Proiect retelistica

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Acest proiect final consta in calcularea, realizarea unei retele si simularea configurarii unor rutere si switch-uri cu ajutorul platformei Cisco Packet Tracer.

Prima parte consta in generarea automata a unei tipologii de retea (Fig1). Aceasta, alaturi de datele generale ale retelei, cum ar fi: Network IP-ul, Subnet Mask-ul, si cele cinci subretele (Fig2).

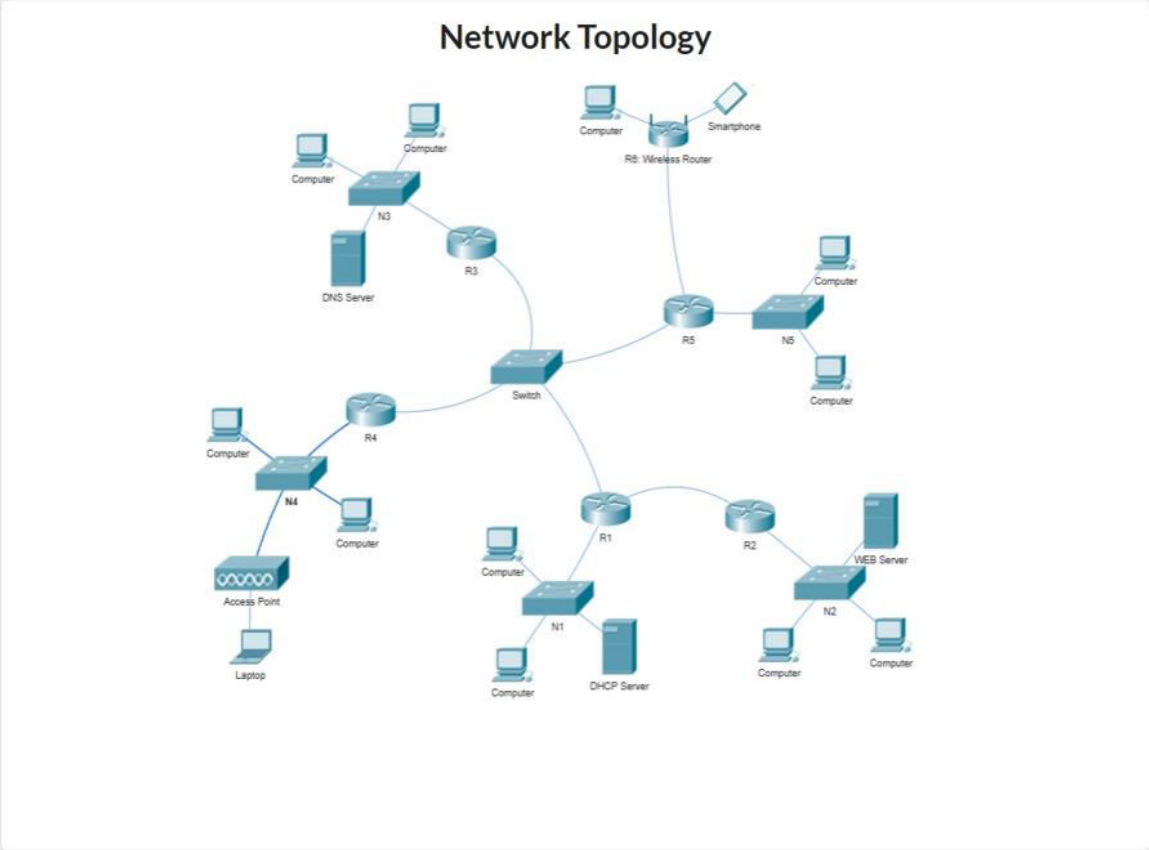


Fig.1 Retea generata automat de pe moodle.cs.ubbcluj.ro

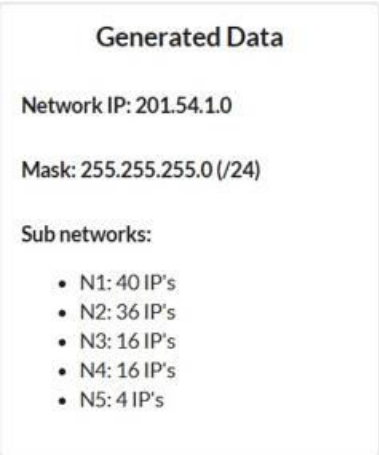


Fig.2 Network IP, Subnet Mask, Sub networks

A doua parte consta in calcularea necesarului de IP-uri pentru retea fiecare retea in parte. Din start putem calcula numarul de IP-uri de care dispunem, cu ajutorul Mask-ului:

255 - reprezinta 8 de 1 (binary code)

0 - reprezinta 8 de 0 (binary code)

(/24) - indica numarul cifrei 1 din Mask-ul nostru

Numarul total de biti dintr-un IP este de 32 de biti **(32 - 24 = 8 biti)**.

Pentru determinarea numarului total de adrese de care dispunem, se poate folosi formula: **2^n**, unde **n** reprezinta numarul total de zerouri din Mask-ul nostru.

n - 8 (avem 8 zerouri in Mask)

2^8 = 256 (deci avem 255 de adrese IP)

Identificarea si calcularea necesarului de IP-uri a mini-retelelor

Avem urmatoare sub networks care sunt stiute deja:

N1: 40 IP's

N2: 36 IP's

N3: 16 IP's

N4: 16 IP's

N5: 4 IP's

Si pe langa acestea s-au mai identificat inca 3, iar acestea sunt:

N12: 2 IP's

N5w: 2 IP's

N1345: 4 IP's

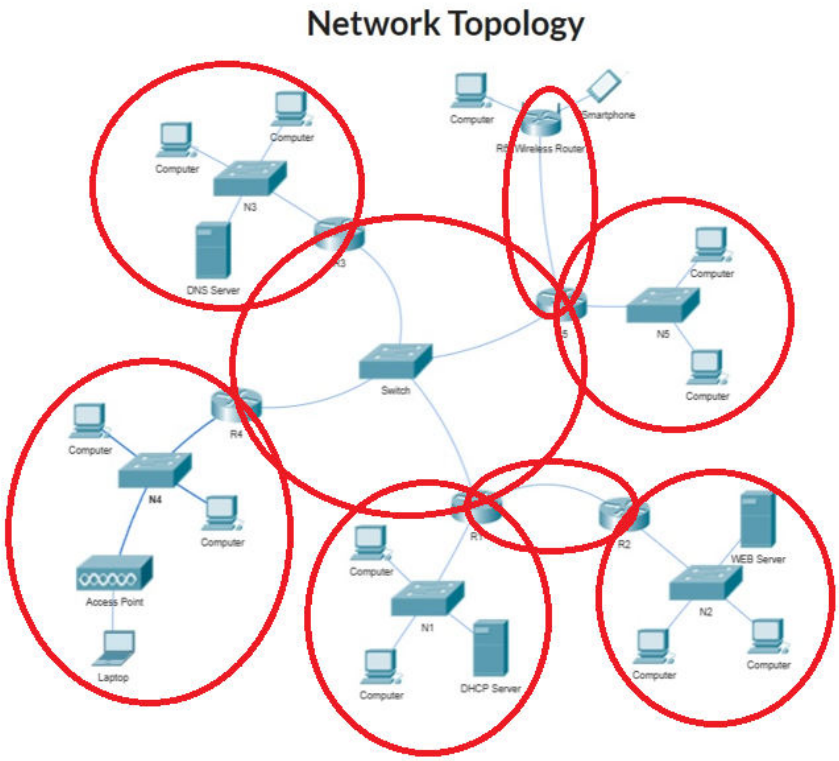


Fig.3 Repartizarea mini-retelelor date si a celor noi identificate

Calcularea necesarului de IP-uri se face dupa urmatoarea formula: **n devices (IP) + 1 router + 1 NA + 1 BA => n+3**

N1: 40 + 3 = 43<**64** = 2^6 6 zeros, 32 - 6 = 26 ones /26

N2: 36 + 3 = 39<**64** = 2^6 6 zeros, 32 - 6 = 26 ones /26

N3: 16 + 3 = 19<**32** = 2^5 5 zeros, 32 - 5 = 27 ones /27

N4: 16 + 3 = 19<**32** = 2^5 5 zeros, 32 - 5 = 27 ones /27

N5: 4 + 3 = 7<**8** = 2^3 3 zeros, 32 - 3 = 29 ones /29

N1345: 4 + 2 = 6<**8** = 2^3 3 zeros, 32 - 3 = 29 ones /29

N12: 2 + 2 = 4<**4** = 2^2 2 zeros, 32 - 2 = 30 ones /30

N5w: 2 + 2 = 4<**4** = 2^2 2 zeros, 32 - 2 = 30 ones /30

SUM = **64+64+32+32+8+8+4+4=216<256 (necesar IP-uri)**

Apoi vom folosi un arbore binar pentru a imparti cele 256 de IP-uri in doua de **32**, doua de **16**, doua de **8**, si doua de **4**.

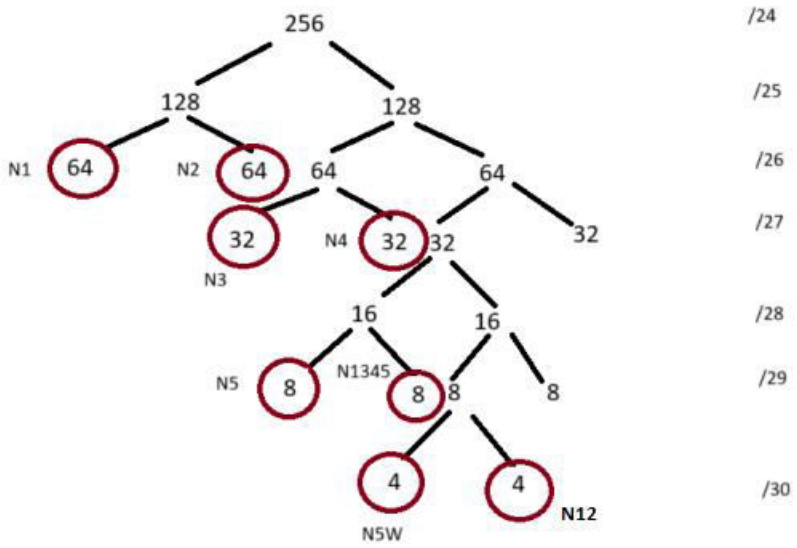


Fig.4 Retea recursiva folosind arbore binar

Pe urma vom imparti intervalul conform arborelui binar:

```
[0.....................................................................255] /24
[0.........................127][128.....................................255] /25
[0.....N1.....63][64.....N2.....127][128.................191][192.............255] /26
[0.....N1.....63][64.....N2.....127][128.N3.159][160.N4.191][192...223][224...255] /27
[192.........................223][224.................................255] /27
[192.......207][208.............223][224............239][240.................255] /28
[192.N5.199][200.N1345.207][208..215][216..223][224..231][232..239][240..247][248....255] /29
[208......215][216......223][224....231][232.....239][240......247][248.......255] /29
[208.N12.211][212.N5w.215][216..219][220..223][224..227][228..231][232..235][236..239][240..243][244..247][248..251][252..255] /30
```

Dupa rezolvarea calculelor am obtinut urmatoarele intervale de IP-uri, urmatoarelor retele:

- N1: 201.54.1.0 /26 R1:201.54.1.1 S:201.54.1.2
- N2: 201.54.1.64 /26 R2:201.54.1.65 S:201.54.1.66
- N3: 201.54.1.128 /27 R3:201.54.1.129 S:201.54.1.130
- N4: 201.54.1.160 /27 R4:201.54.1.161
- N5: 201.54.1.192 /29 R5:201.54.1.193
- N1345: 201.54.1.200 /29 R1:.204 R3:.202 R4:.201 R5:203
- N12: 201.54.1.208 /30 R1:.209 R2:.210
- N5w: 201.54.1.212 /30 R5:.213 W:214

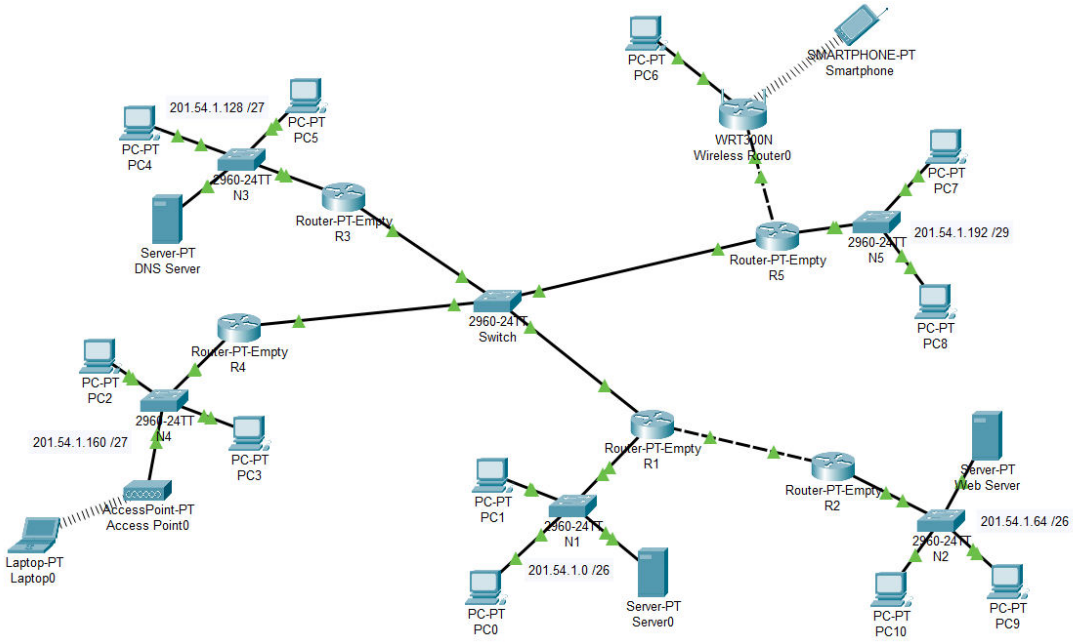


Fig.5 Retea configurata in Cisco Packet Tracer

La fiecare retea Default Gateway-ul l-am setat in functie de IP retelei din care face parte (IP-ul routerului din reteaua respectiva) , iar DNS-ul este 201.54.1.130 /27 peste tot.

Reteaua N1: 201.54.1.0 /2

- Primul IP este rezervat routerului R1 – 201.54.1.1 /26
- Al doilea IP este rezervat serverului S1 - 201.54.1.2 /26. Pe S1 l-am configurat ca fiind server DHCP, astfel calculalatoarele sunt trecute din static pe DHCP si isi iau automat IP_urile urmatoare
- Al treilea IP l-a primit PC0: – 201.54.1.4 /26
- Al patrulea IP l-am primit PC1: – 201.54.1.3 /26

Reteaua N2: 201.54.1.64 /26

- Primul IP este rezervat routerului R2 – 201.54.1.65 /26
- Al doilea IP este rezervat serverului S2 care este si un server Web – 201.54.1.66 /26 si, de asemenea, este si server DHCP, ceea ce inseamna ca, calculatoarele vor fi trecute din static pe DHCP si vor primi automat IP-uri conform clasei de retea
- Al treilea IP l-a primit PC9: 201.54.1.67 /26
- Al patrulea IP l-a primit PC10: 201.54.1.68 /26

Reteaua N3: 201.54.1.128 /27

- Primul IP este rezervat routerului R3– 201.54.1.129 /27
- Al doilea IP este rezervat serverului S3 care este server DNS - 201.54.1.130 /27. Pe S3 l-am configurat ca fiind server DHCP, astfel calculalatoarele sunt trecute din static pe DHCP si isi iau automat IP-urile.
- Al treilea IP l-a primit PC5 - 201.54.1.131 /27
- Al patrulea IP l-am primit PC4 - 201.54.1.132 /27

Reteaua N4: 201.54.1.160 /27

- Primul IP este rezervat routerului R4 - 201.54.1.161 /27. Am configurat routerul din command line interface ca fiind server de DHCP.
- Al doilea IP -> PC2 - 201.54.1.162 /27
- Al treilea IP -> PC3 - 201.54.1.163 /27
- Al patrulea IP -> Laptop -> 201.54.1.164 /27
- In aceasta retea exista si un Access Point la care i-am modificat numele retelei wireless (SSID) la care ulterior am conectat un laptop prin wireless

Reteau N5: 201.54.1.192 /29

- Primul IP este rezervat pentru routerul R5 -> 201.54.1.193 /29. In aceasta retea nu avem server, astfel am introdus manual IP-urile calculatoarelor
- Computer 7 - IP -> 201.54.1.194 /29
- Computer 8 - IP -> 201.54.1.195 /29

Reteaua N5W : 201.54.1.212 /30

- IP Rw -> 201.54.1.214 /30, iar pentru partea de routare am setat R5 -> 201.54.1.213 /30

Reteaua N12: 201.54.1.208 /30

- IP R1-> 201.54.1.209 /30 si IP R2 -> 201.54.1.210 /30

Reteaua N1345: 201.54.1.200 /29

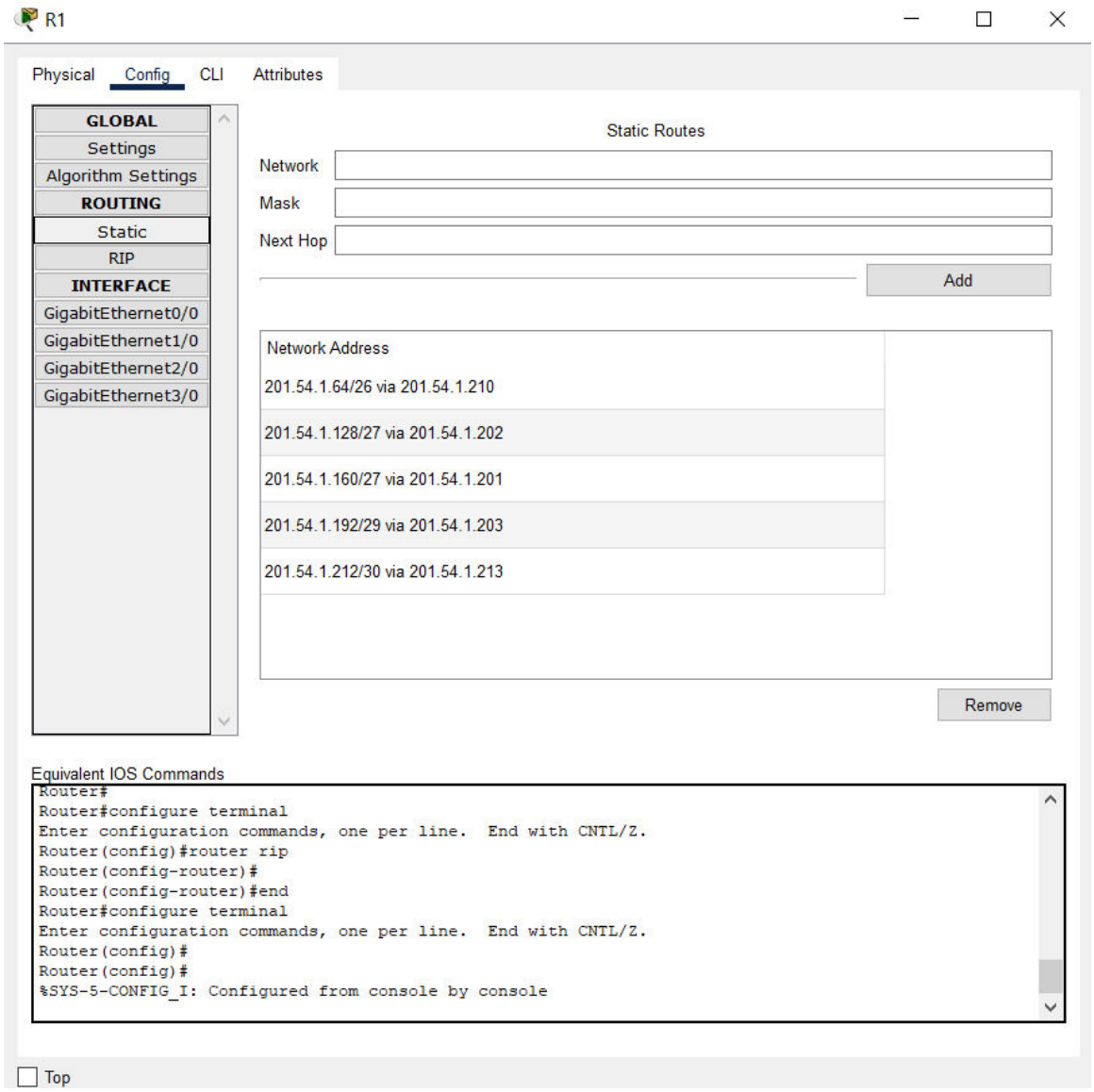
- IP R1 -> 201.54.1.204 /30, R3 -> 201.54.1.202 /30, R4 -> 201.54.1.201 /30, R5 -> 201.54.1.203 /30

Tabela de rutare

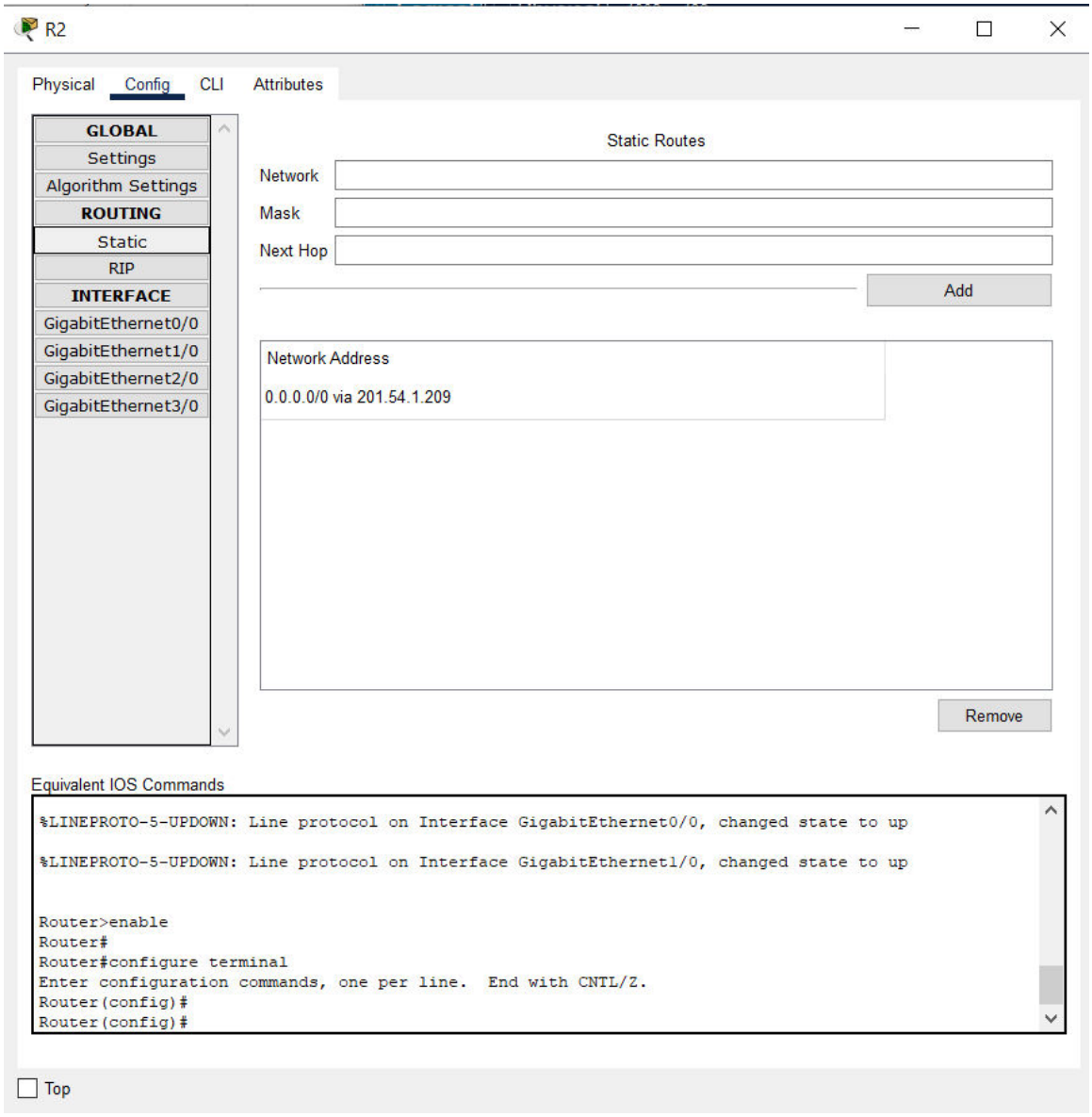
Fiecare router dispune de o “tabela de rutare” -> o structura pe baza careia alege portul pe care sa emita un pachet. In mod normal, aceste tabele pot fi configurate static sau dinamic folosind RIP. In cadrul acestui proiect rutarea s-a facut static.

Rutarea statica inseamna ca mergem la fiecare router in parte si vedem la ce sunt conectate placile de retea de la router (ce retele cunoaste), iar restul retelelor pe care nu le vede le adaugam noi la Config->Static.

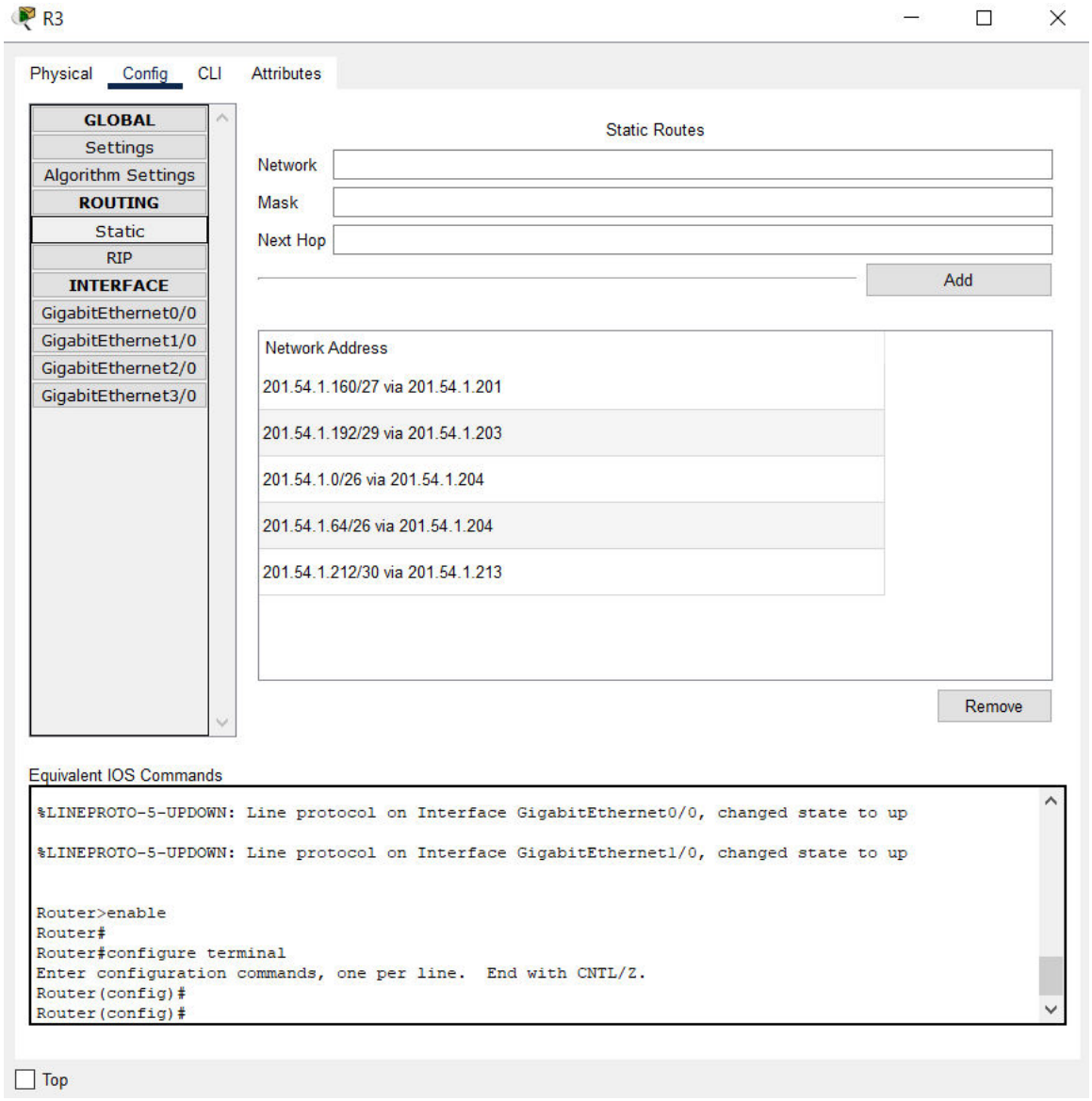
R1


R1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
GigabitEthernet0/0
GigabitEthernet1/0
GigabitEthernet2/0
GigabitEthernet3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
201.54.1.64/26 via 201.54.1.210
201.54.1.128/27 via 201.54.1.202
201.54.1.160/27 via 201.54.1.201
201.54.1.192/29 via 201.54.1.203
201.54.1.212/30 via 201.54.1.213
Remove
Equivalent IOS Commands
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#
Router(config-router)#end
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
%SYS-5-CONFIG_I: Configured from console by console
Top

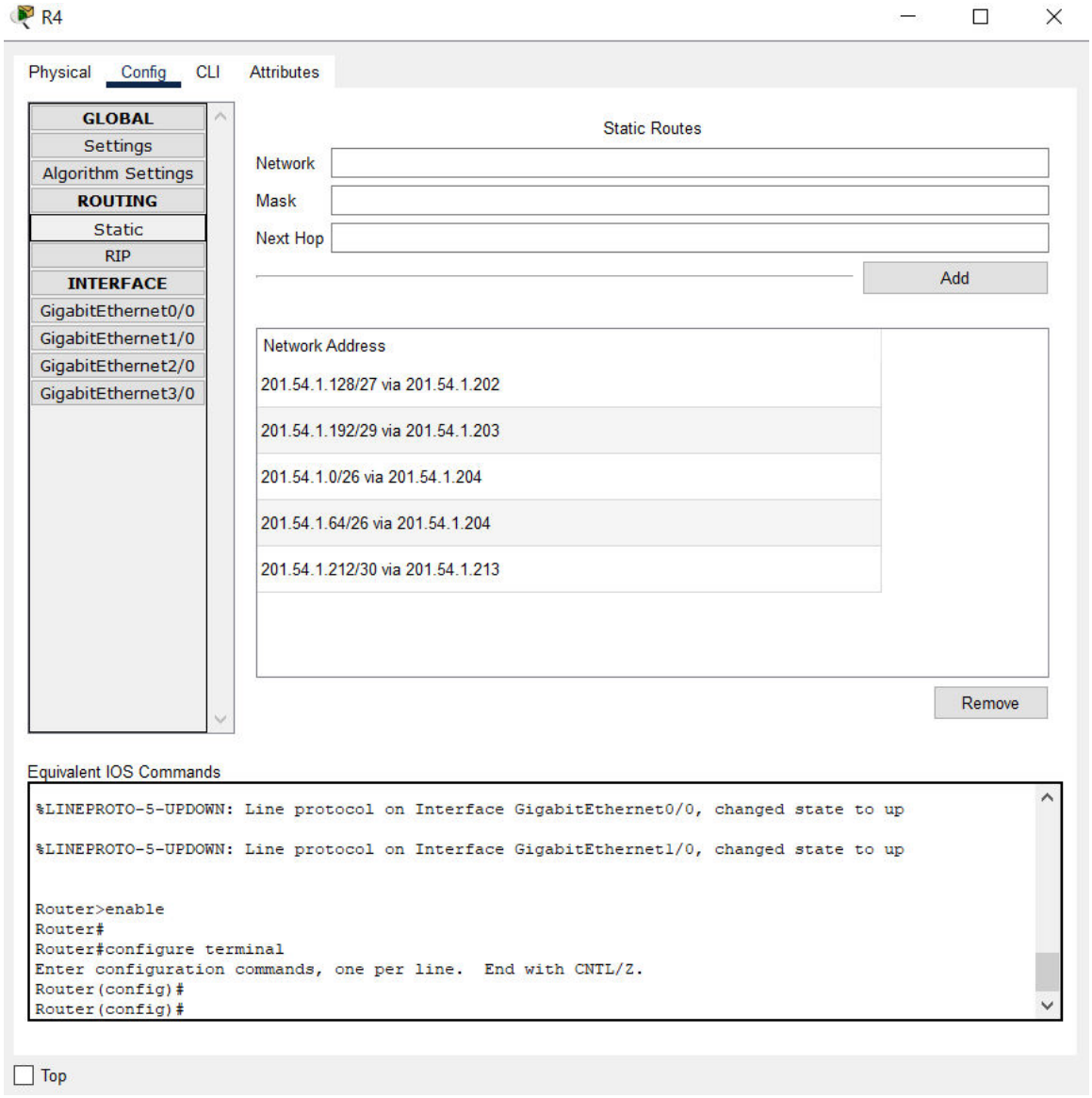
R2


R2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
GigabitEthernet0/0
GigabitEthernet1/0
GigabitEthernet2/0
GigabitEthernet3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
0.0.0.0/0 via 201.54.1.209
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0, changed state to up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Top

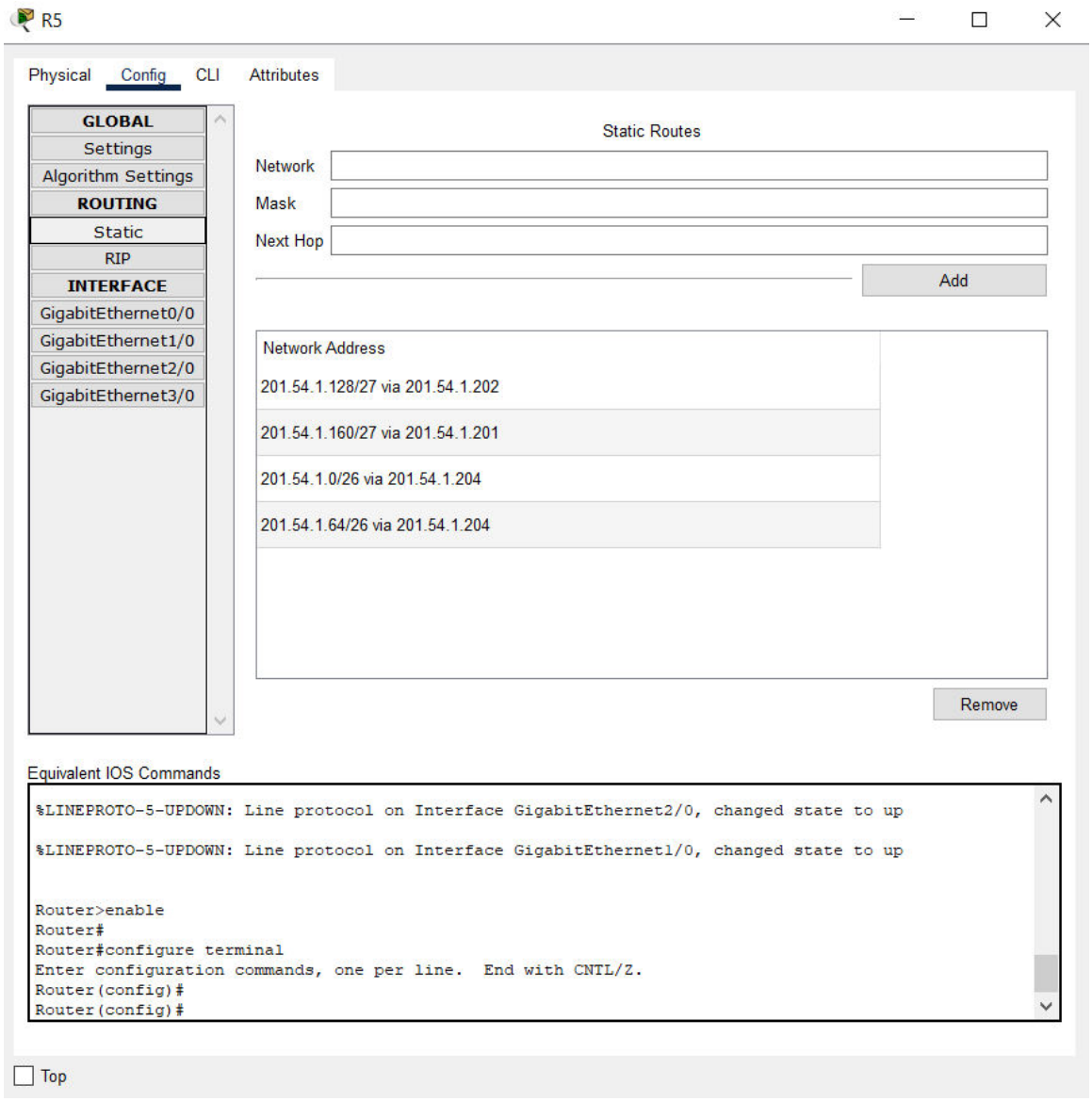
R3


R3
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
GigabitEthernet0/0
GigabitEthernet1/0
GigabitEthernet2/0
GigabitEthernet3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
201.54.1.160/27 via 201.54.1.201
201.54.1.192/29 via 201.54.1.203
201.54.1.0/26 via 201.54.1.204
201.54.1.64/26 via 201.54.1.204
201.54.1.212/30 via 201.54.1.213
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0, changed state to up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Top

R4

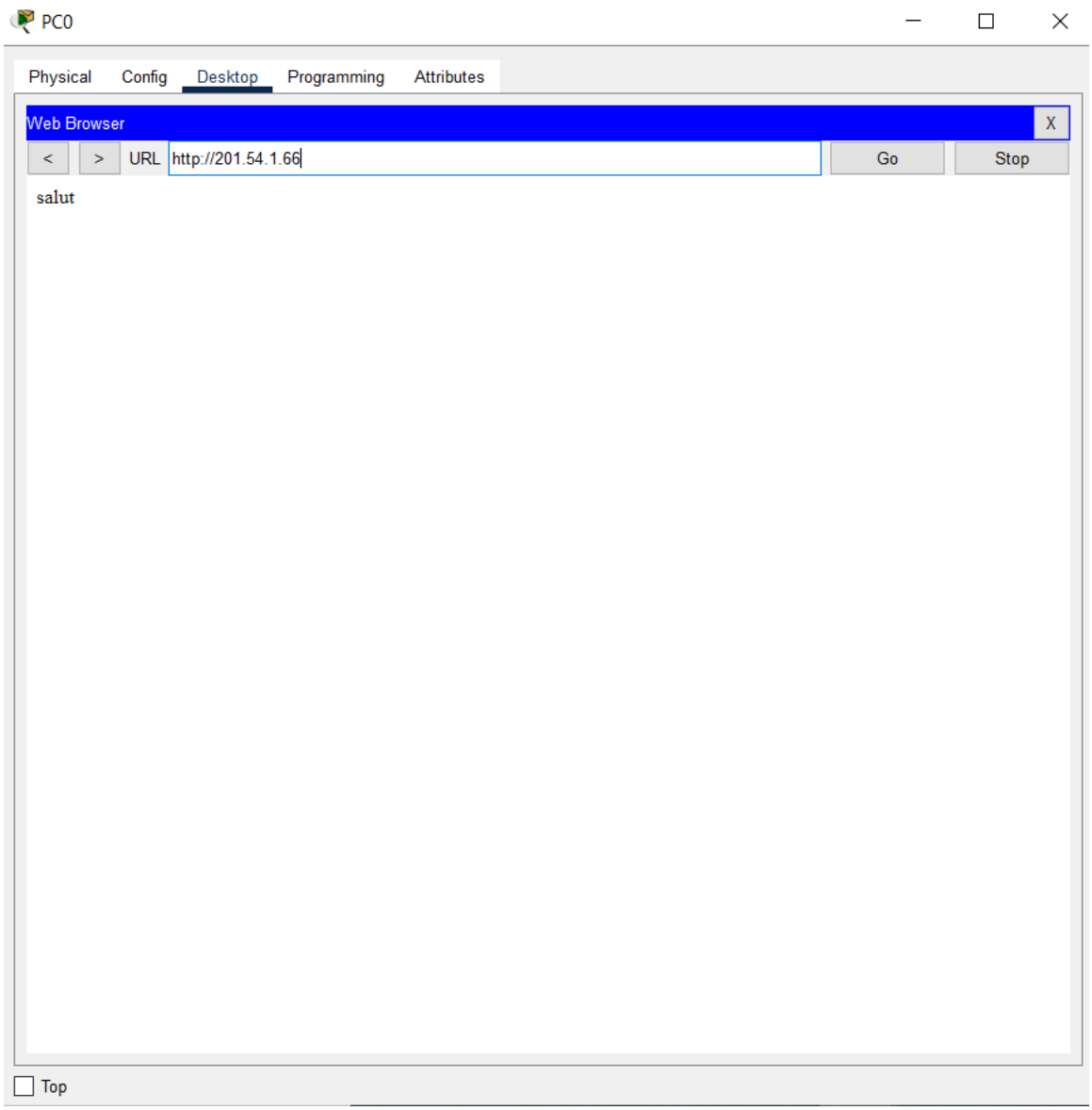

R4
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
GigabitEthernet0/0
GigabitEthernet1/0
GigabitEthernet2/0
GigabitEthernet3/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
201.54.1.128/27 via 201.54.1.202
201.54.1.192/29 via 201.54.1.203
201.54.1.0/26 via 201.54.1.204
201.54.1.64/26 via 201.54.1.204
201.54.1.212/30 via 201.54.1.213
Remove
Equivalent IOS Commands
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/0, changed state to up
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#
Top

R5

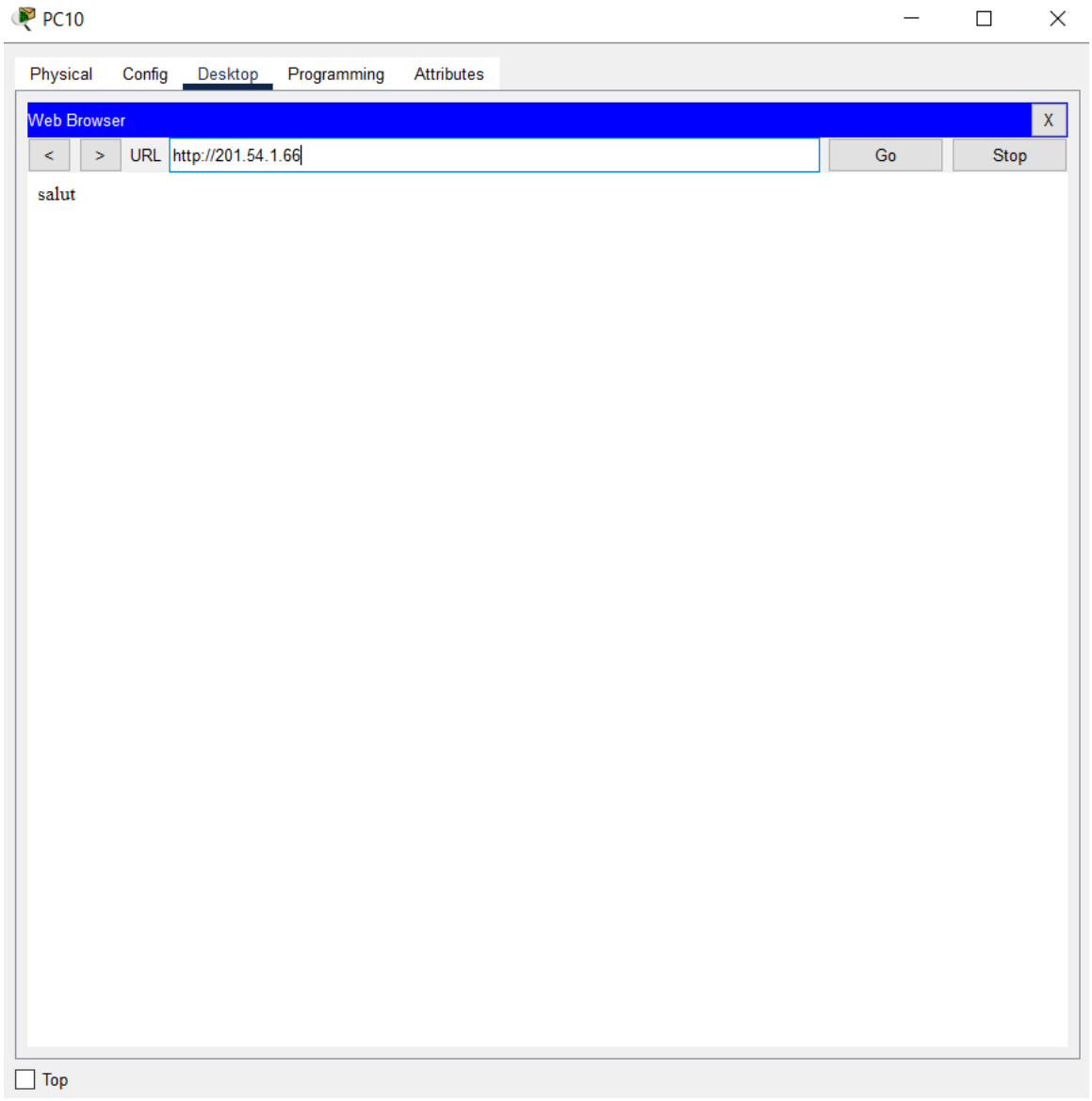


Accesarea paginii web

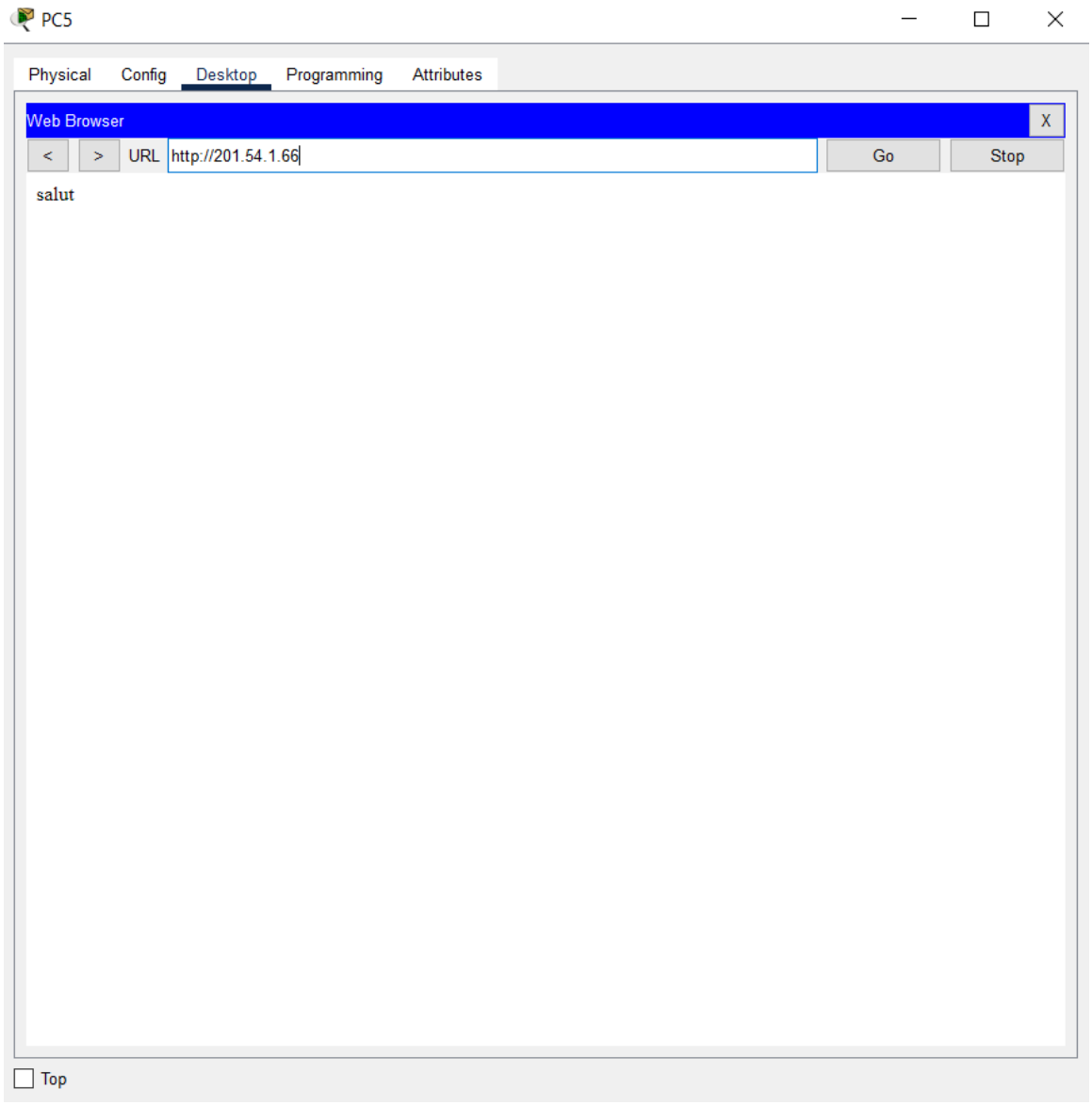
N1


PC0
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://201.54.1.66
Go
Stop
salut
Top

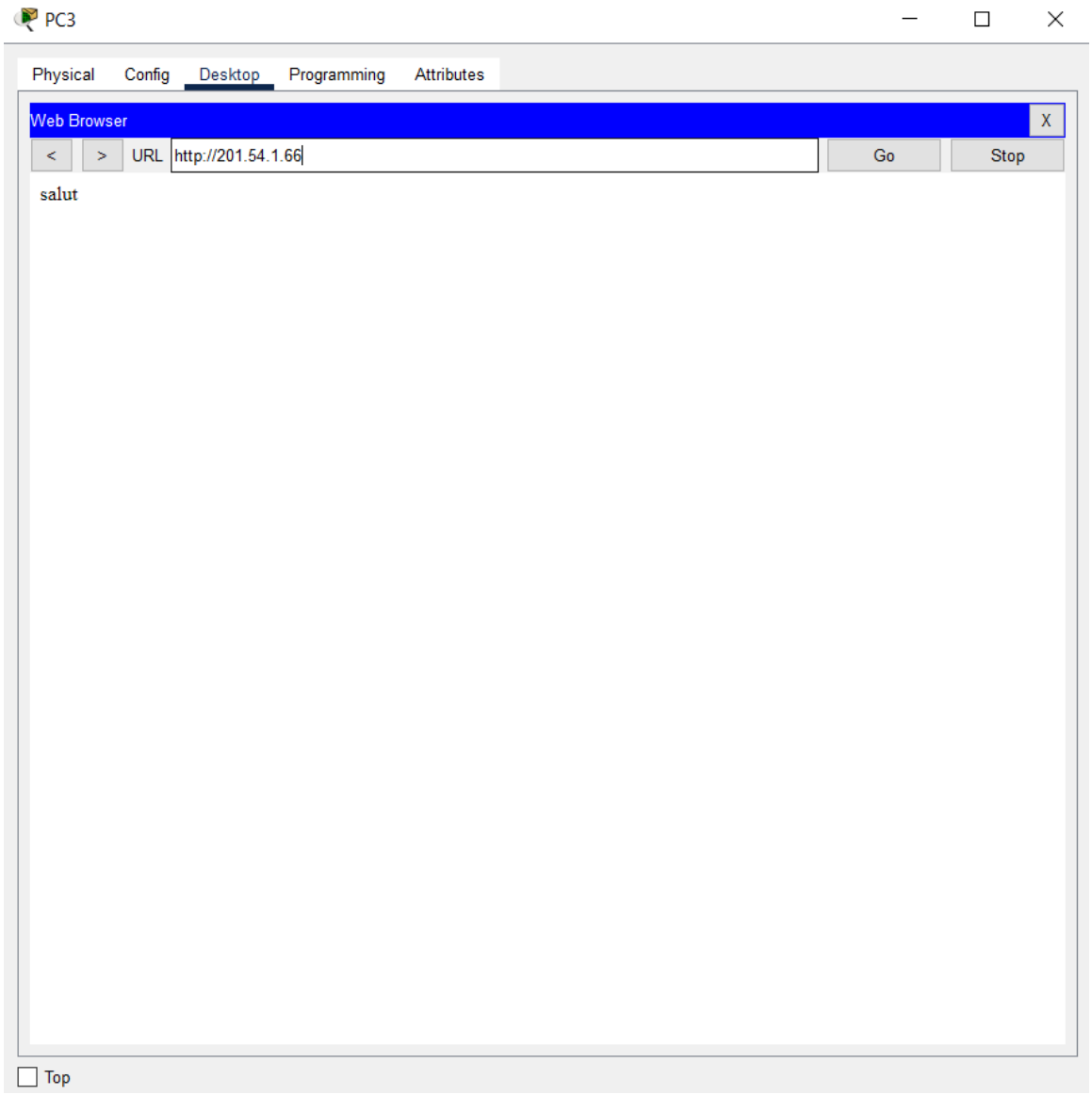
N2


PC10
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://201.54.1.66
Go
Stop
salut
Top

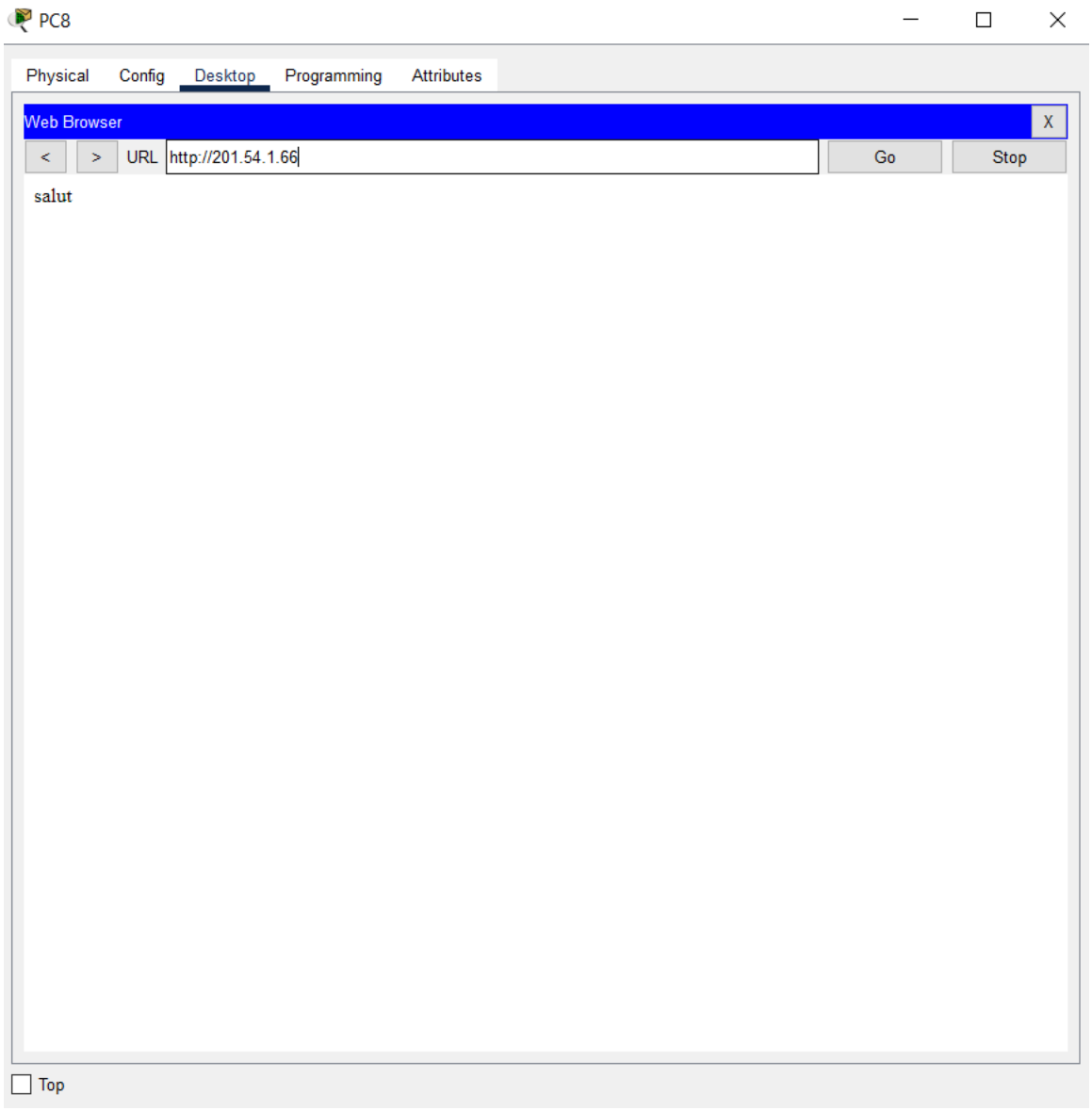
N3


PC5
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://201.54.1.66
Go
Stop
salut
Top

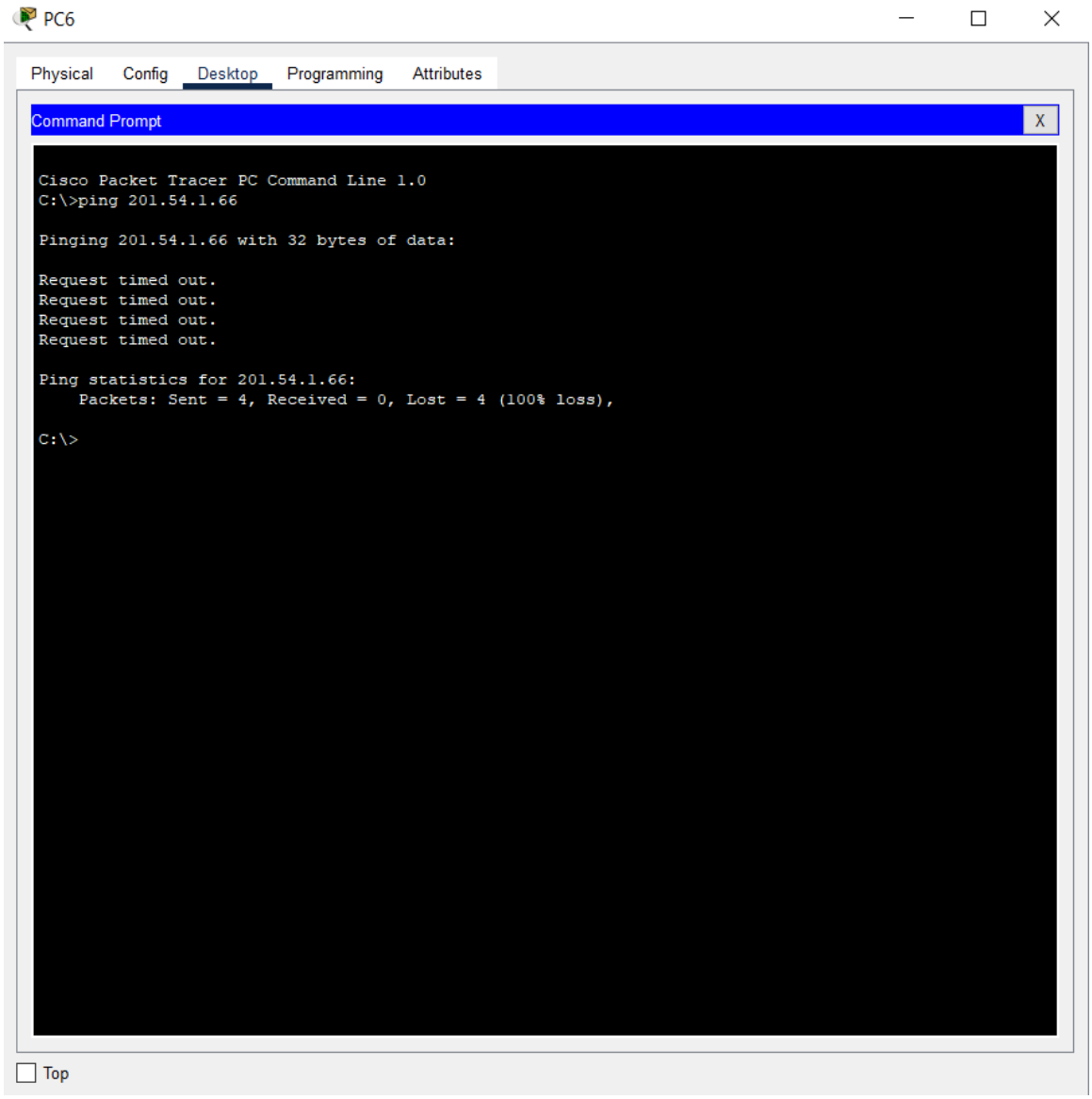
N4


PC3
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://201.54.1.66
Go
Stop
salut
Top

N5


PC8
Physical
Config
Desktop
Programming
Attributes
Web Browser
X
<
>
URL
http://201.54.1.66
Go
Stop
salut
Top

N5W



N5W - este singura retea in care nu functioneaza conectarea la pagina web, **desi** ping command spre web server functioneaza (se poate vedea in poza de mai sus).

Va multumesc!