

Q. HOW TO CREATE 10 SUBNETS WITH CLASS C WHOSE NETWORK ID IS 192.168.3.0, BY USING THE FIRST 3 SUBNETS CREATE A ROUTER ON STICK WITH 2 SWITCHES?

ANSWER :

STEP 1: SUBNETTING THE NETWORK (192.168.3.0/24)

SINCE WE WANT TO CREATE 10 SUBNETS FROM A CLASS C NETWORK (WHICH HAS 256 IP ADDRESSES), WE NEED TO BORROW BITS FROM THE HOST PORTION OF THE IP ADDRESS.

A /24 SUBNET PROVIDES 256 IP ADDRESSES, BUT WE NEED TO DIVIDE THIS INTO 10 SUBNETS. TO ACHIEVE THIS, LET'S START BY DETERMINING HOW MANY BITS ARE REQUIRED.

THE ORIGINAL NETWORK (192.168.3.0/24) USES 24 BITS FOR THE NETWORK PORTION AND LEAVES 8 BITS FOR THE HOST PORTION.

TO CREATE 10 SUBNETS, WE NEED TO BORROW BITS FROM THE HOST PORTION.

FORMULA: NUMBER OF SUBNETS = 2^N , WHERE N IS THE NUMBER OF BITS.

TO CREATE AT LEAST 10 SUBNETS, WE NEED 4 BORROWED BITS BECAUSE $2^4 = 16$ SUBNETS. THIS LEAVES 4 BITS FOR HOSTS, PROVIDING UP TO 14 USABLE HOST ADDRESSES PER SUBNET.

THUS, THE SUBNET MASK BECOMES /28 ($24 + 4 = 28$ BITS).

STEP 2: CREATING SUBNETS

WITH A /28 SUBNET MASK, EACH SUBNET WILL HAVE 16 IP ADDRESSES (OUT OF WHICH 14 ARE USABLE FOR HOSTS, AS 2 ARE RESERVED FOR NETWORK AND BROADCAST ADDRESSES).

HERE ARE THE SUBNETS WE CAN CREATE FROM 192.168.3.0/24:

192.168.3.0/28 — NETWORK 192.168.3.0, BROADCAST 192.168.3.15

192.168.3.16/28 — NETWORK 192.168.3.16, BROADCAST 192.168.3.31

192.168.3.32/28 — NETWORK 192.168.3.32, BROADCAST 192.168.3.47

192.168.3.48/28 — NETWORK 192.168.3.48, BROADCAST 192.168.3.63

192.168.3.64/28 — NETWORK 192.168.3.64, BROADCAST 192.168.3.79

192.168.3.80/28 — NETWORK 192.168.3.80, BROADCAST 192.168.3.95

192.168.3.96/28 — NETWORK 192.168.3.96, BROADCAST 192.168.3.111

192.168.3.112/28 — NETWORK 192.168.3.112, BROADCAST 192.168.3.127

192.168.3.128/28 — NETWORK 192.168.3.128, BROADCAST 192.168.3.143

192.168.3.144/28 — NETWORK 192.168.3.144, BROADCAST 192.168.3.159

THE FIRST THREE SUBNETS (192.168.3.0/28, 192.168.3.16/28, AND 192.168.3.32/28) WILL BE USED FOR THE ROUTER-ON-A-STICK.

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STEP – 3:

NOW WE TAKE THE FIRST 3 SUBNETS AS

ROUTER SUBINTERFACE 1 (192.168.3.1/28) FOR VLAN 10.

ROUTER SUBINTERFACE 2 (192.168.3.17/28) FOR VLAN 20.

ROUTER SUBINTERFACE 3 (192.168.3.33/28) FOR VLAN 30.

LET'S DO THIS ON PRACTICAL NOW,

STEP - 4: OPEN THE CISCO PACKET TRACER BY DOUBLE CLICKING THE APP.



STEP -5: SELECT THE PC SYMBOL AND PASTE THE PC'S AS WE REQUIRED, WE TAKE THEM AS

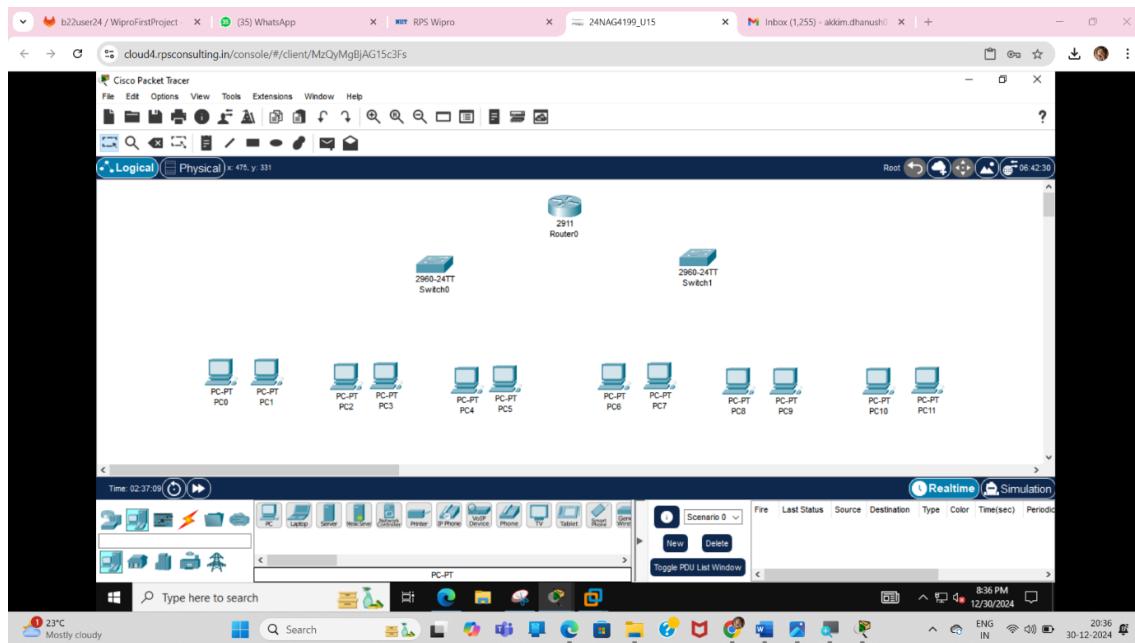
PC0,PC1,PC2,PC3,PC4,PC5,PC6,PC7,PC8,PC9,PC10,PC11.

NOW TO CONNECT THE PC'S WE USE THE 2960 SWITCHES OF 2 AS SWITCH 0,

SWITCH 1.

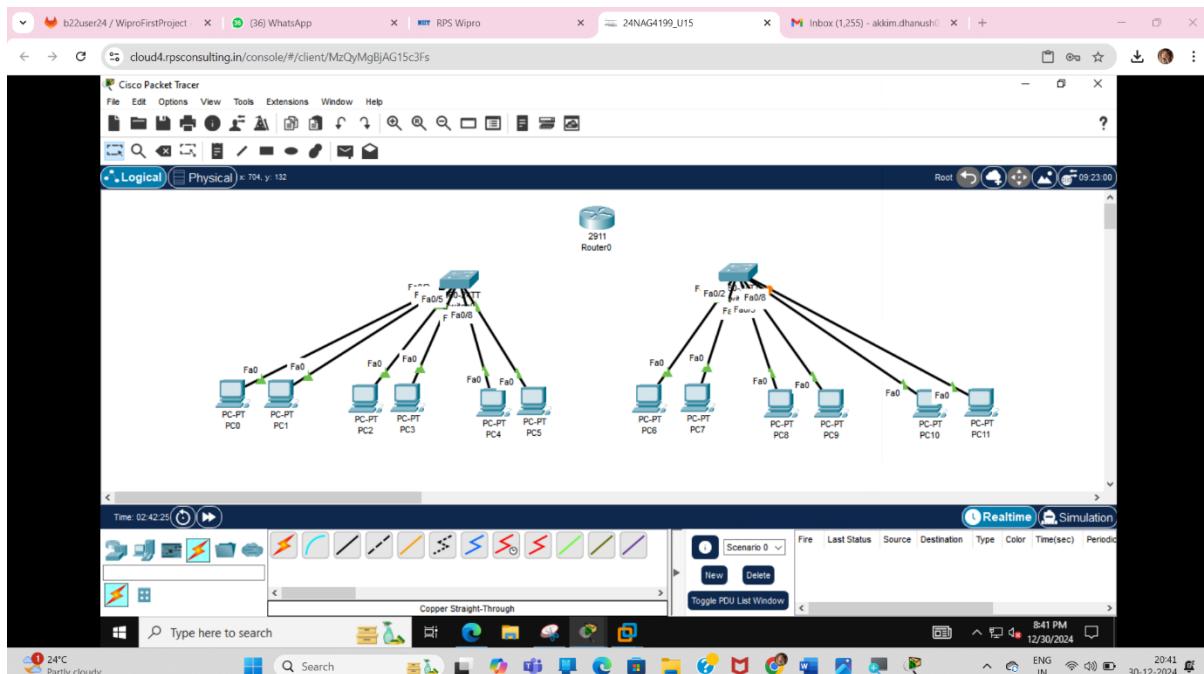
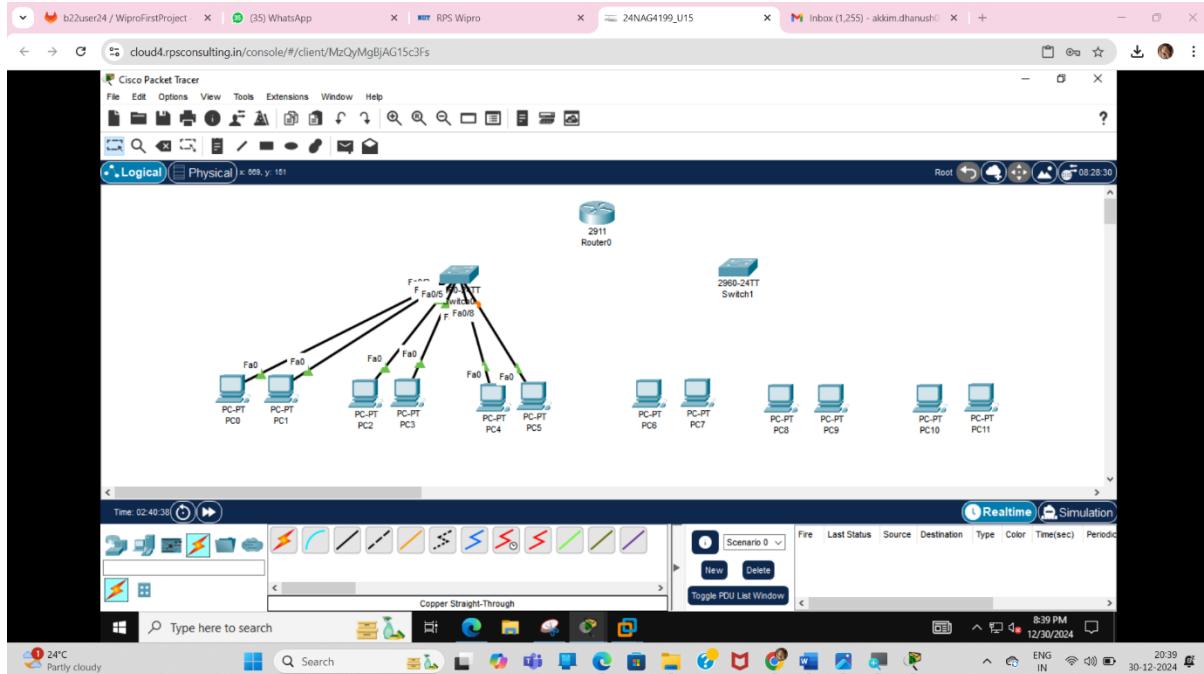
AND WE USE 2911 ROUTER TO CONNECT THE NETWORK BETWEEN THE

SWITCHES.



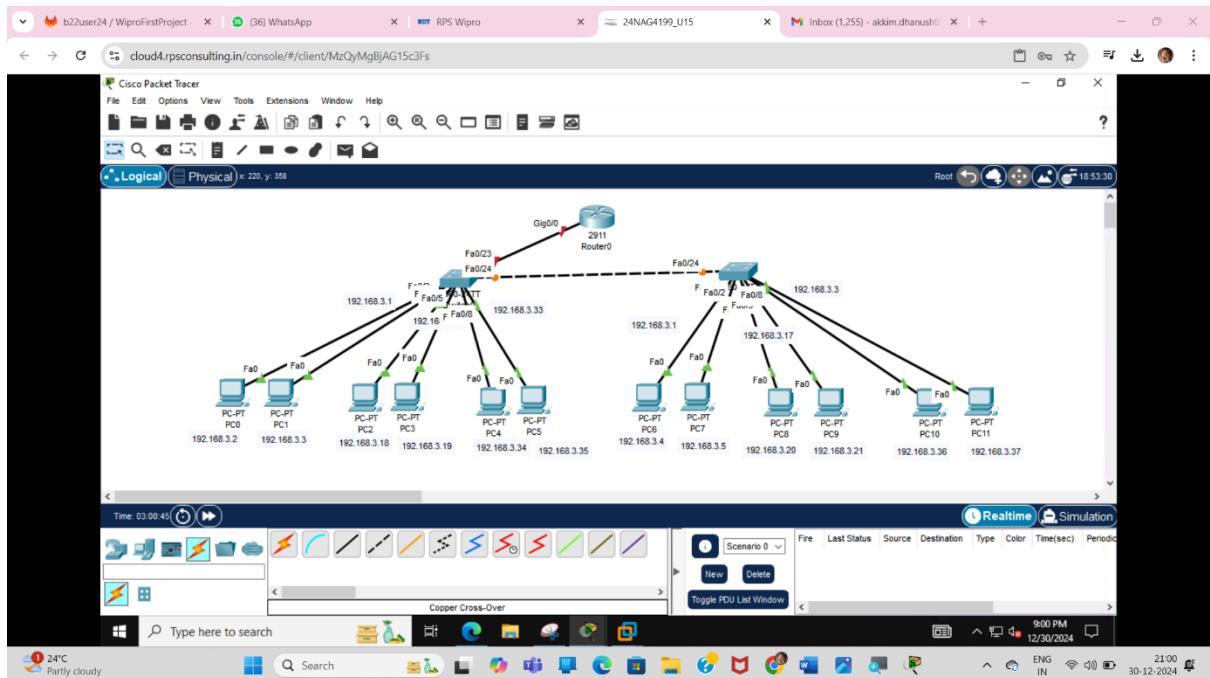
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STEP -6: BY CLICKING THE CONNECTION SYMBOL  , WE USE COPPER STRAIGHT CONNECTION TO CONNECT THE NETWORKS BETWEEN PC'S TO SWITCHES.

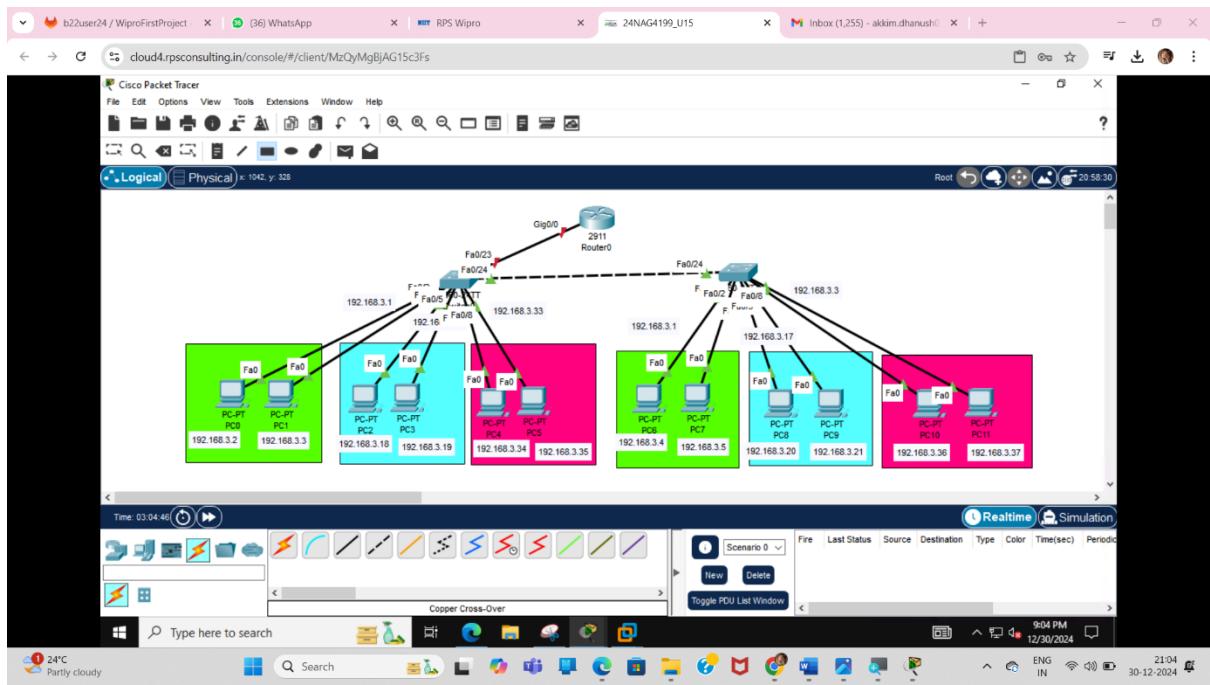


NOW, WE CONNECT THE SWITCH0 TO THE ROUTERO BY USING THE SAME CONNECTION AND THE CROSS OVER CONNECTION BETWEEN THE SWITCHES.

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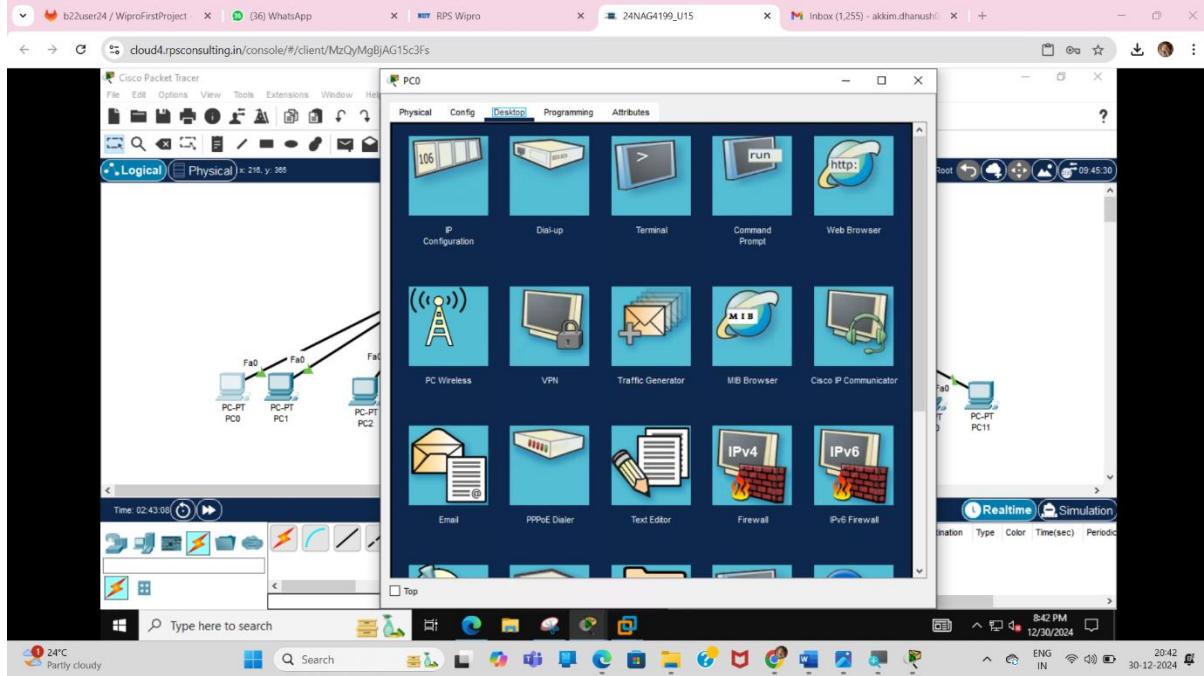
STEP -7: WE CAN EDIT THE PCS , SWITCHES AND ROUTERS WITH THE SHAPES AND COLOURS AS WE WANT. SO, WE CAN EASILY IDENTIFY THE SEPARATE NETWOTKS AS SHOWN IN THE BELOW PICTURE.



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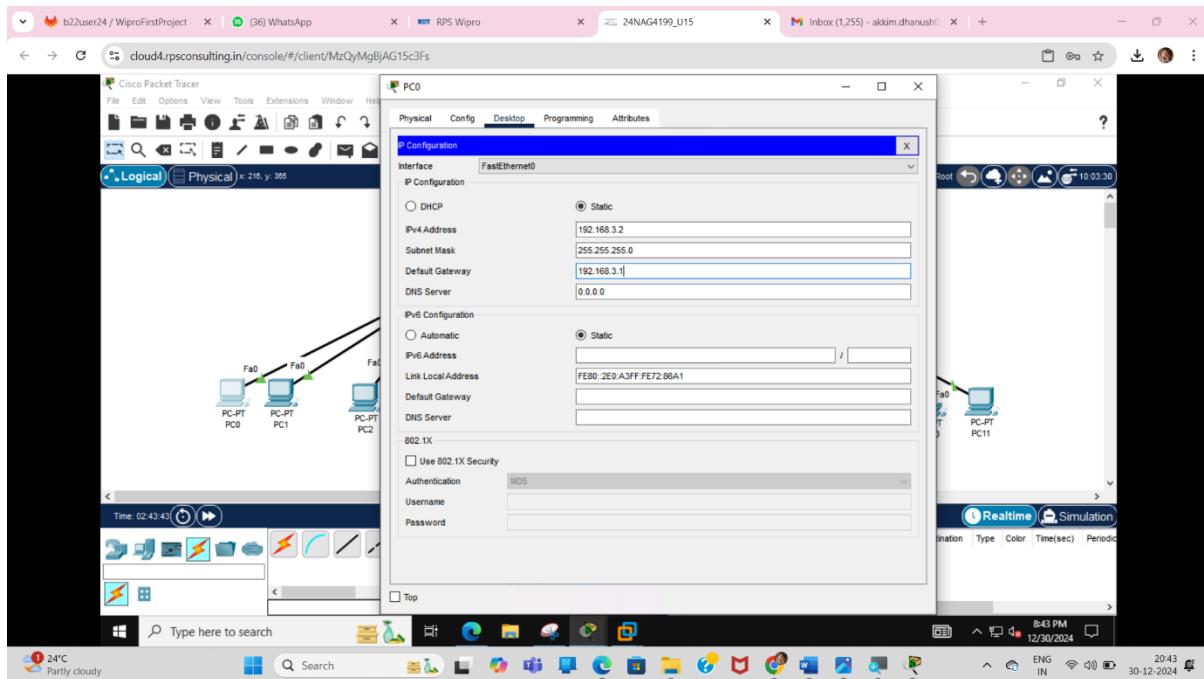
STEP -8: WE HAVE TO GIVE THE IP ADDRESSES TO THE EACH PC.

DOUBLE CLICK ON PC'S, SELECT THE DESKTOP OPTION AND GIVE THE IP ADDRESS AND
CLICK ON TAB, IT AUTOMATICALLY TAKES THE SUBNET MASK OF THE NETWORK.

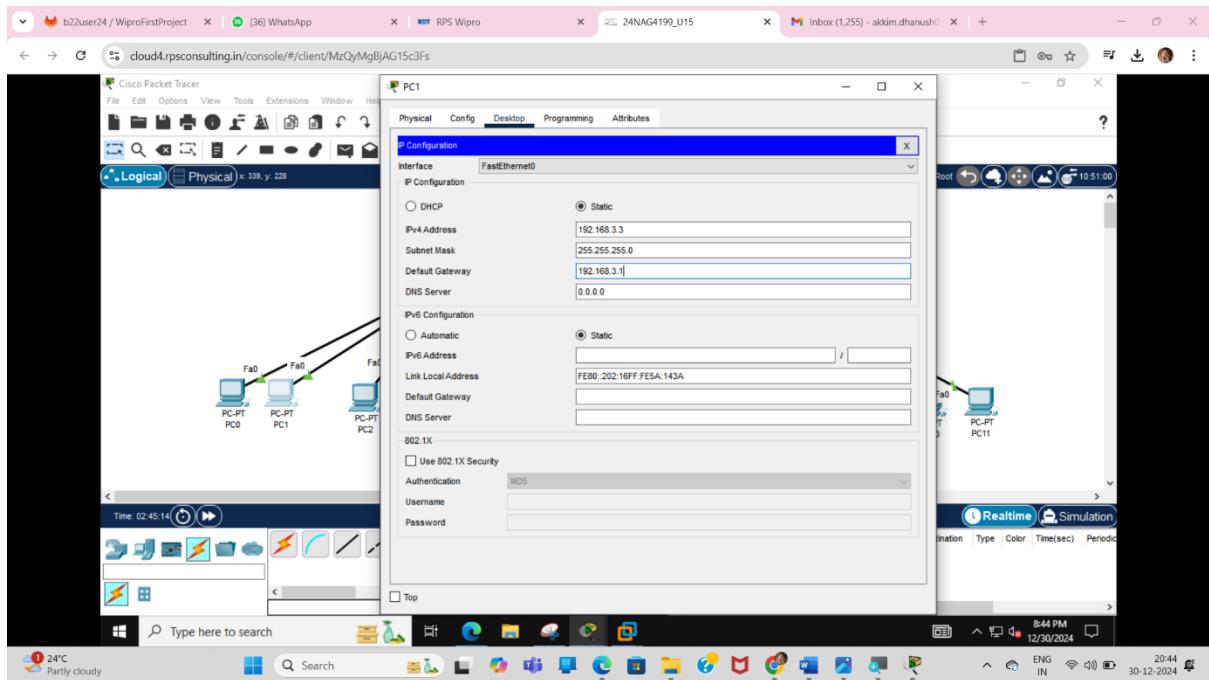


SIMILARLY, DO THE SAME PROCESS AS OTHER PC'S.

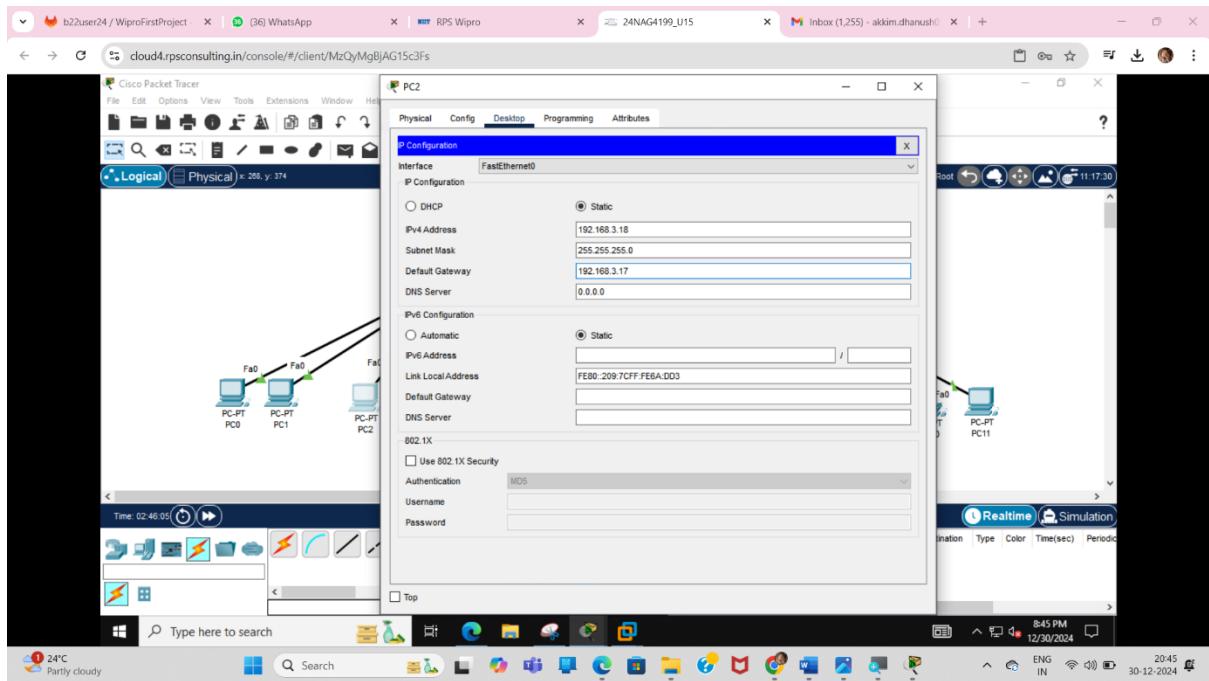
PC0 – 192.168.3.2, PC1 – 192.168.3.3 AND THE DEFAULT GATEWAY AS 192.168.3.1 AS SHOWN BELOW,



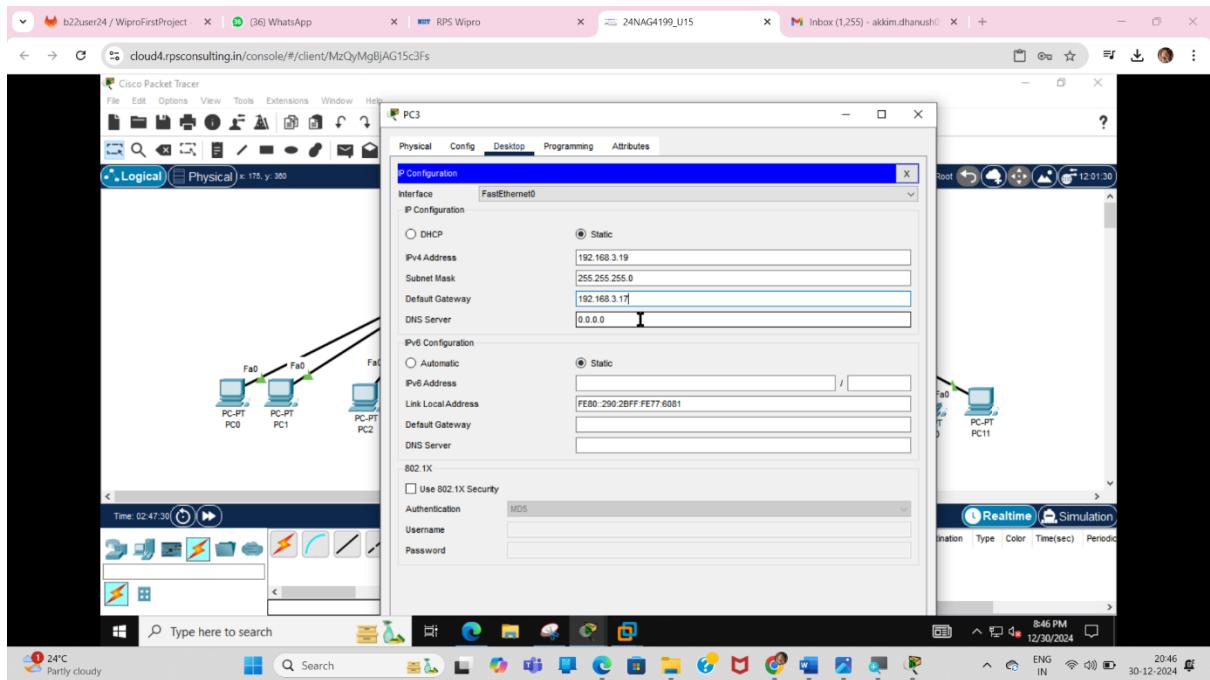
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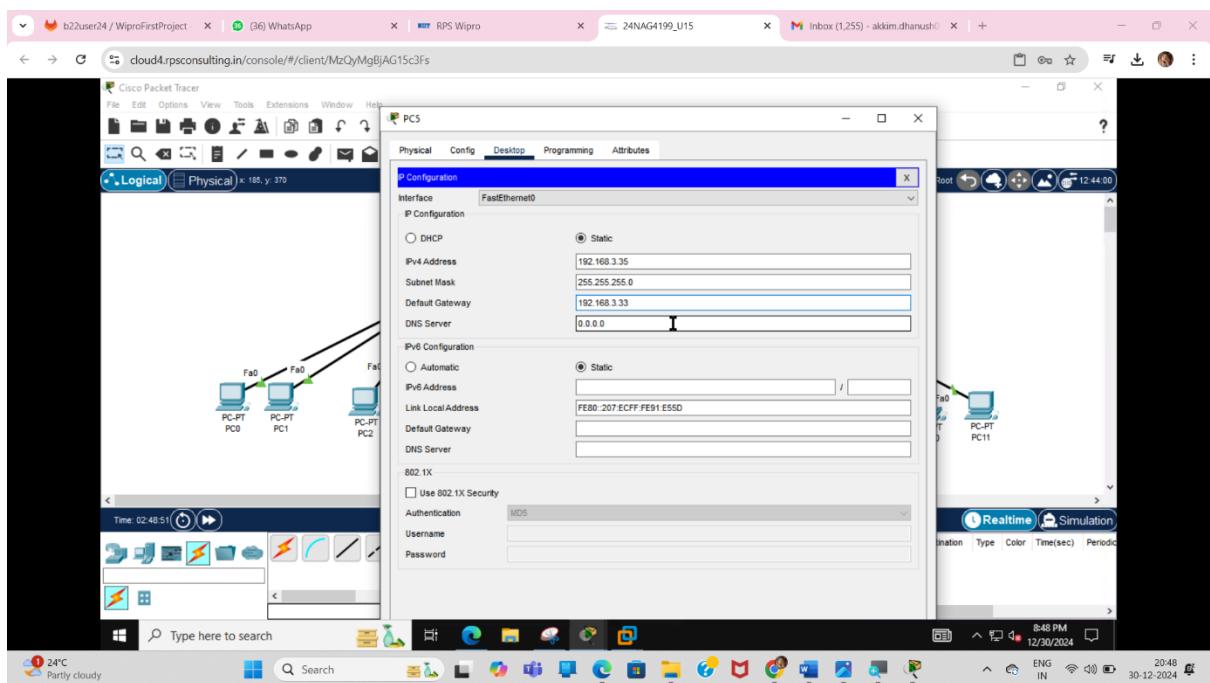
PC2 – 192.168.3.18, PC3 – 172.17.3.19 AND THE DEFAULT GATEWAY AS 192.168.3.17 AS SHOWN BELOW,



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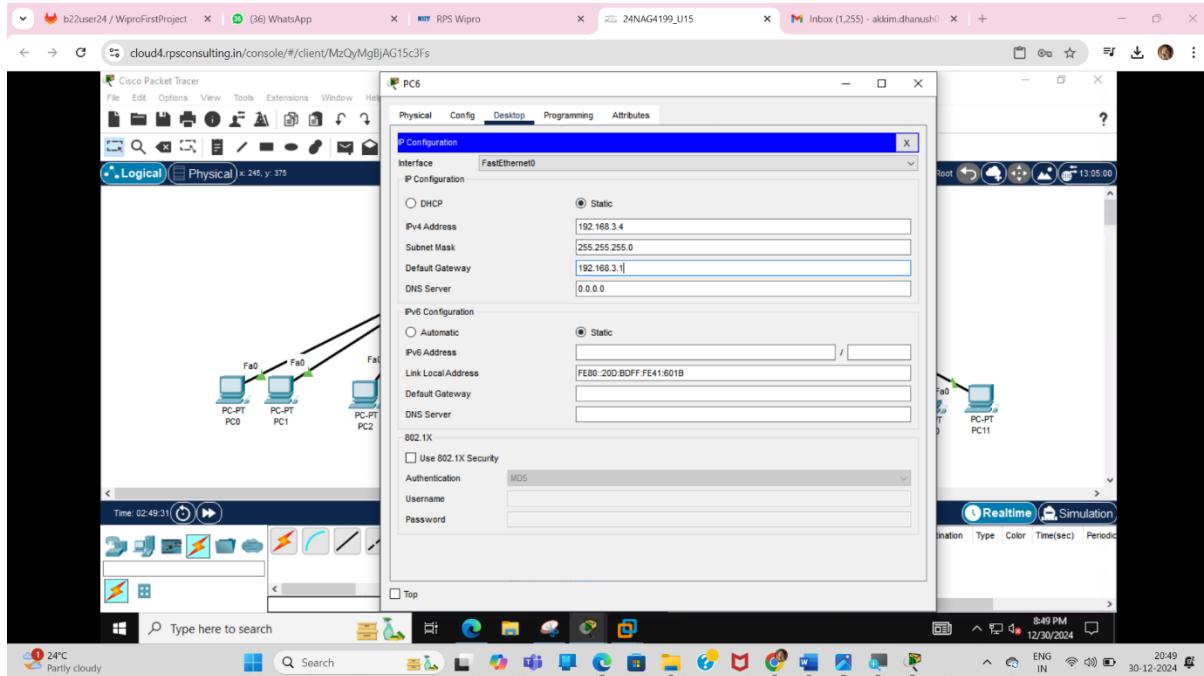
PC4 – 192.168.3.34, PC5 – 192.168.3.35 AND THE DEFAULT GATEWAY AS 192.168.3.33,



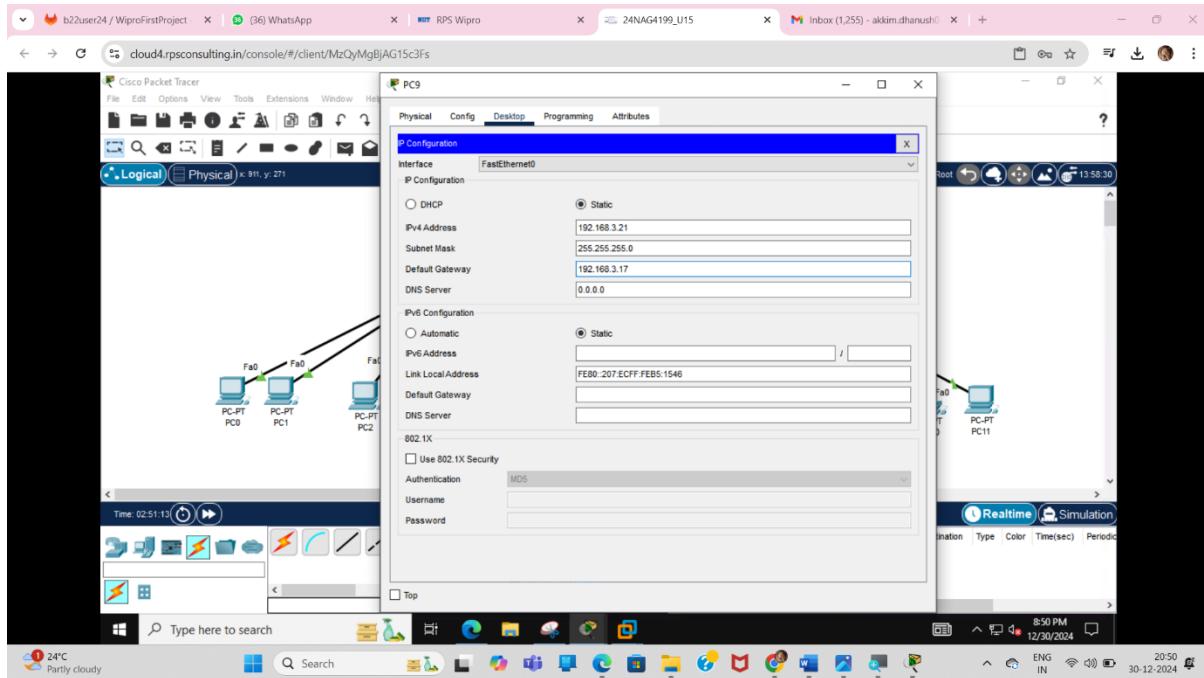
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STEP – 9: NOW WE HAVE TO GIVE THE IP ADDRESS OF THE 2ND SWITCH PC'S AS

PC6 – 192.168.3.4, PC7 – 192.168.3.5 AND THE DEFAULT GATEWAY IS 192.168.3.1

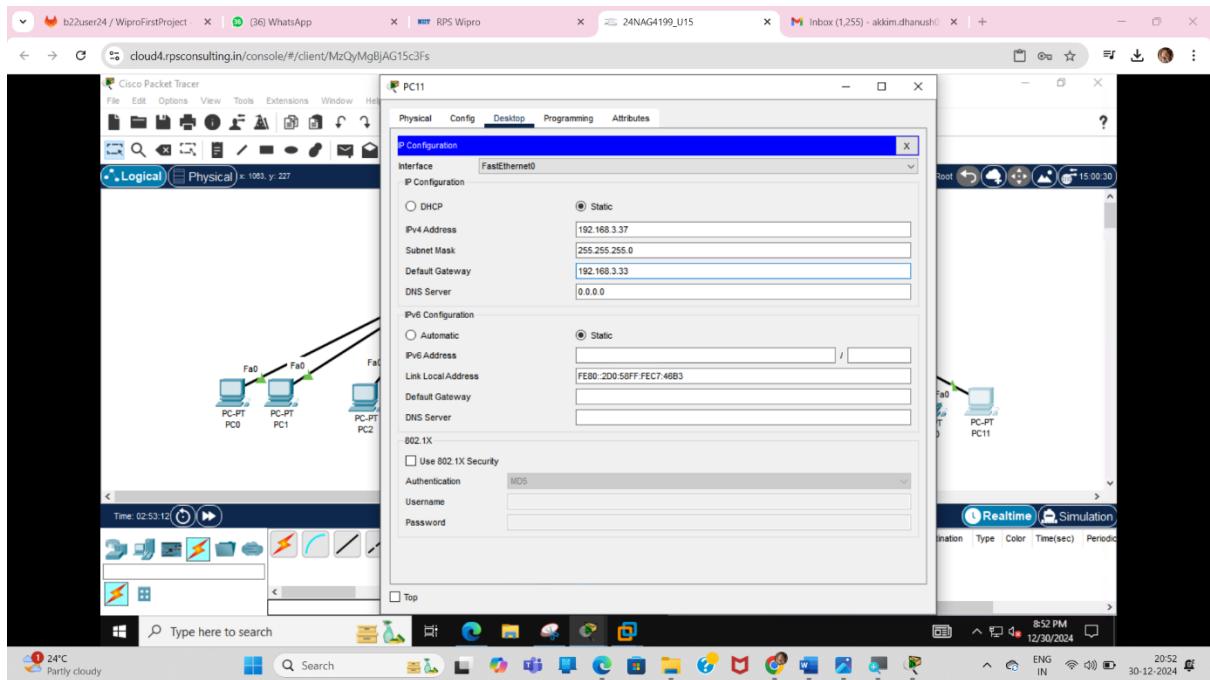
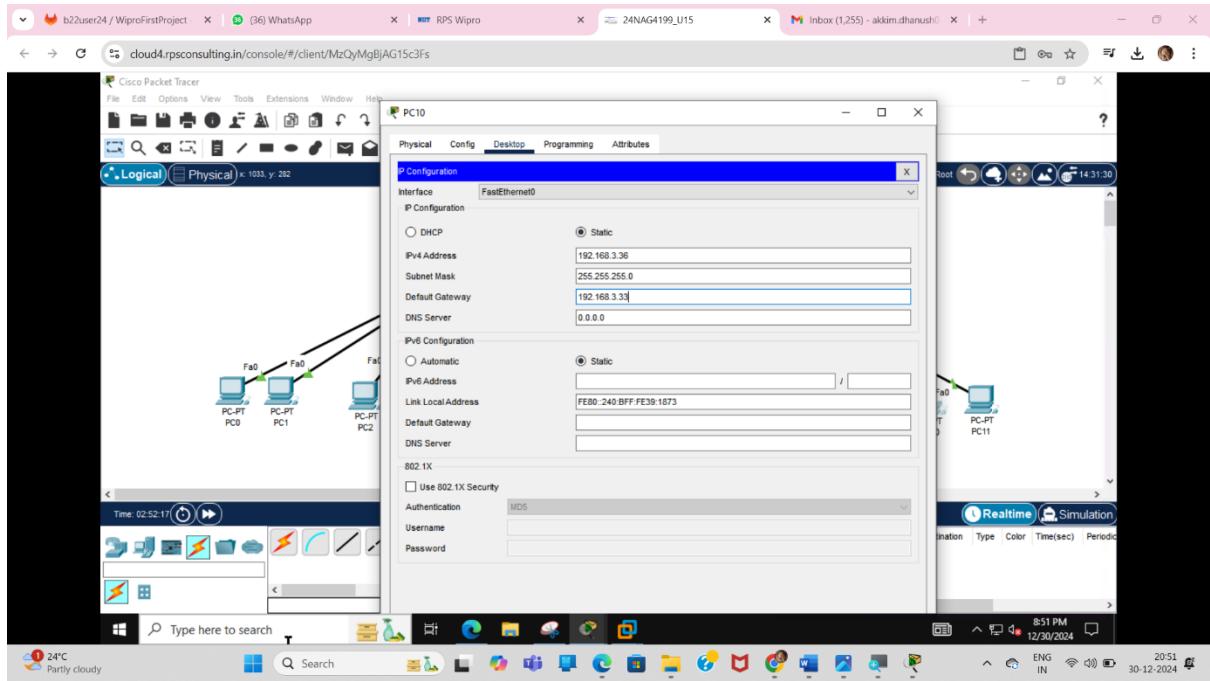


PC8 – 192.168.3.20, PC9 – 192.168.3.21 AND THE DEFAULT GATEWAY IS 192.168.3.17



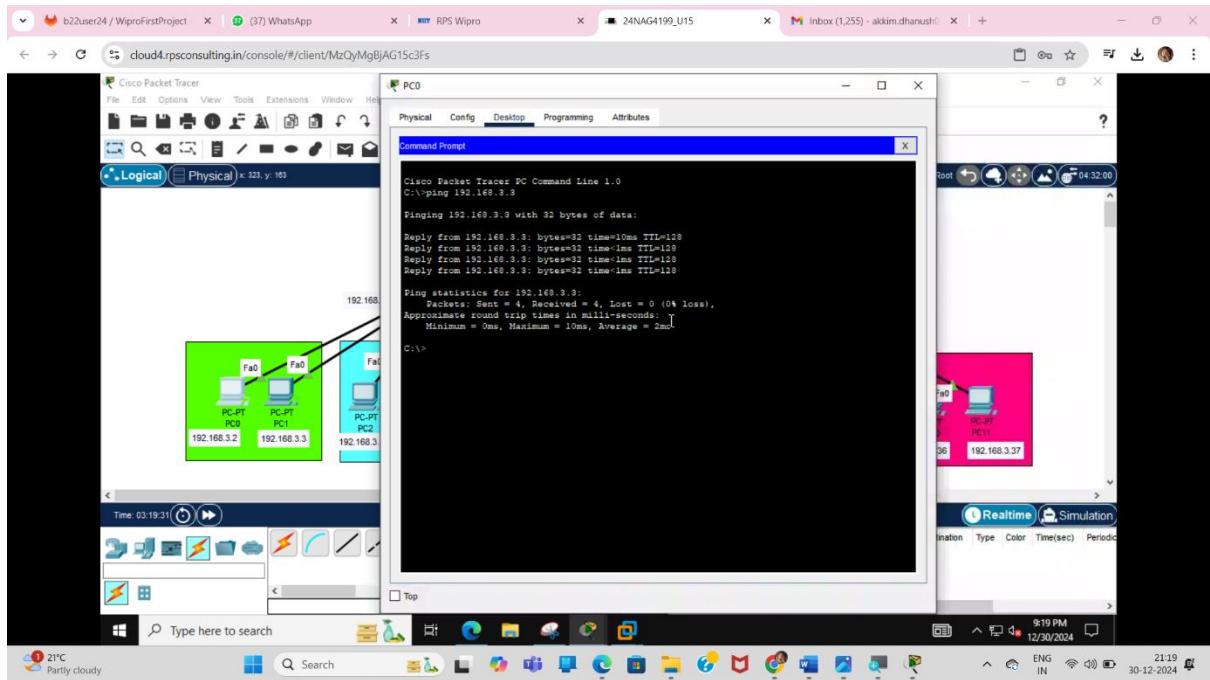
PC10 – 192.168.3.36, PC11 – 192.168.3.37 AND THE DEFAULT GATEWAY IS 192.168.3.33

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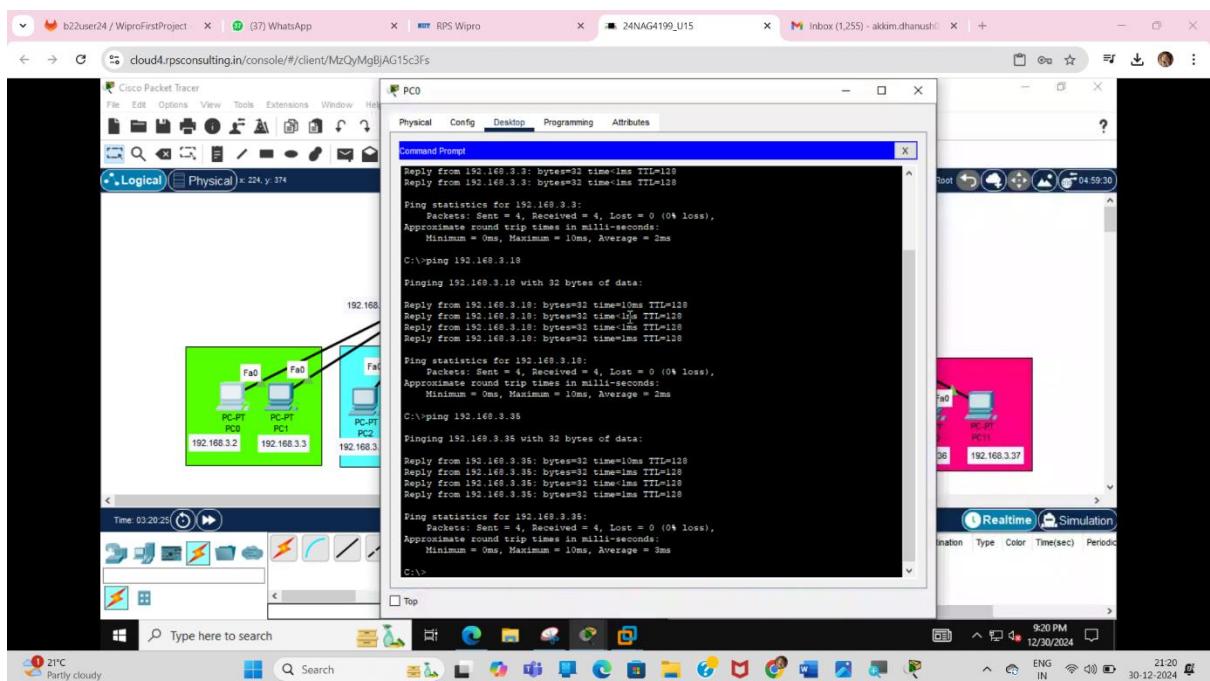


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STEP -10: NOW, WE CAN PING FROM PC0 TO PC1 AND PC1 TO PC0,

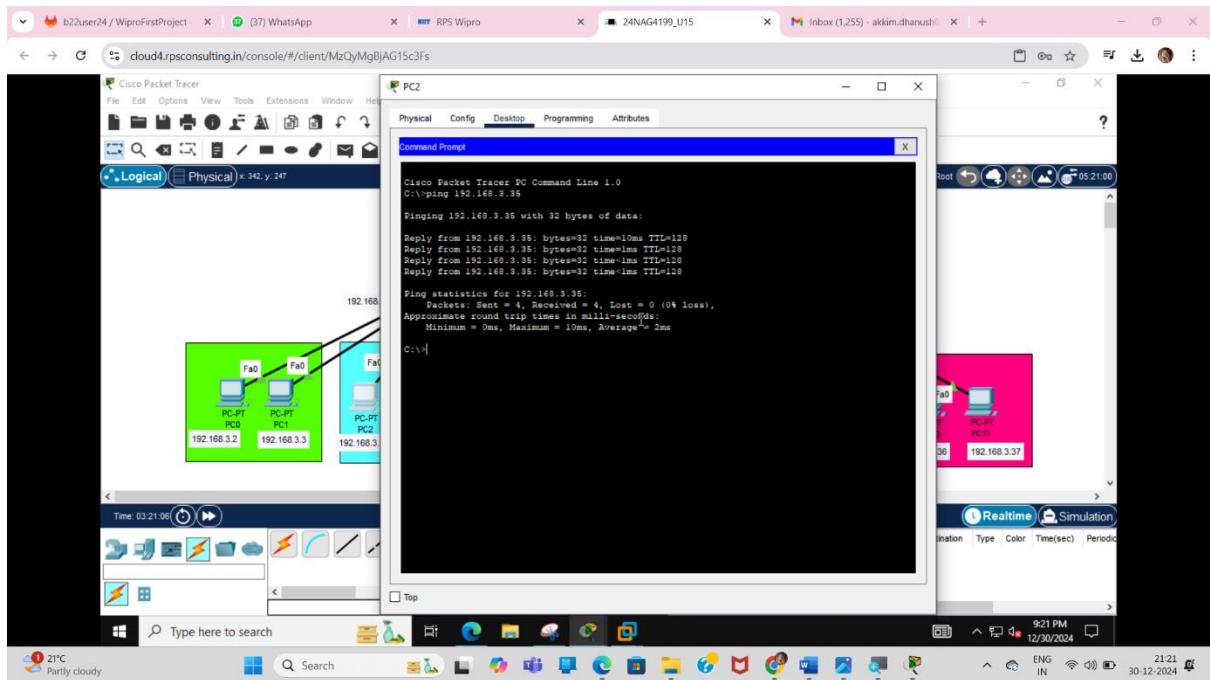


SIMILARLY, WE CAN PING FROM PC2 TO PC3 AND PC3 TO PC2

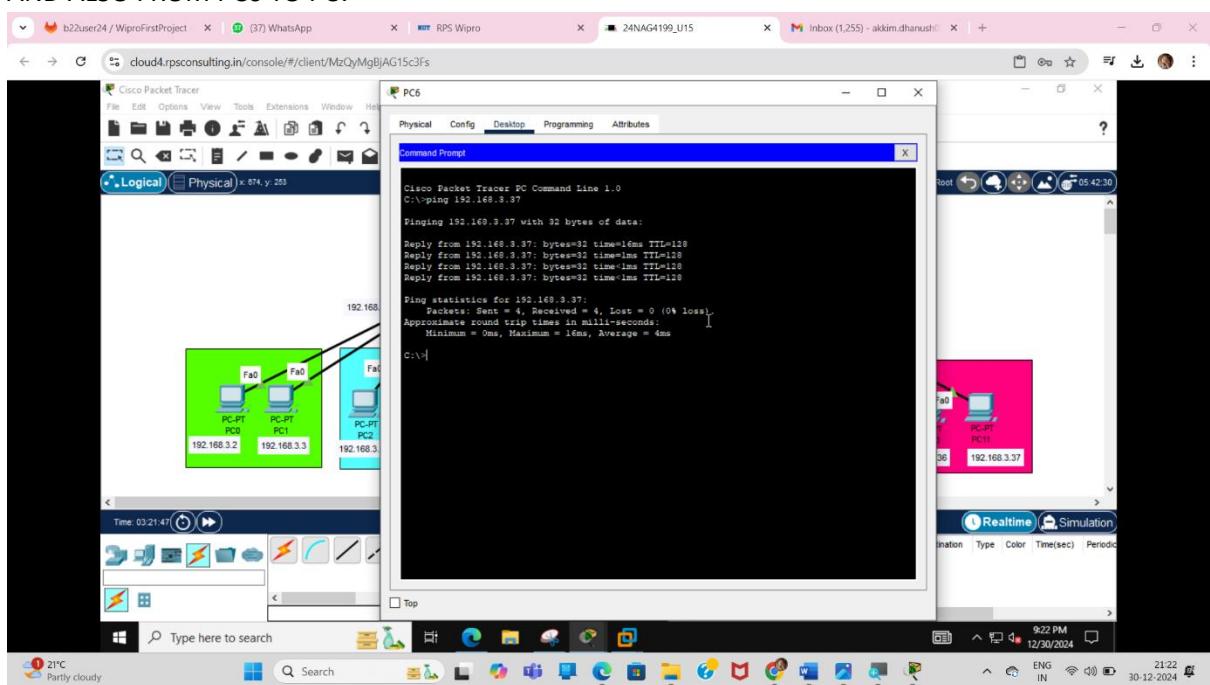


ALSO, FROM PC4 TO PC5.

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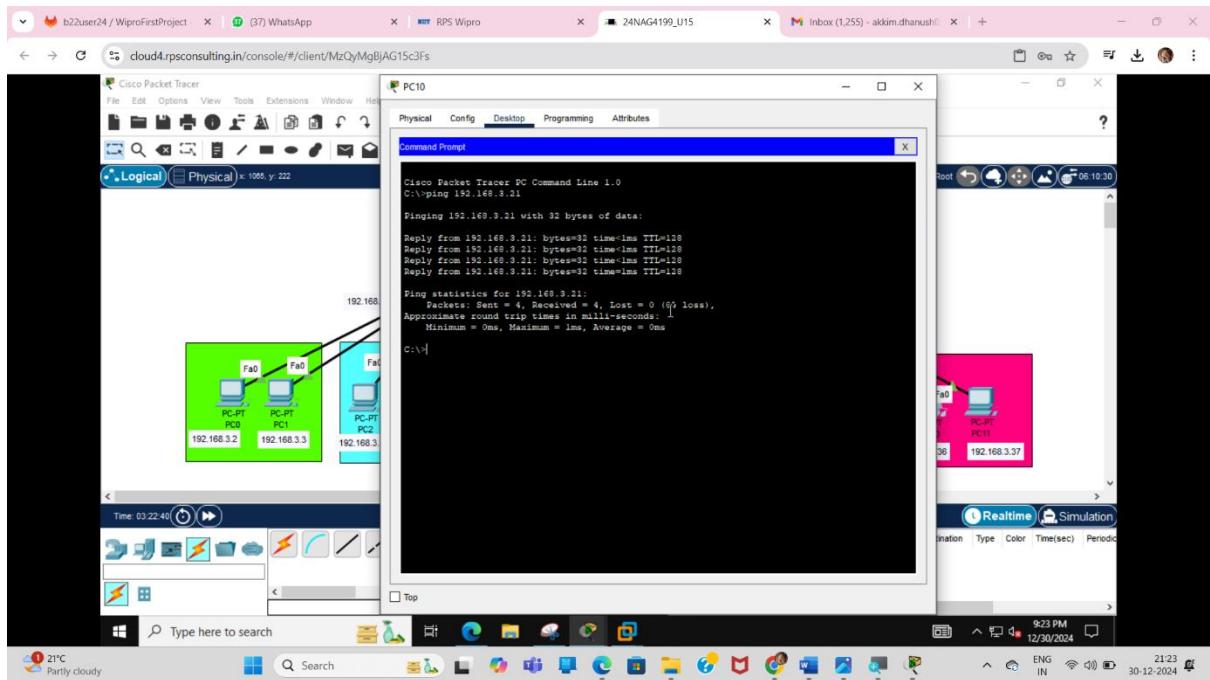


AND ALSO FROM PC6 TO PC7



LIKE THIS IN EACH OF THE SWITCHES WE CAN PING FROM ANY OF THE PCS TO ANY.

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NOW OUR TARGET IS TO PING FROM THE PCS WHICH ARE CONNECTED TO SWITCH 1 IS TO CONNECT TO SWITCH 2 PCS.

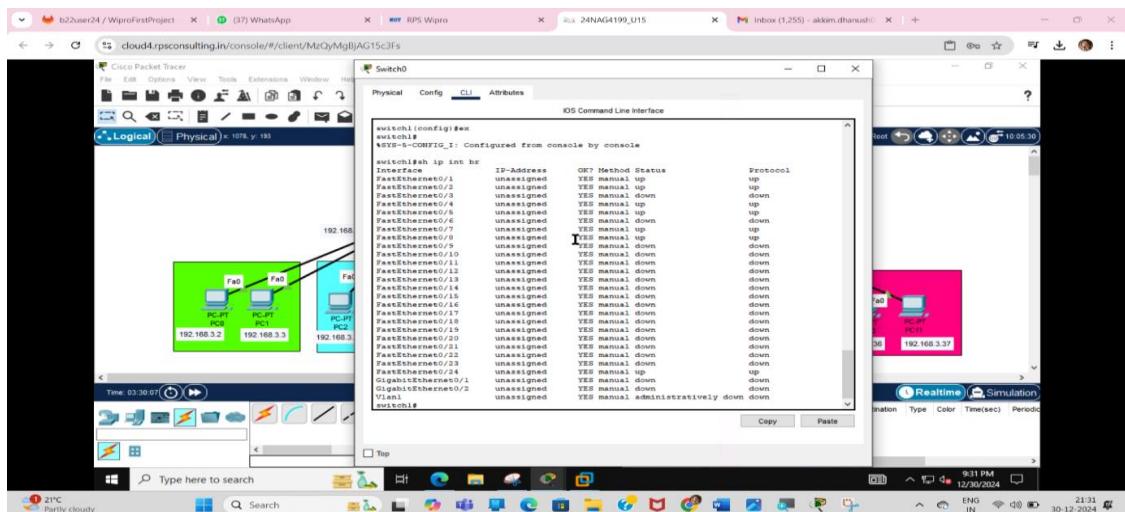
(.I.E) FROM PC0 TO PC6,PC7,PC11.....ETC.

STEP -11: DOUBLE CLICK ON SWITCH 0 AND GO TO CLI AND PRESS ENTER.

GIVE THE COMMAND AS EN/ENABLE TO GO THE PRIVILIGED MODE,

NOW TO GO TO THE GLOBAL CONFIGURATION MODE WE USE “CONF T” COMMAND.

LET US GIVE THE HOSTNAME AS SWITCH 1,GIVE “EX” COMMAND TO EXIT THE MODE AND GIVE THE COMMAND AS “SH IP INT BR”

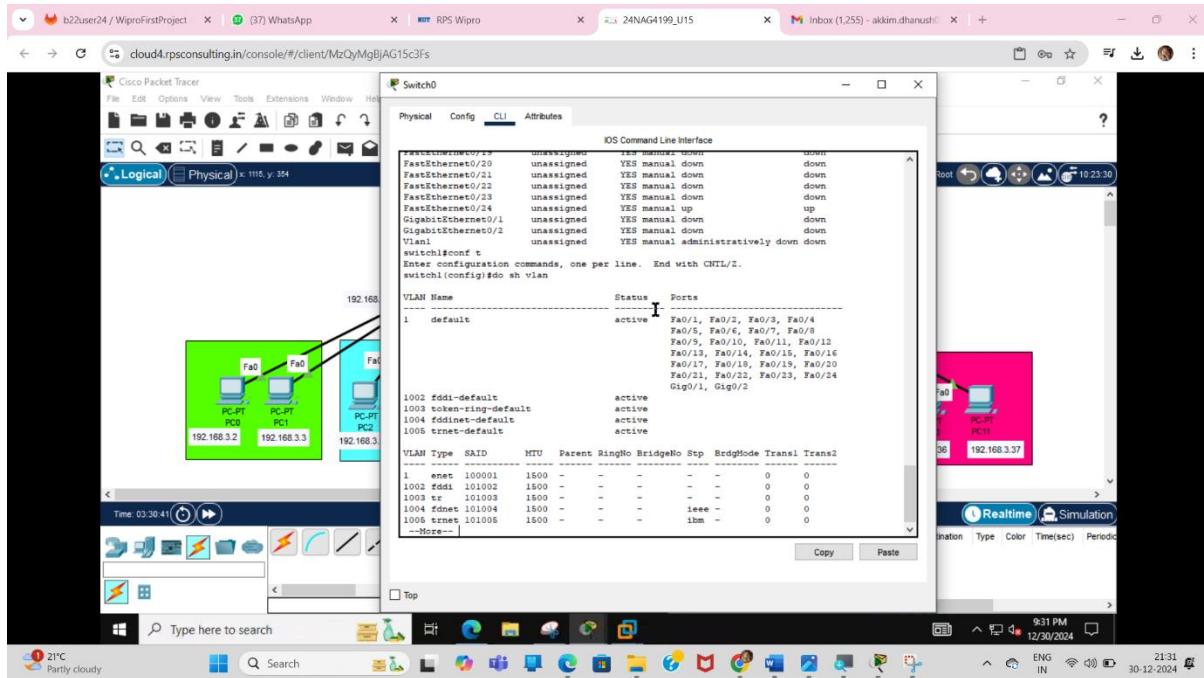


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WE CAN SEE THAT ALL THE INTERFACES IN SWITCH 1.

NOW GO TO THE GLOBAL CONFIGURATION MODE AND GIVE THE COMMAND AS "DO SH VLAN"

WE CAN SEE THE VLAN'S IN THE SWITCH.



LET US CREATE THE VLAN'S,

GIVE THE COMMAND VLAN 10,PRESS ENTER IT GOES TO THE VLAN CONFIGURATION MODE,

GIVE IT THE NAME AS SALES FOR VLAN 10,FOR VLAN 20 GIVE THE NAME AS YOU WANT, I AM TAKING AS HR AND FOR VLAN 30 NAME AS ENGINNER.

NOW WE SHOULD CONFIGURE THE SWITCHES,

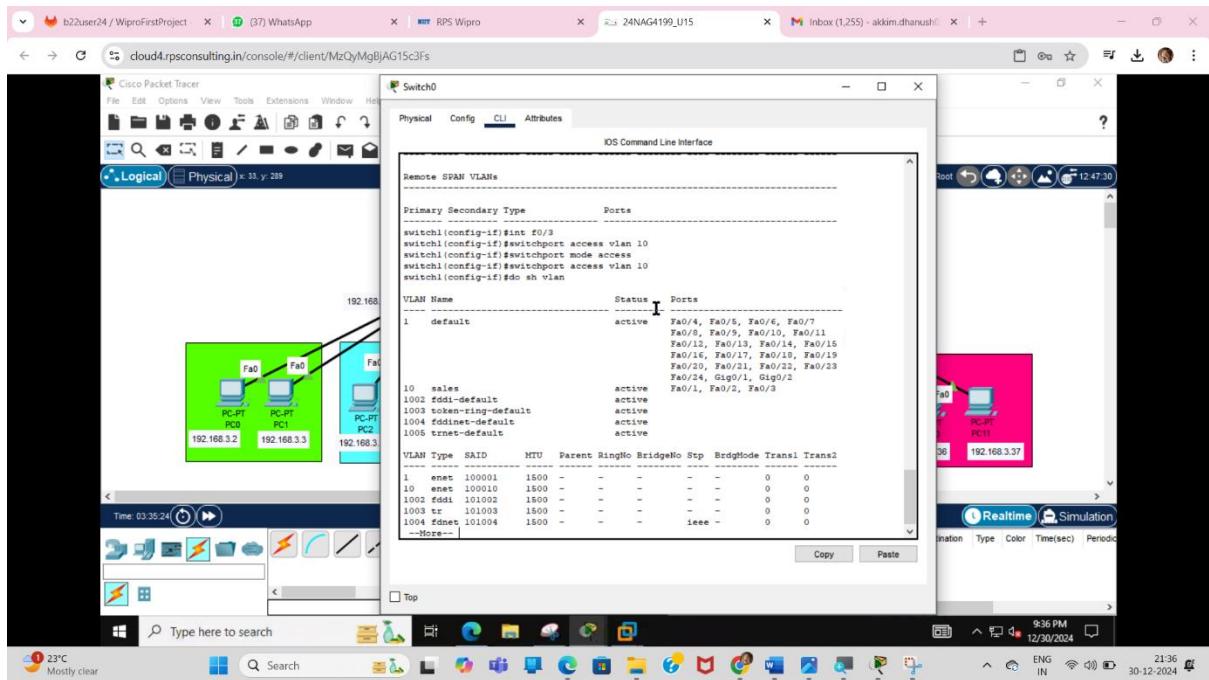
FOR VLAN 10, WE TAKE SOME MORE FASTETHERNET, WE USE

"INT F0/1-3" COMMAND SO IT ALLOWS ,F0/1,F0/2,F0/3 NETWORKS.

"INT F0/4-6" COMMAND SO IT ALLOWS ,F0/4,F0/5,F0/6 NETWORKS.

"INT F0/7-9" COMMAND SO IT ALLOWS ,F0/7,F0/8,F0/9 NETWORKS.

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LETS ACCESS THE SWITCHPORT MODE WE USE COMMAND,

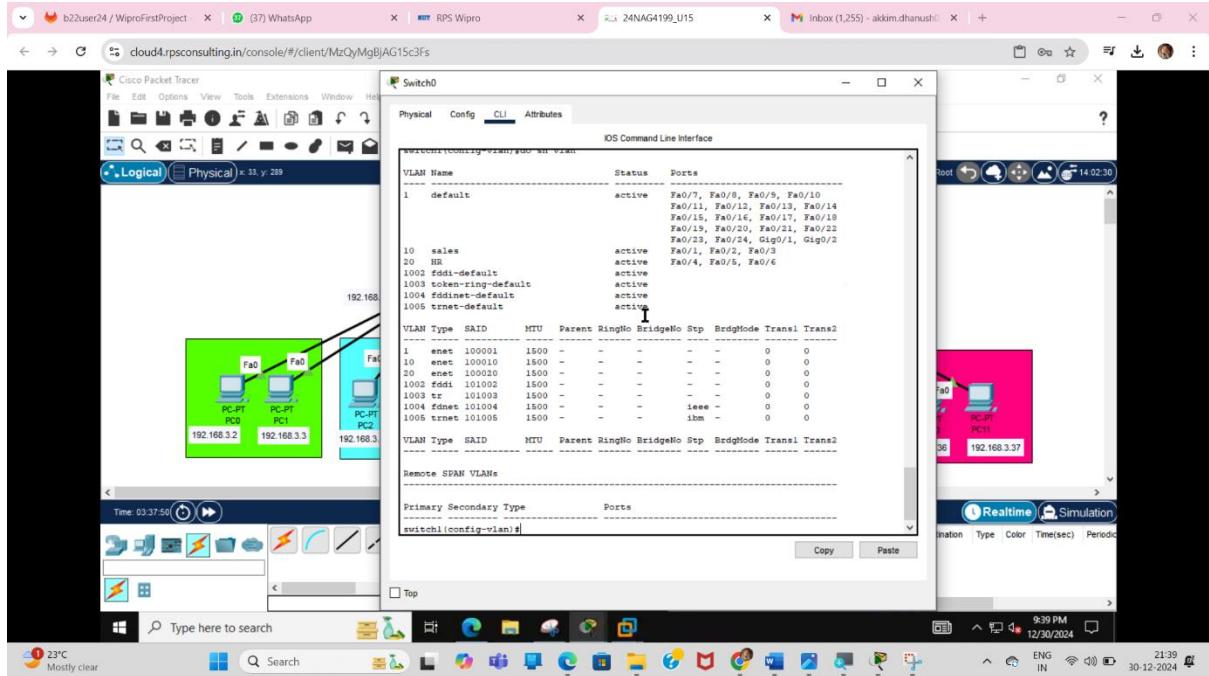
“SWITCHPORT MODE ACCESS”

“SWITCHPORT ACCESS VLAN 10”

SIMILARLY FOR VLAN 20 AND FOR VLAN 30,WE USE

“SWITCHPORT MODE ACCESS”

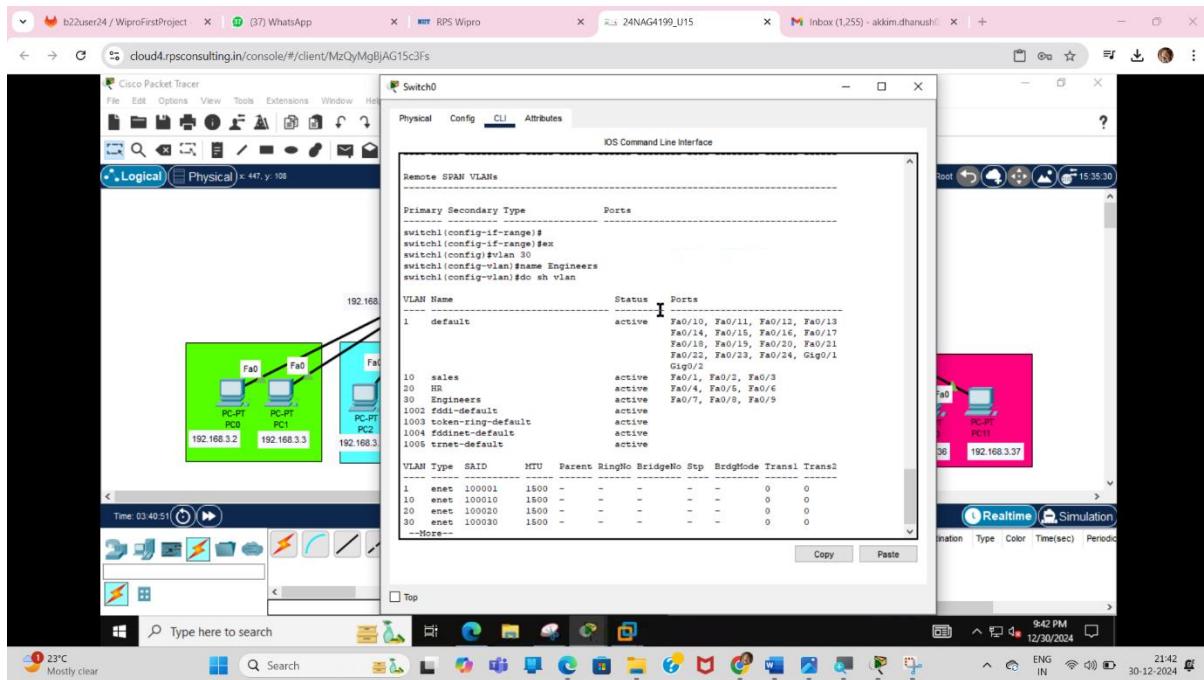
“SWITCHPORT ACCESS VLAN 20”



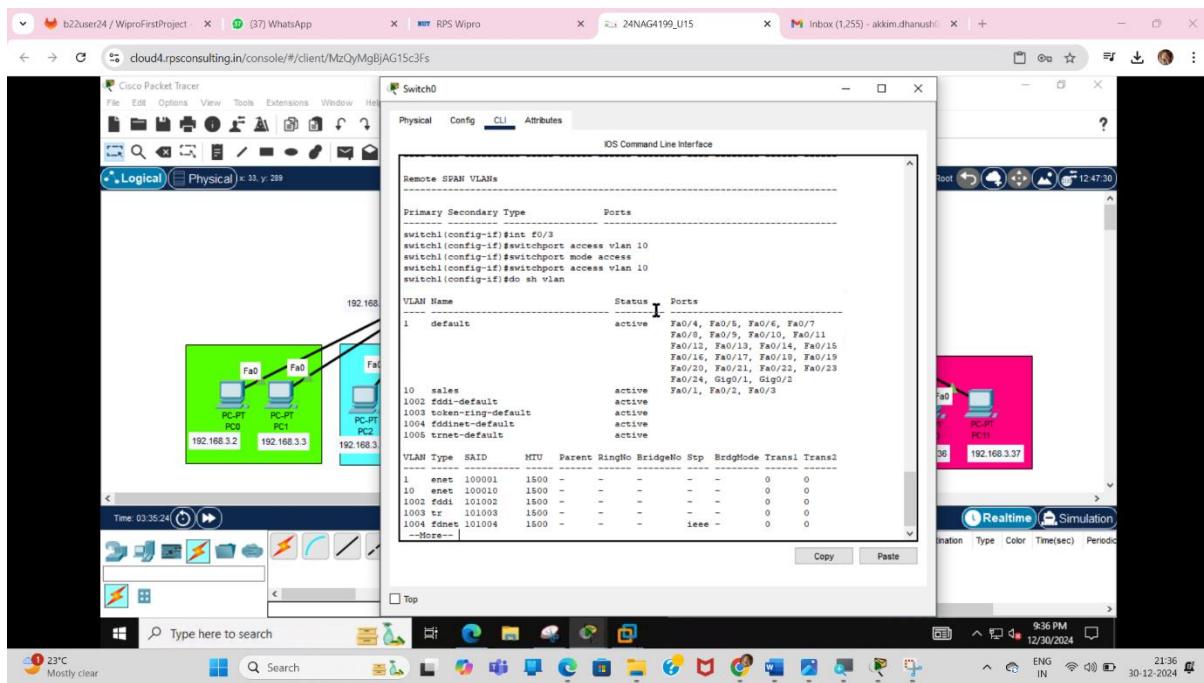
“SWITCHPORT MODE ACCESS”

“SWITCHPORT ACCESS VLAN 30”

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SIMILARLY, WE USE THESE COMMANDS FOR ANOTHER SWITCH AND CREATE THE NETWORKS,



STEP – 12: LET US CONFIGURE THE SWITCHES

WE HAVE TWO SWITCHES CONNECTED TO THE ROUTER, ONE FOR EACH OF THE FIRST TWO VLANS. WE NEED TO CONFIGURE TRUNKING ON THE SWITCHES TO ALLOW THE VLANS TO PASS BETWEEN THE SWITCHES.

SWITCH 1 CONFIGURATION (FOR VLAN 10):

INT F0/24

SWITCHPORT MODE TRUNK

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SWITCH 2 CONFIGURATION (FOR VLAN 20):

INT F0/24

SWITCHPORT MODE TRUNK

THESE TRUNKS WILL CARRY THE TAGGED VLAN TRAFFIC BETWEEN THE ROUTER AND THE SWITCHES.

STEP – 13: CONFIGURE THE ROUTER

ASSUMING THE ROUTER HAS AN ETHERNET INTERFACE (E.G., GIGABITETHERNET0/1), THE ROUTER WILL NEED TO BE CONFIGURED WITH SUB-INTERFACES FOR EACH VLAN.

ROUTER CONFIGURATION (EXAMPLE ON CISCO ROUTER):

INTERFACE GIGABITETHERNET0/1.10

ENCAPSULATION DOT1Q 10

IP ADDRESS 192.168.3.1 255.255.255.240

INTERFACE GIGABITETHERNET0/1.20

ENCAPSULATION DOT1Q 20

IP ADDRESS 192.168.3.17 255.255.255.240

INTERFACE GIGABITETHERNET0/1.30

ENCAPSULATION DOT1Q 30

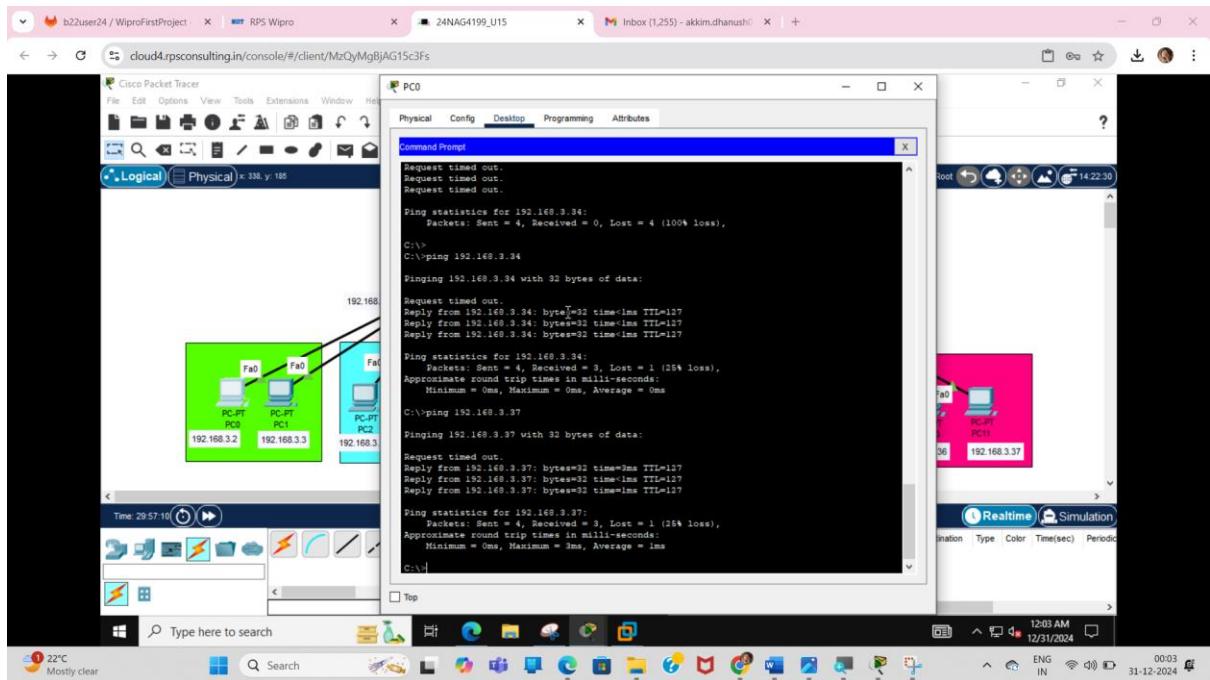
IP ADDRESS 192.168.3.33 255.255.255.240

- THE ENCAPSULATION DOT1Q COMMAND ALLOWS VLAN TAGGING FOR EACH SUB-INTERFACE.
- EACH SUB-INTERFACE CORRESPONDS TO A SPECIFIC SUBNET.

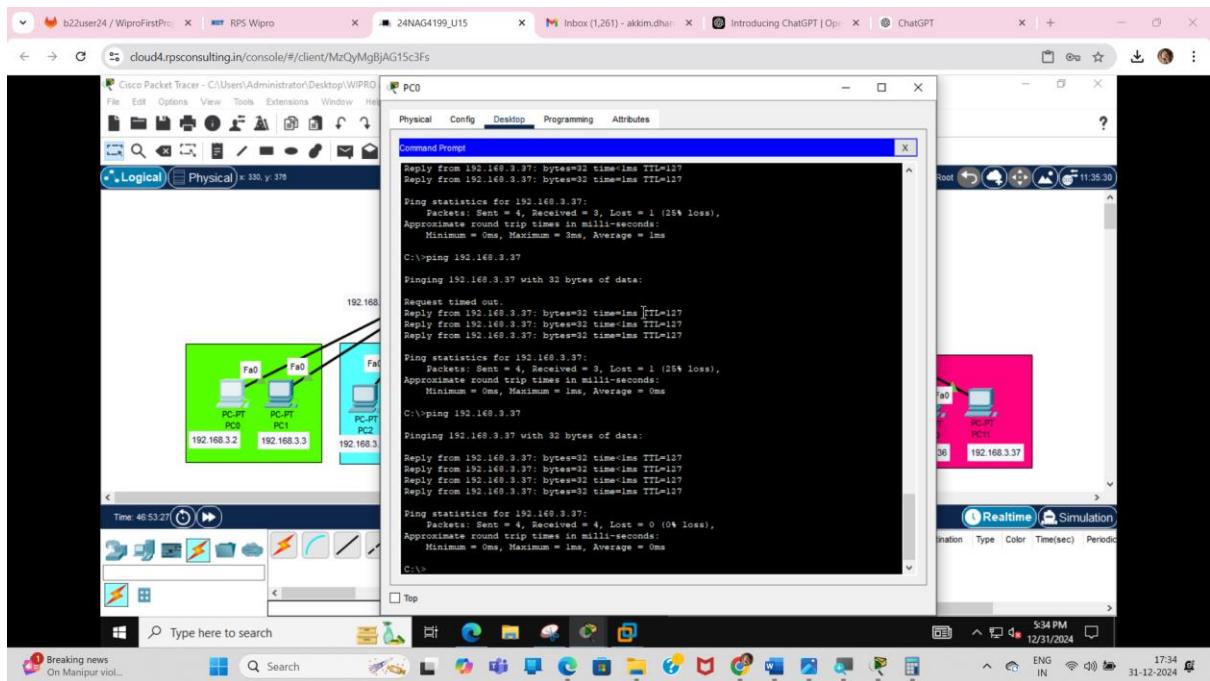
WE HAVE CONNECTED THE F0/23 TO G0/0IN THE ROUTER,

GIVE “NO SHUT” COMMAND TO ALL THESE INTERFACE.

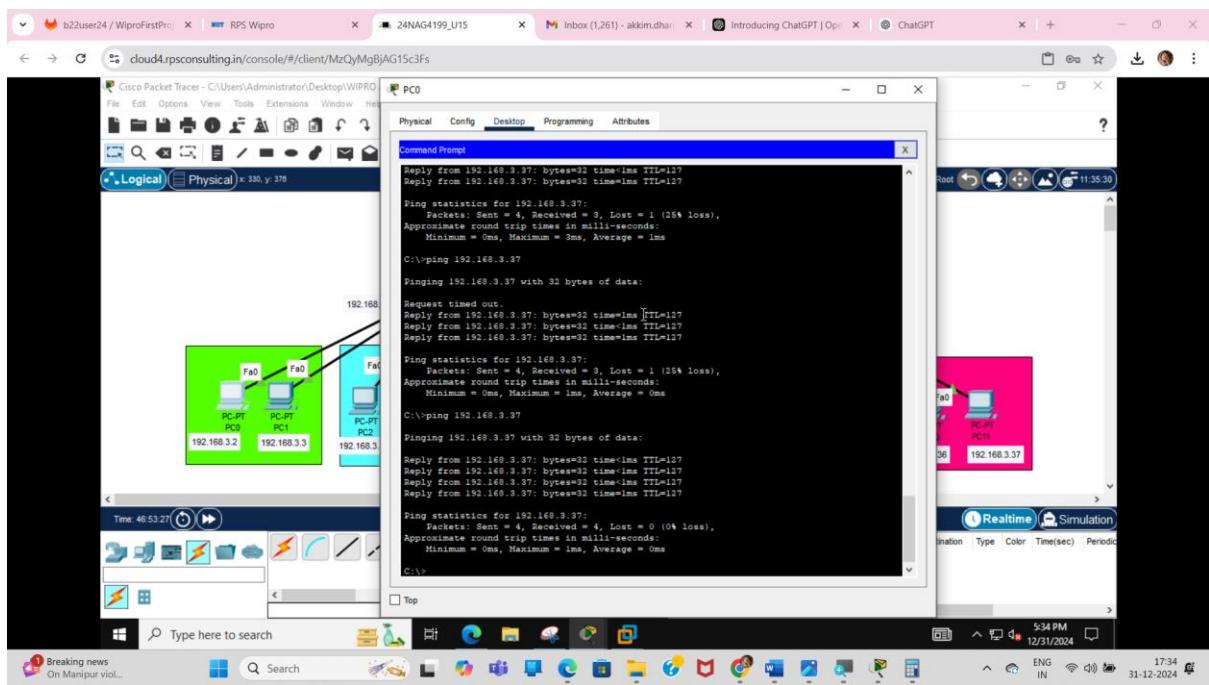
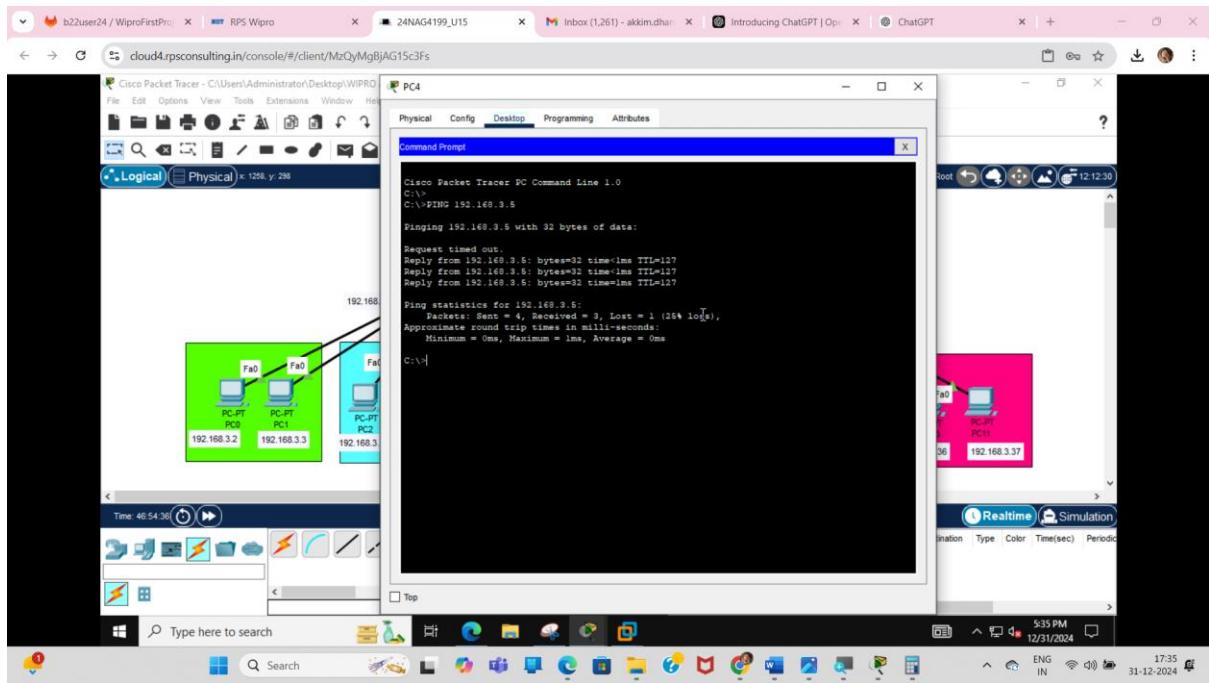
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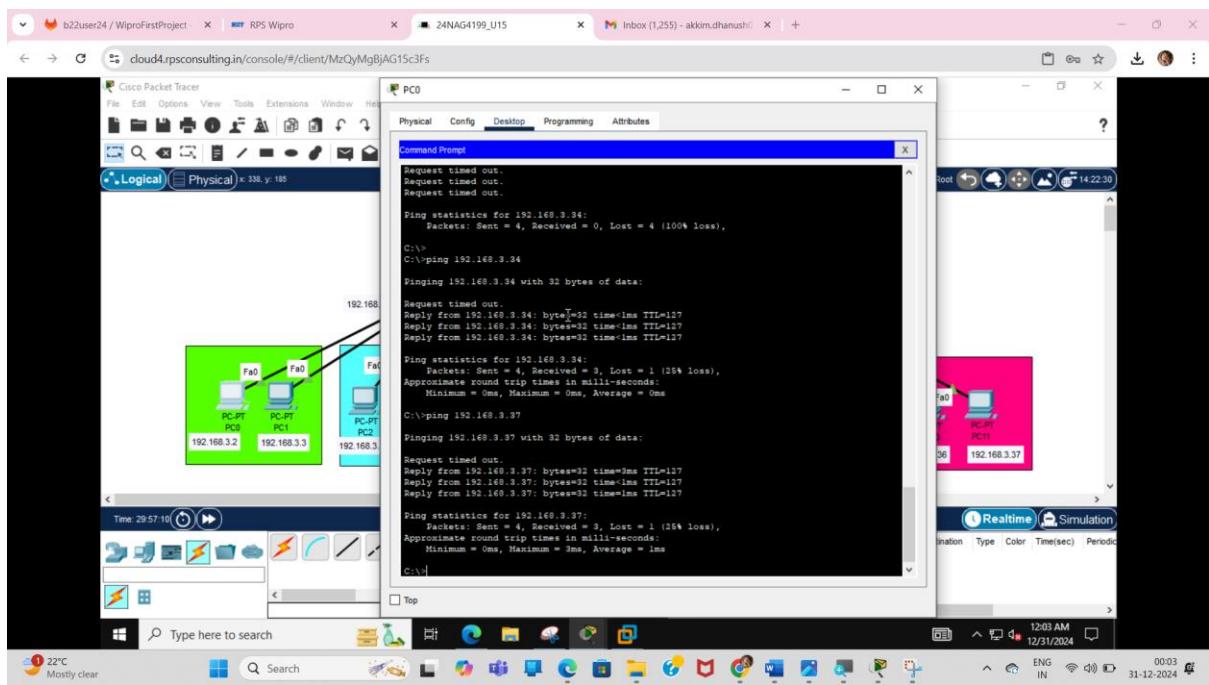
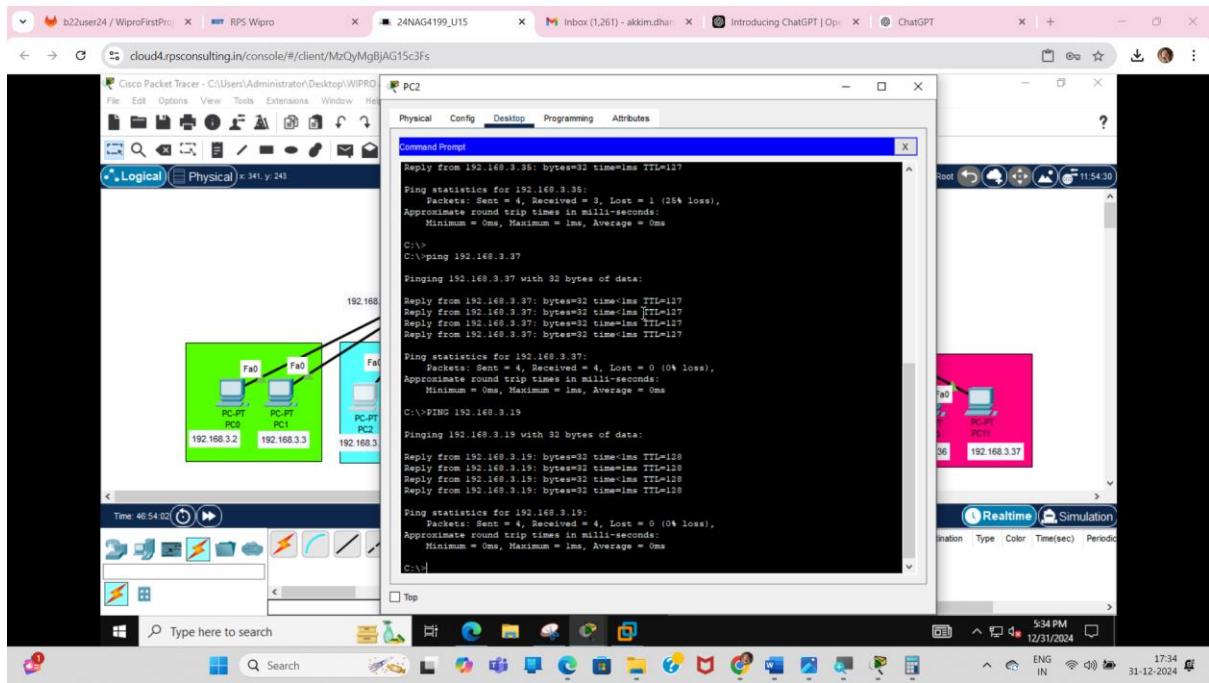
WE CAN SEE THAT WE ARE ABLE TO PING THE MESSAGE.



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HENCE, WE CAN PING FROM ANY PC TO ANY.

*****THANK YOU*****

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