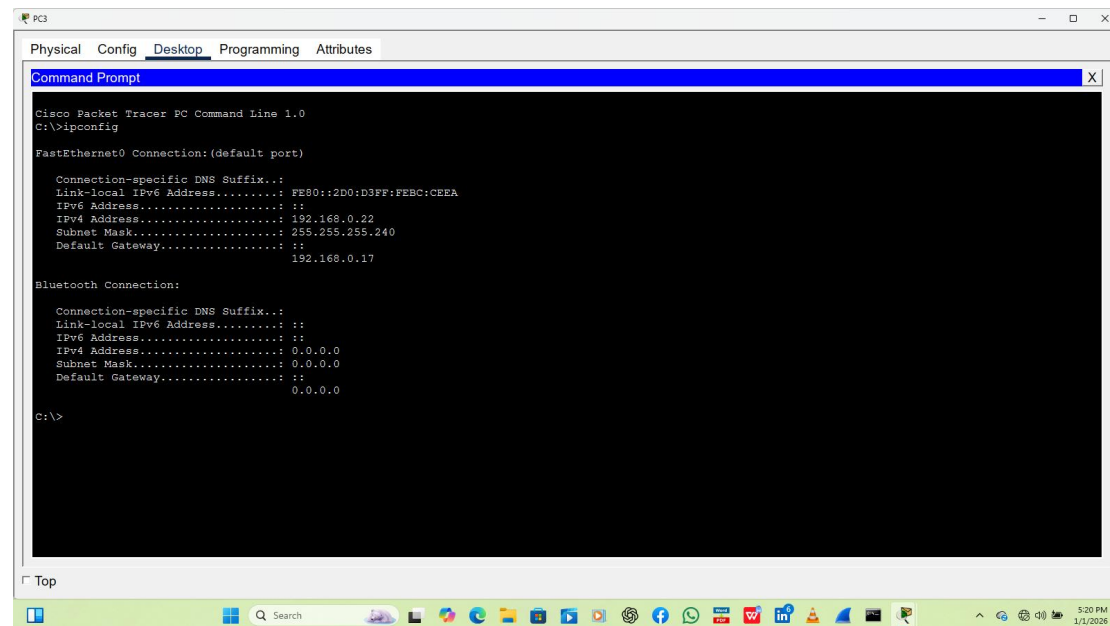
The command 'show int trunk' also displays the following information:

Port	Vlans in spanning tree forwarding state and not pruned
Gig0/1	1,20

Let us check if our PCs got ip addresses now

Command is ipconfig

PC-1



The screenshot shows the Command Prompt window for PC-1 in Cisco Packet Tracer. The window title is 'PC3' and it has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' tab is active, showing a 'Command Prompt' window. The text in the Command Prompt is as follows:

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

FastEthernet0 Connection: (default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::2D0:D3FF:FEBC:CCEA
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 192.168.0.22
    Subnet Mask . . . . .: 255.255.255.240
    Default Gateway . . . . .: ::
                               192.168.0.17

Bluetooth Connection:

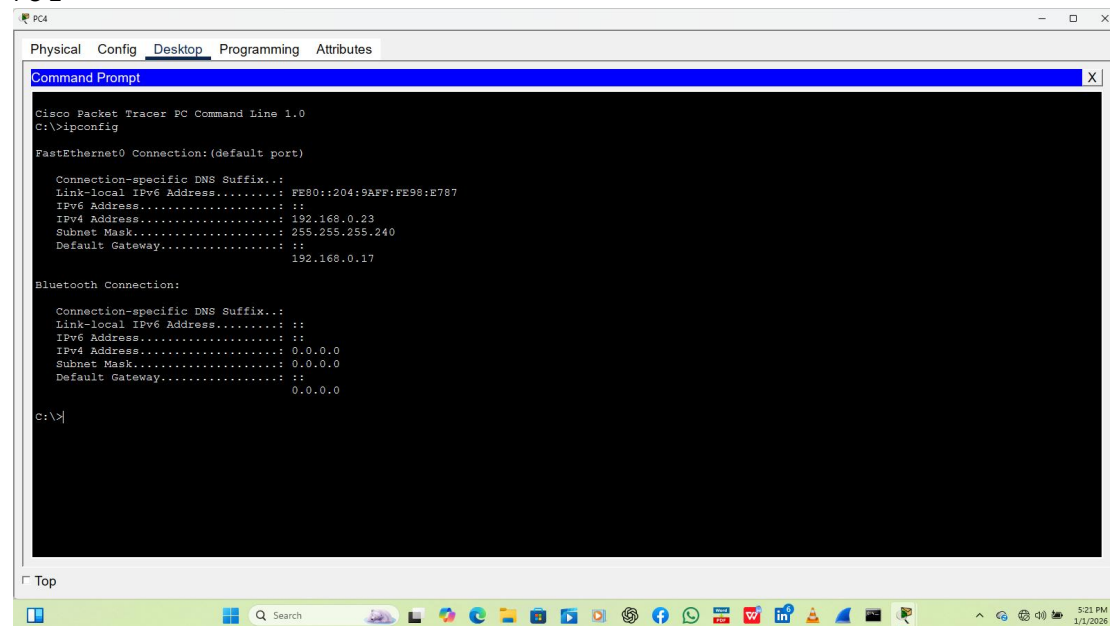
    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .:
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 0.0.0.0
    Subnet Mask . . . . .: 0.0.0.0
    Default Gateway . . . . .: ::
                               0.0.0.0

C:\>
```

The taskbar at the bottom shows the Windows Start button, a search bar, and various application icons. The system clock in the bottom right corner indicates 5:20 PM on 1/1/2026.

Let us check the second pc

PC-2



The screenshot shows the Command Prompt window for PC-2 in Cisco Packet Tracer. The window title is 'PC4' and it has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' tab is active, showing a 'Command Prompt' window. The text in the Command Prompt is as follows:

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

FastEthernet0 Connection: (default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::204:9AFF:FE98:E787
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 192.168.0.23
    Subnet Mask . . . . .: 255.255.255.240
    Default Gateway . . . . .: ::
                               192.168.0.17

Bluetooth Connection:

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .:
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 0.0.0.0
    Subnet Mask . . . . .: 0.0.0.0
    Default Gateway . . . . .: ::
                               0.0.0.0

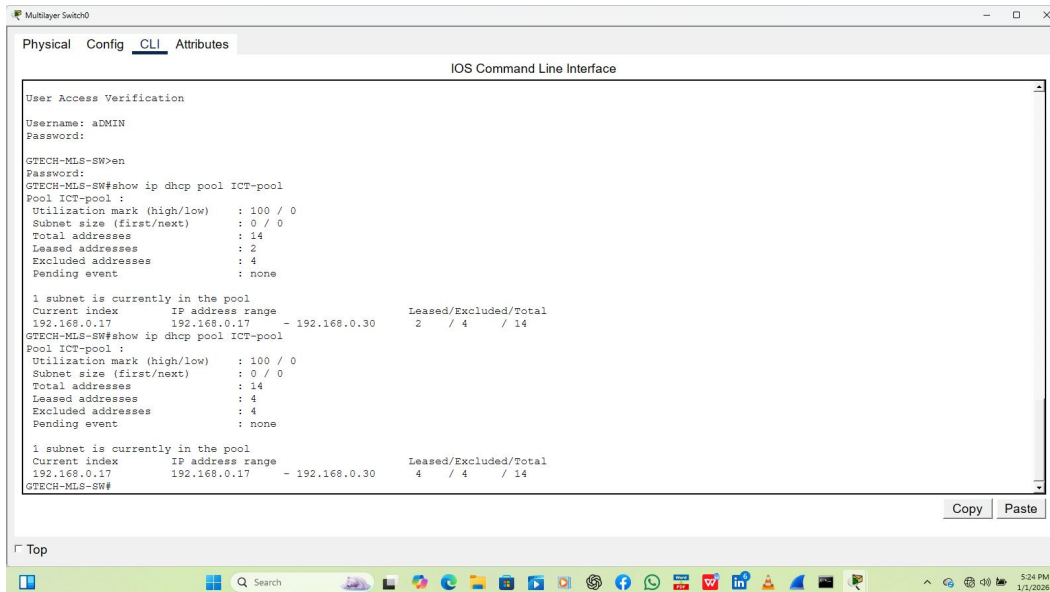
C:\>
```

The taskbar at the bottom shows the Windows Start button, a search bar, and various application icons. The system clock in the bottom right corner indicates 5:21 PM on 1/1/2026.

We could do PC by PC but to summarize this we issue the show ip dhcp pool for SALES and ICT



## ICT POOL VERIFICATION



```
Physical Config CLI Attributes
IOS Command Line Interface

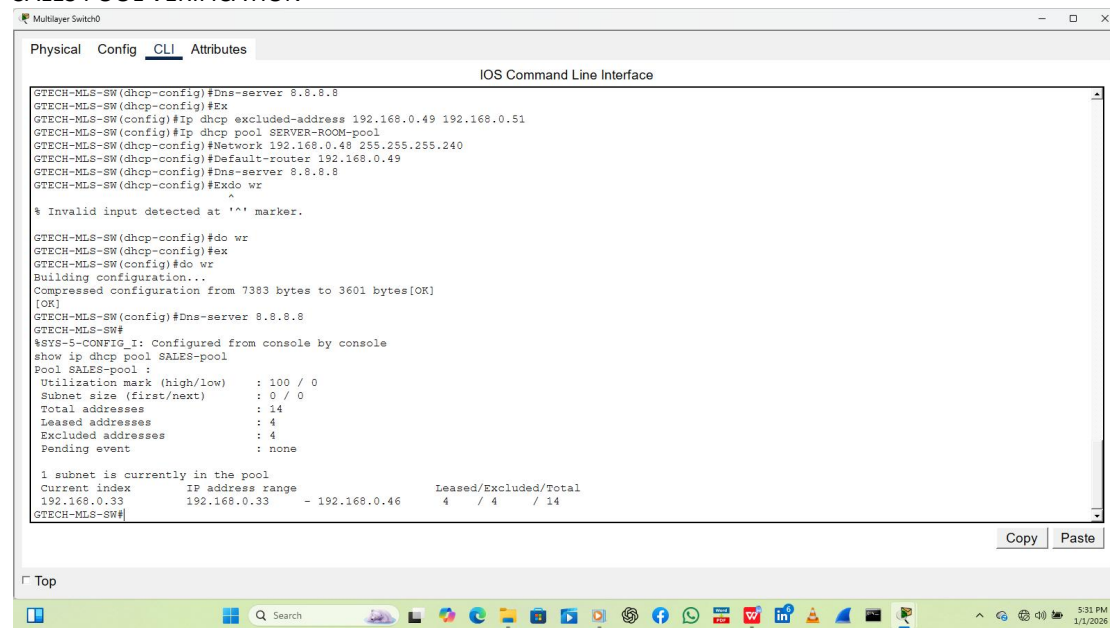
User Access Verification
Username: ADMIN
Password:
GTECH-MLS-SW>en
GTECH-MLS-SW#show ip dhcp pool ICT-pool
Pool ICT-pool :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 14
  Leased addresses : 2
  Excluded addresses : 4
  Pending event : none

1 subnet is currently in the pool
Current index IP address range Leased/Excluded/Total
192.168.0.17 192.168.0.17 - 192.168.0.30 2 / 4 / 14
GTECH-MLS-SW#show ip dhcp pool ICT-pool
Pool ICT-pool :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 14
  Leased addresses : 4
  Excluded addresses : 4
  Pending event : none

1 subnet is currently in the pool
Current index IP address range Leased/Excluded/Total
192.168.0.17 192.168.0.17 - 192.168.0.30 4 / 4 / 14
GTECH-MLS-SW#
```

We can see that 4 ip addresses has been leased,that's for the 3 PCs and a printer

## SALES POOL VERIFICATION



```
Physical Config CLI Attributes
IOS Command Line Interface

GTECH-MLS-SW(dhcp-config)#Dns-server 8.8.8.8
GTECH-MLS-SW(dhcp-config)#Ex
GTECH-MLS-SW(config)#ip dhcp excluded-address 192.168.0.49 192.168.0.51
GTECH-MLS-SW(config)#ip dhcp pool SERVER-ROOM-pool
GTECH-MLS-SW(dhcp-config)#Network 192.168.0.48 255.255.255.240
GTECH-MLS-SW(dhcp-config)#default-router 192.168.0.49
GTECH-MLS-SW(dhcp-config)#Dns-server 8.8.8.8
GTECH-MLS-SW(dhcp-config)#Exit
^
% Invalid input detected at '^' marker.

GTECH-MLS-SW(dhcp-config)#do wr
GTECH-MLS-SW(dhcp-config)#ex
GTECH-MLS-SW(config)#do wr
Building configuration...
Compressed configuration from 7383 bytes to 3601 bytes[OK]
[OK]
GTECH-MLS-SW(config)#Dns-server 8.8.8.8
GTECH-MLS-SW#
%SYS-5-CONFIG_I: Configured from console by console
show ip dhcp pool SALES-pool
Pool SALES-pool :
  Utilization mark (high/low) : 100 / 0
  Subnet size (first/next) : 0 / 0
  Total addresses : 14
  Leased addresses : 4
  Excluded addresses : 4
  Pending event : none

1 subnet is currently in the pool
Current index IP address range Leased/Excluded/Total
192.168.0.33 192.168.0.33 - 192.168.0.46 4 / 4 / 14
GTECH-MLS-SW#
```

We are done with our dhcp pools

Next we configure the interface to the router and static route

Int gig1/0/1

No switchport

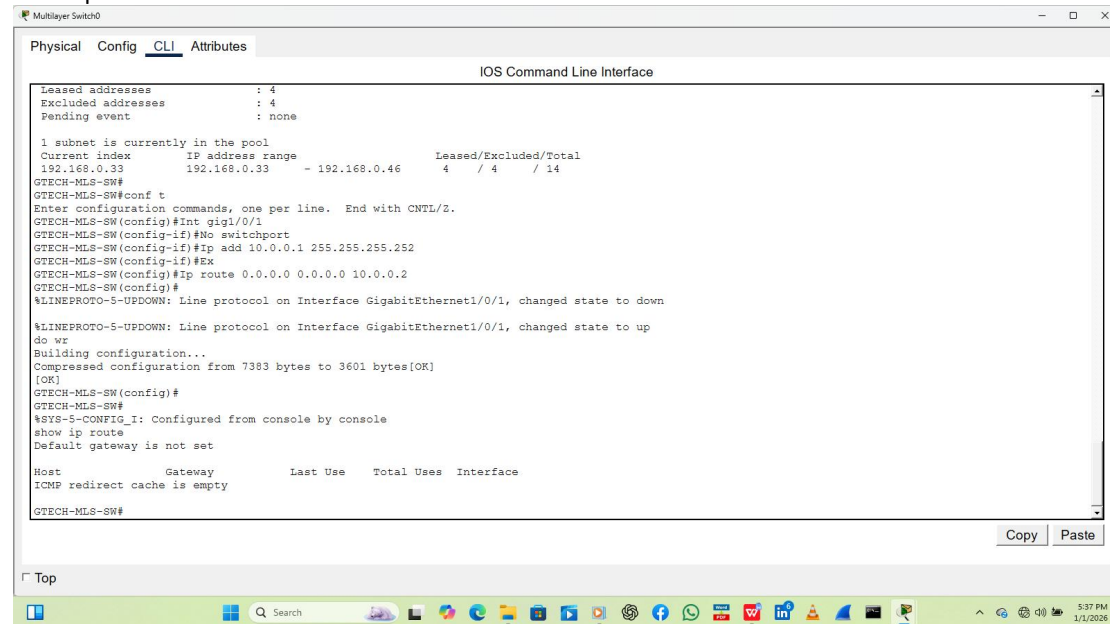
Ip add 10.0.0.1 255.255.255.252

Ex

Ip route 0.0.0.0 0.0.0.0 10.0.0.2

Let us verify the static route

## Show ip route



```
Physical Config CLI Attributes
IOS Command Line Interface

Leased addresses      : 4
Excluded addresses   : 4
Pending event        : none

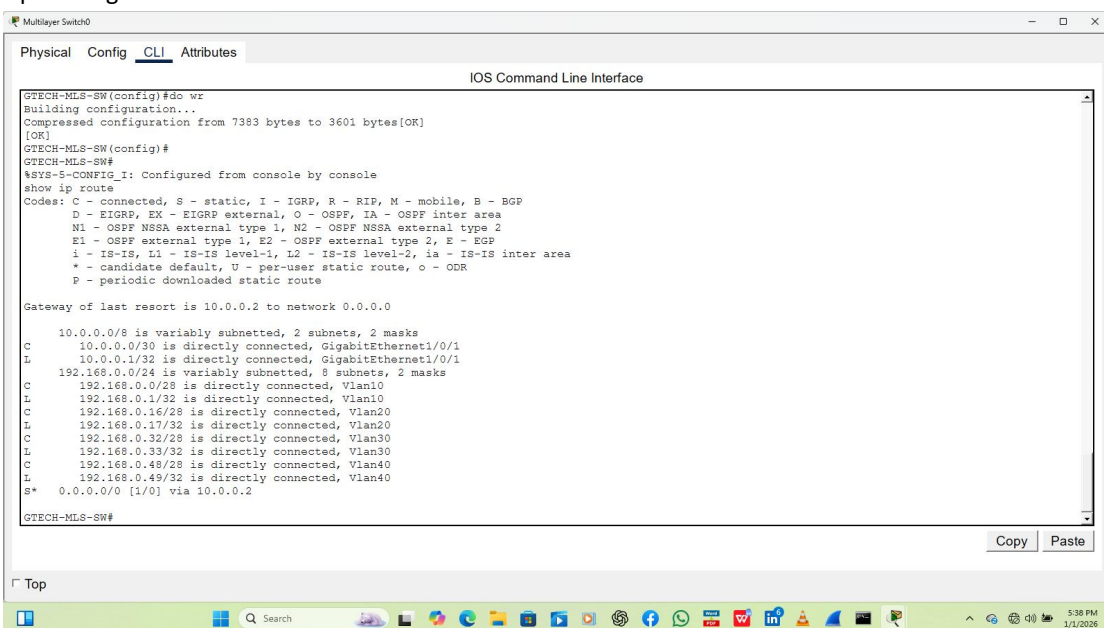
1 subnet is currently in the pool
Current index      IP address range      Leased/Excluded/Total
192.168.0.33      192.168.0.33 - 192.168.0.46      4 / 4 / 14
GTECH-MLS-SW#
GTECH-MLS-SW#conf t
Enter configuration commands, one per line. End with CNTL/Z.
GTECH-MLS-SW(config)#int gig1/0/1
GTECH-MLS-SW(config-if)#no switchport
GTECH-MLS-SW(config-if)#ip add 10.0.0.1 255.255.255.252
GTECH-MLS-SW(config-if)#ip route 0.0.0.0 0.0.0.0 10.0.0.2
GTECH-MLS-SW(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to down
do wr
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0/1, changed state to up
Building configuration...
Compressed configuration from 7383 bytes to 3601 bytes[OK]
[OK]
GTECH-MLS-SW(config)#
GTECH-MLS-SW#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Default gateway is not set

Host      Gateway      Last Use      Total Uses      Interface
ICMP redirect cache is empty
GTECH-MLS-SW#
```

We have to enable ip routing

Let us do that

Ip routing



```
Physical Config CLI Attributes
IOS Command Line Interface

GTECH-MLS-SW(config)#do wr
Building configuration...
Compressed configuration from 7383 bytes to 3601 bytes[OK]
[OK]
GTECH-MLS-SW(config)#
GTECH-MLS-SW#
%SYS-5-CONFIG_I: Configured from console by console
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 10.0.0.2 to network 0.0.0.0

  10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
    C   10.0.0.0/30 is directly connected, GigabitEthernet1/0/1
    L   10.0.0.1/32 is directly connected, GigabitEthernet1/0/1
    L   192.168.0.0/24 is variably subnetted, 8 subnets, 2 masks
      C   192.168.0.0/28 is directly connected, Vlan10
      L   192.168.0.1/32 is directly connected, Vlan10
      C   192.168.0.16/28 is directly connected, Vlan20
      L   192.168.0.17/32 is directly connected, Vlan20
      C   192.168.0.32/28 is directly connected, Vlan30
      L   192.168.0.33/32 is directly connected, Vlan30
      C   192.168.0.48/28 is directly connected, Vlan40
      L   192.168.0.49/32 is directly connected, Vlan40
    S*   0.0.0.0/0 [1/0] via 10.0.0.2
GTECH-MLS-SW#
```

We are good now, lets us finish up with our edge router

Let us try to ping the gateway to the edge router on our MLS and the edge router itself

Ping from any PC

Ping 10.0.0.1 and ping 10.0.0.2

```
PC5
Physical Config Desktop Programming Attributes
Command Prompt
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=10ms 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 = 10ms, Average = 2ms
C:\>ping 10.0.0.2
Pinging 10.0.0.2 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
```

We are unable to ping the edge router, let us configure routing protocol in this case ospf

On both our MLS and edge router

MLS

Router ospf 1

Router-id 1.1.1.1

Network 10.0.0.0 0.0.0.3 area 0

Network 192.168.0.0 0.0.0.15 area 0

Network 192.168.0.16 0.0.0.15 area 0

Network 192.168.0.32 0.0.0.15 area 0

Network 192.168.0.48 0.0.0.15 area 0

Do wr

Let us try to ping again

FROM ANY PC

```
PC8
Physical Config Desktop Programming Attributes
Command Prompt
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=45ms TTL=254
Reply from 10.0.0.2: bytes=32 time=1ms TTL=254
Reply from 10.0.0.2: bytes=32 time=1ms TTL=254
Reply from 10.0.0.2: bytes=32 time=1ms TTL=254
Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 45ms, Average = 12ms
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<1ms TTL=254
Reply from 203.0.113.2: bytes=32 time<1ms TTL=254
Reply from 203.0.113.2: bytes=32 time<1ms 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 = 0ms, Maximum = 1ms, Average = 0ms
C:\>
```

We are now good to go, let us configure NAT

Int gig0/0

Ip nat inside

Ex

Int gig0/1

Ip nat outside

ex

Access-list 1 permit 192.168.0.0 0.0.0.15

Access-list 1 permit 192.168.0.16 0.0.0.15

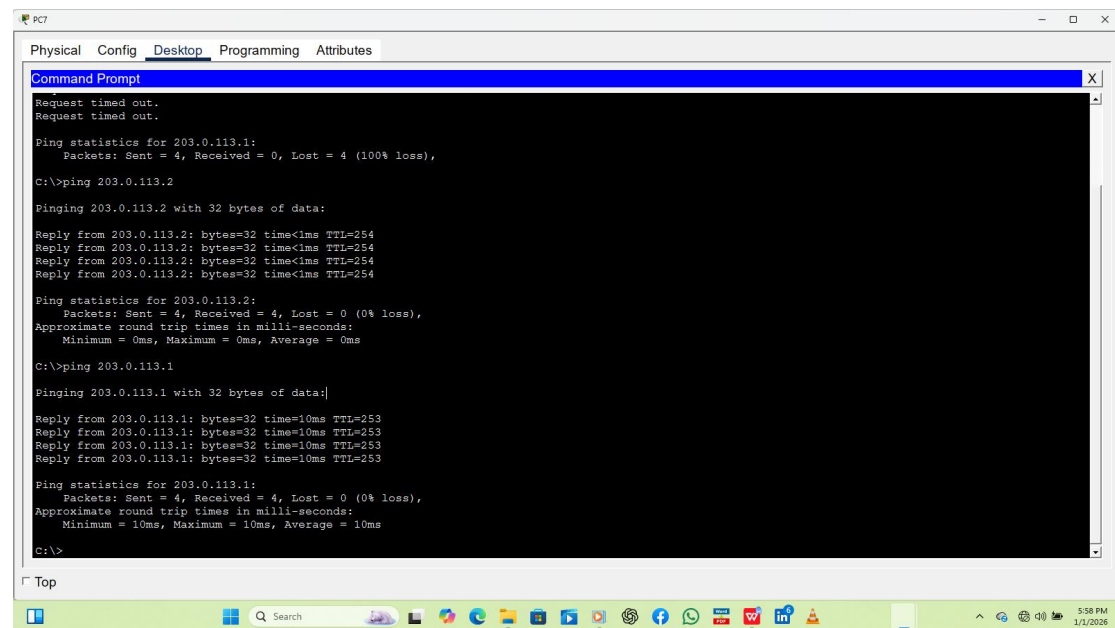
Access-list 1 permit 192.168.0.32 0.0.0.15

Access-list 1 permit 192.168.0.48 0.0.0.15

Ip nat inside source list 1 int gig0/1 overload

Do wr

Before configuring NAT the PC was unable to ping the ISP, now that we have configured it let's try again



```
PC
Physical Config Desktop Programming Attributes
Command Prompt
Request timed out.
Request timed out.

Ping statistics for 203.0.113.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

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<1ms TTL=254
Reply from 203.0.113.2: bytes=32 time<1ms TTL=254
Reply from 203.0.113.2: bytes=32 time<1ms 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 = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 203.0.113.1

Pinging 203.0.113.1 with 32 bytes of data:

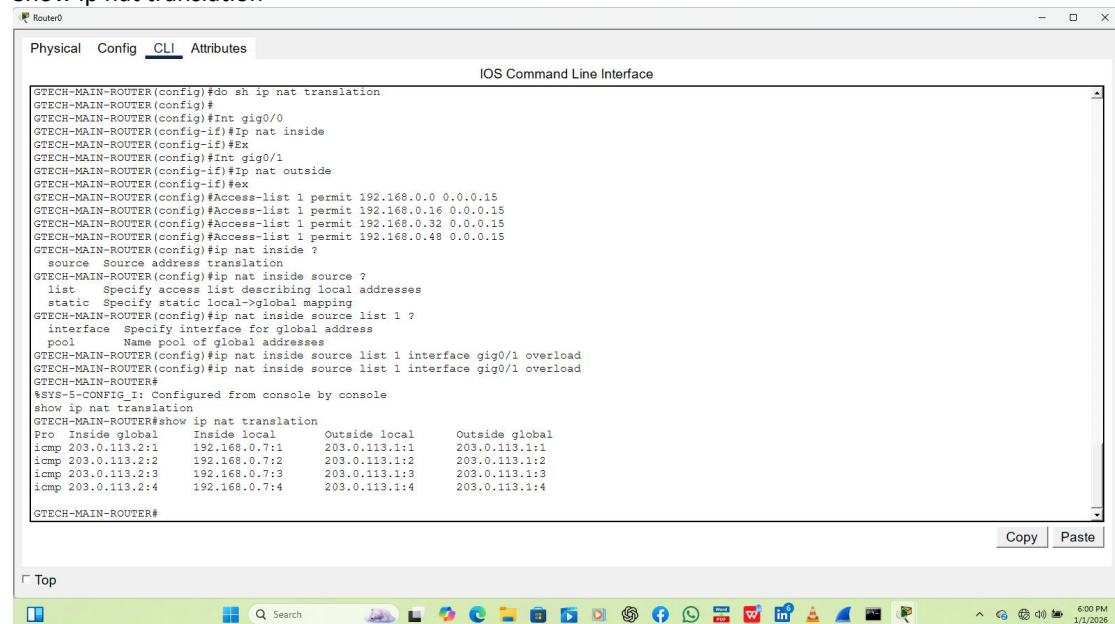
Reply from 203.0.113.1: bytes=32 time=10ms TTL=253
Reply from 203.0.113.1: bytes=32 time=10ms TTL=253
Reply from 203.0.113.1: bytes=32 time=10ms TTL=253
Reply from 203.0.113.1: bytes=32 time=10ms TTL=253

Ping statistics for 203.0.113.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 10ms, Average = 10ms

C:\>
```

We are good, now let us verify out NAT

Show ip nat translation



```
Router0
Physical Config CLI Attributes
IOS Command Line Interface

GTECH-MAIN-ROUTER(config)#do sh ip nat translation
GTECH-MAIN-ROUTER(config)#
GTECH-MAIN-ROUTER(config)#Int gig0/0
GTECH-MAIN-ROUTER(config-if)#ip nat inside
GTECH-MAIN-ROUTER(config-if)#ex
GTECH-MAIN-ROUTER(config)#Int gig0/1
GTECH-MAIN-ROUTER(config-if)#ip nat outside
GTECH-MAIN-ROUTER(config-if)#ex
GTECH-MAIN-ROUTER(config)#Access-list 1 permit 192.168.0.0 0.0.0.15
GTECH-MAIN-ROUTER(config)#Access-list 1 permit 192.168.0.16 0.0.0.15
GTECH-MAIN-ROUTER(config)#Access-list 1 permit 192.168.0.32 0.0.0.15
GTECH-MAIN-ROUTER(config)#Access-list 1 permit 192.168.0.48 0.0.0.15
GTECH-MAIN-ROUTER(config)#ip nat inside ?
    source Source address translation
GTECH-MAIN-ROUTER(config)#ip nat inside source ?
    list Specify access list describing local addresses
    static Specify static local->global mapping
GTECH-MAIN-ROUTER(config)#ip nat inside source list 1 ?
    interface Specify interface for global address
    pool Name pool of global addresses
GTECH-MAIN-ROUTER(config)#ip nat inside source list 1 interface gig0/1 overload
GTECH-MAIN-ROUTER(config)#ip nat inside source list 1 interface gig0/1 overload
GTECH-MAIN-ROUTER#
%SYS-5-CONFIG_I: Configured from console by console
show ip nat translation
GTECH-MAIN-ROUTER#show ip nat translation

Pro Inside global      Inside local      Outside local      Outside global
icmp 203.0.113.2:1      192.168.0.7:1      203.0.113.1:1      203.0.113.1:1
icmp 203.0.113.2:2      192.168.0.7:2      203.0.113.1:2      203.0.113.1:2
icmp 203.0.113.2:3      192.168.0.7:3      203.0.113.1:3      203.0.113.1:3
icmp 203.0.113.2:4      192.168.0.7:4      203.0.113.1:4      203.0.113.1:4

GTECH-MAIN-ROUTER#
```

To make this short I will not do the ping from all PCs in all vlans to the ISP, one is enough,  
Now the server also must be able to receive the incoming traffic from the outside gtech network  
Let us translate the server ip to public

Int gig0/0

Ip nat inside

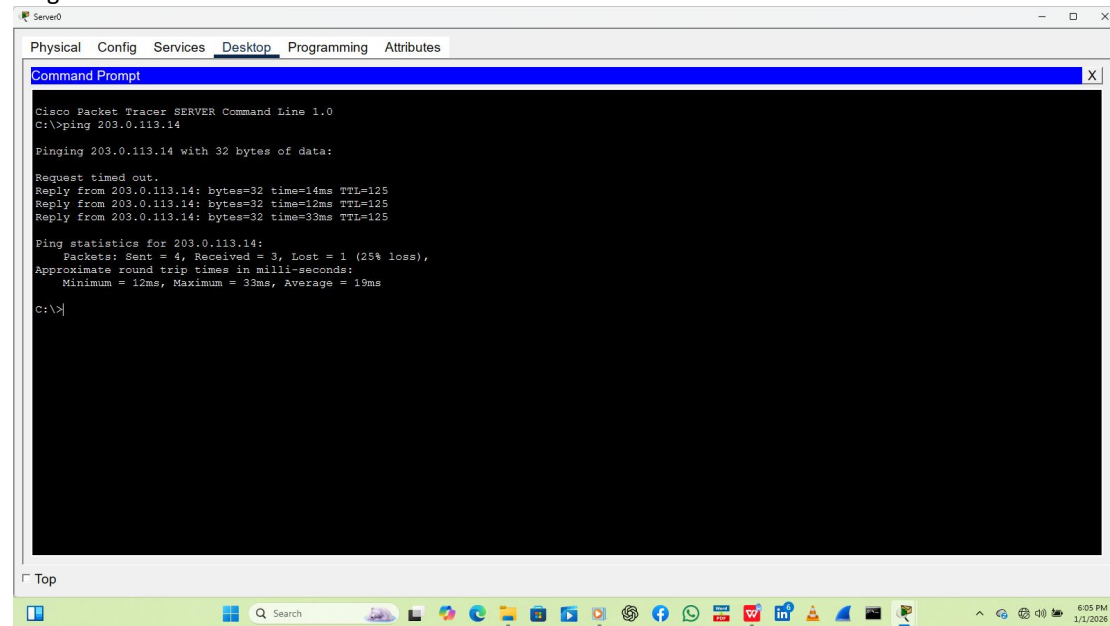
Ex

Ip nat inside source static 192.168.0.52 203.0.113.14

Do wr

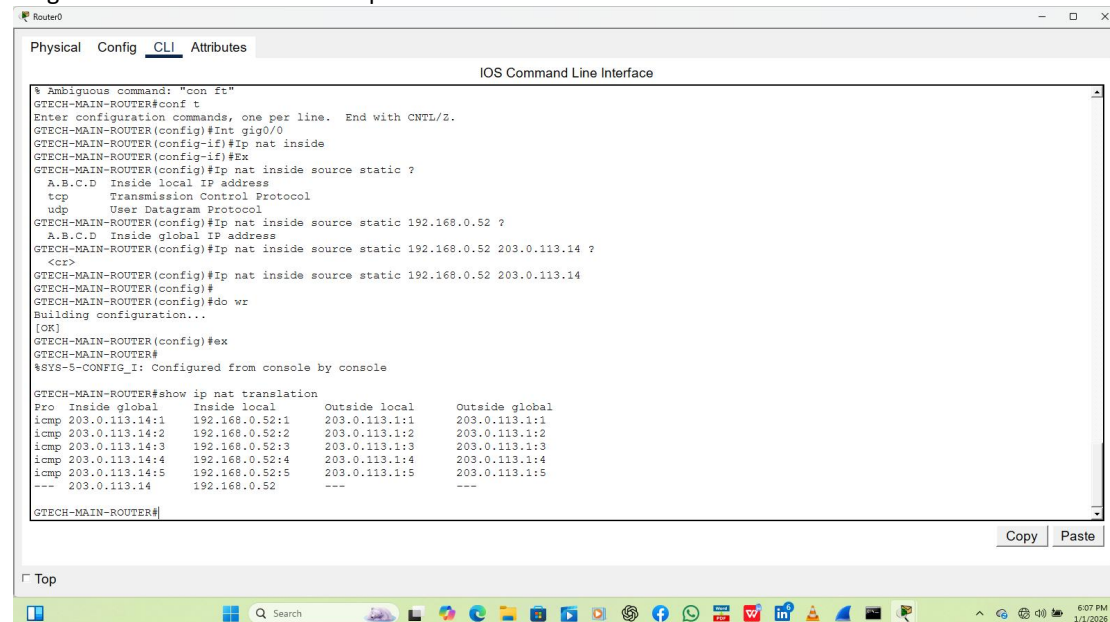
Let us try to ping our internal server from the external server

Ping 203.0.113.14



Next we try from the ISP

Ping 203.0.113.14 and issue the ip nat translation



We are done for now.

End of the project

VLAN 30