

**UNIVERSITATEA DE STAT DIN MOLDOVA  
FACULTATEA DE MATEMATICĂ ȘI INFORMATICĂ  
SPECIALITATEA INFORMATICA**

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**RAPORT FINAL**

***Lucrare de laborator nr.5:  
„Rutare statică și protocoale de rutare dinamică”***

***REȚELE DE CALCULATOARE***

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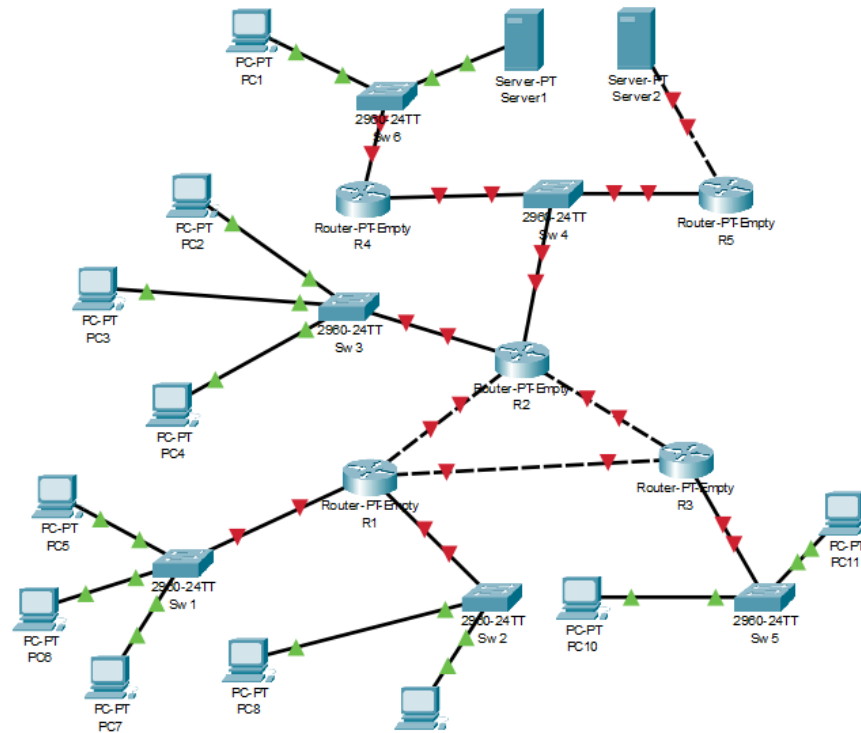
# Cuprins

<b>Lucrare de laborator 2 .....</b>	<b>3</b>
CONDIȚII ȘI SARCINI .....	3
REZOLVAREA PE PAȘI A SARCINILOR.....	6
BIBLIOGRAFIE.....	21

## Lucrare delaborator 2

### CONDIȚII ȘI SARCINI

Se consideră configurația de rețea din Figura 1.



**Figura 1**

1. Folosind adresa de rețea

- a)  $192.168.5+k.14+k/24$ ,
- b)  $172.16.4+k.254-k/20$ ,
- c)  $10.10.16+k.0/18$ .

elaborați o schemă de IPv4 adrese pentru subrețelele rețelei dacă se știe că în fiecare subrețea sunt nu mai mult de 14 host-uri. Se va utiliza configurația de rețea din Figura 1 pentru a forma trei sisteme autonome AS1, AS2 și AS3, astfel încât

- dispozitivelor din AS1 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul a).
- dispozitivelor din AS2 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul b).
- dispozitivelor din AS3 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul c).

În Cisco Packet Tracer, efectuați următoarele:

2. Folosind rutarea statică, configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS1. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5a.pkt**

### 3. Folosind protocolul de rutare dinamică

- ✓ RIP (pentru k un număr din mulțimea {1,3,5,7,9,11,13,15,17,19,21,23,25}),
- ✓ EIGRP (pentru k un număr din mulțimea {2,4,6,8,10,12,14,16,18,20,22,24}),

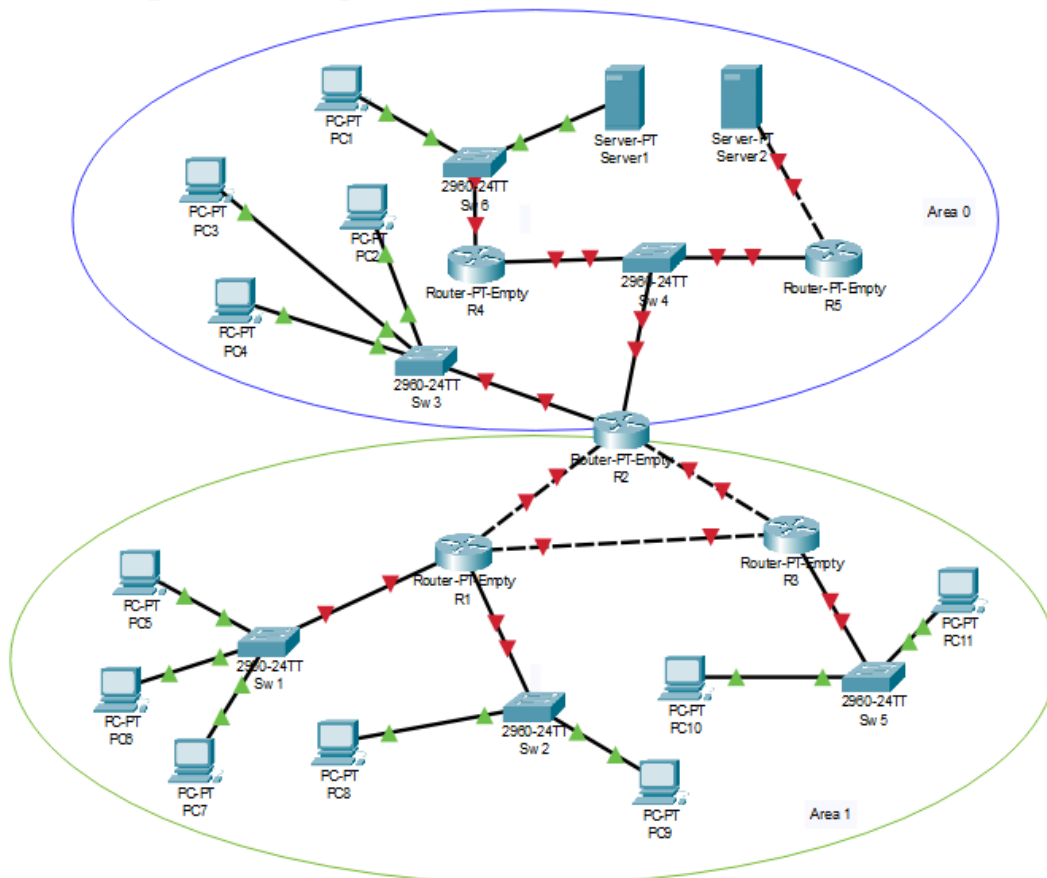
configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS2. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5b.pkt**

4. Routerelor sistemului autonom AS3 sunt divizate în două domenii, Area 0 și Area 1. Folosind protocolul de rutare dinamică OSPF cu două domenii, Area0 și Area 1 (a se vedea Figura 2), configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS3, astfel încât să fie asigurată conexiune între oricare două dispozitive ale rețelei inițiale. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5c.pkt**.

5. Se consideră rețeaua formată din trei sisteme autonome AS1, AS2 și AS3 (a se vedea Figura 3), care sunt conectate între ele prin routerul R0. Subrețelelor ce conectează routerul R0 cu AS1, AS2 și AS3 li se vor atribui corespunzător IP adresele 10.1.k.0/24, 10.1.k+1.0/24 și 10.1.k+2.0/24. În AS1 este configurată rutarea statică realizată la punctul 2. În AS2 este configurată rutarea dinamică realizată la punctul 3, iar în AS3 - rutarea dinamică realizată la punctul 4.

5.1. Realizați o redistribuire a rutelor între AS1, AS2 și AS3 fără a utiliza protocolul BGP. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea4d.pkt**

5.2. Realizați o redistribuire a rutelor între AS1, AS2 și AS3, folosind protocolul de rutare dinamică BGP. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea4e.pkt**



**Figura 2**

După realizarea fiecăruia din punctele 2,3,4 și 5, verificați conexiunea dintre dispozitive, folosind comanda ping. Folosind comanda tracert, generați trasee între două host-uri aleatoare din rețea.

Realizați o dare de seamă asupra lucrului efectuat, care să conțină răspunsuri explicite la fiecare punct formulat în cerințe.

Încărcați fișierul cu darea de seamă și fișierele .pkt în mapa Lucrarea de laborator N5 din pagina dedicată cursului de Rețele de Calculatoare a platformei educaționale moodle.usm.md.

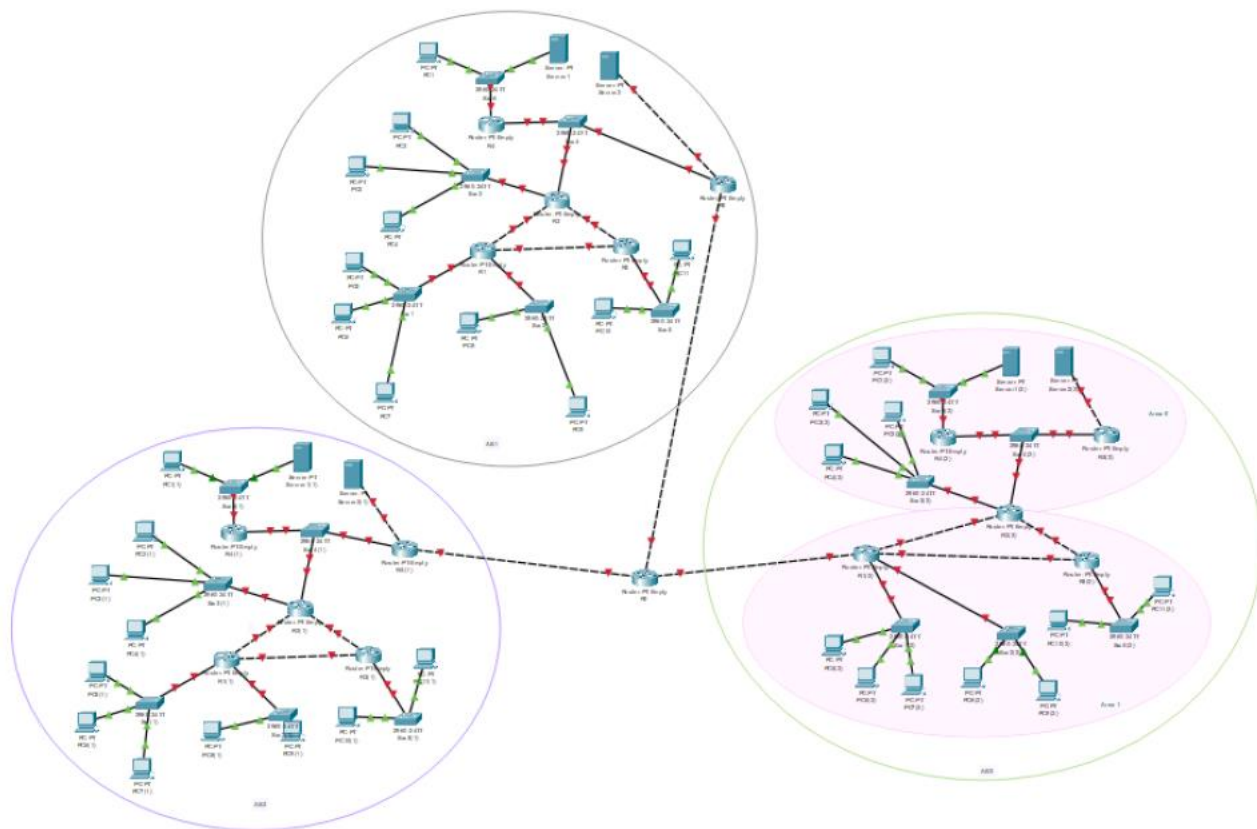
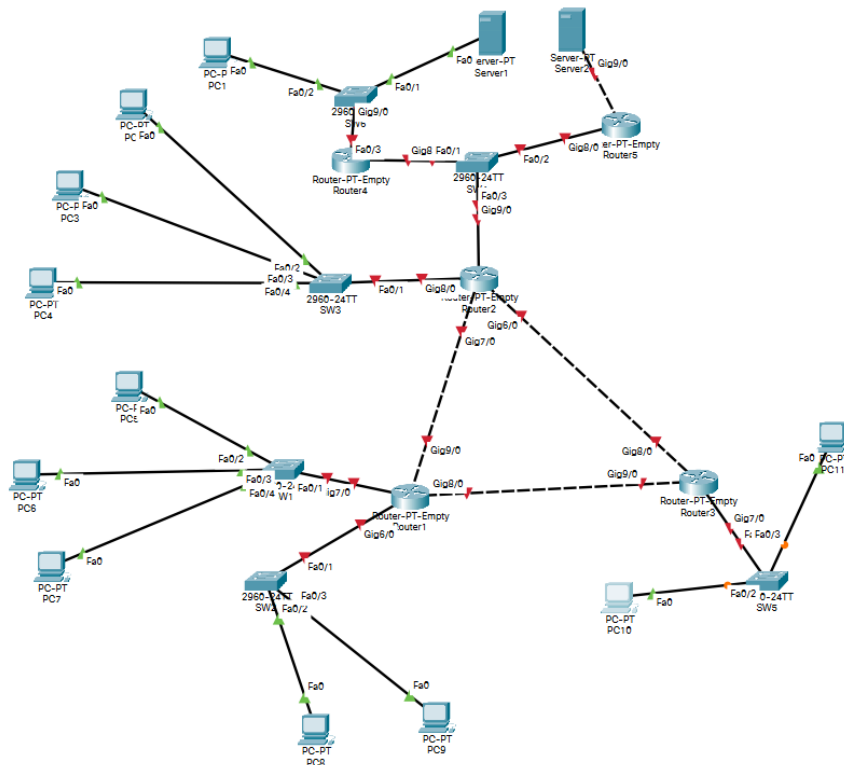


Figura 3

## REZOLVAREA PE PAȘI A SARCINILOR



1. Folosind adresa de rețea

- a)  $192.168.5+k.14+k/24$ ,
- b)  $172.16.4+k.254-k/20$ ,
- c)  $10.10.16+k.0/18$ ,

(k - numărul de ordine al studentului în registrul grupei)

elaborați o schemă de IPv4 adrese pentru subrețelele rețelei dacă se știe că în fiecare subrețea sunt nu mai mult de 14 host-uri. Se va utiliza configurația de rețea din Figura 1 pentru a forma trei sisteme autonome AS1, AS2 și AS3, astfel încât

- dispozitivelor din AS1 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul a).
- dispozitivelor din AS2 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul b).
- dispozitivelor din AS3 li se vor atribui IP adrese ce aparțin schemei elaborate la punctul c).

a)  $192.168.16.25/24$

**SUBNET MASK: 255.255.255.240/28**

Numarul subrețelei	Adresa subrețelei	Range-ul adreselor de host utilizabile	Adresa de broadcast în subrețea
0	192.168.16.0	192.168.16.1 - 192.168.16.14	192.168.16.15
1	192.168.16.16	192.168.16.17 - 192.168.16.30	192.168.16.31
2	192.168.16.32	192.168.16.33 - 192.168.16.46	192.168.16.47
3	192.168.16.48	192.168.16.49 - 192.168.16.62	192.168.16.63

4	192.168.16.64	192.168.16.65 - 192.168.16.78	192.168.16.79
5	192.168.16.80	192.168.16.81 - 192.168.16.94	192.168.16.95
6	192.168.16.96	192.168.16.97 - 192.168.16.110	192.168.16.111
7	192.168.16.112	192.168.16.113 - 192.168.16.126	192.168.16.127
8	192.168.16.128	192.168.16.129 - 192.168.16.142	192.168.16.143
9	192.168.16.144	192.168.16.145 - 192.168.16.158	192.168.16.159
10	192.168.16.160	192.168.16.161 - 192.168.16.174	192.168.16.175
11	192.168.16.176	192.168.16.177 - 192.168.16.190	192.168.16.191
12	192.168.16.192	192.168.16.193 - 192.168.16.206	192.168.16.207
13	192.168.16.208	192.168.16.209 - 192.168.16.222	192.168.16.223
14	192.168.16.224	192.168.16.225 - 192.168.16.238	192.168.16.239
15	192.168.16.280	192.168.16.241 - 192.168.16.254	192.168.16.255

b) 172.16.15.243/20

**SUBNET MASK: 255.255.255.240/28**

Numarul subretelei	Adresa subretelei	Range-ul adreselor de host utilizabile	Adresa de broadcast in subretea
0	172.16.0.0	172.16.0.1 - 172.16.0.14	172.16.0.15
1	172.16.0.16	172.16.0.17 - 172.16.0.30	172.16.0.31
2	172.16.0.32	172.16.0.33 - 172.16.0.46	172.16.0.47
3	172.16.0.48	172.16.0.49 - 172.16.0.62	172.16.0.63
4	172.16.0.64	172.16.0.65 - 172.16.0.78	172.16.0.79
5	172.16.0.80	172.16.0.81 - 172.16.0.94	172.16.0.95
6	172.16.0.96	172.16.0.97 - 172.16.0.110	172.16.0.111
7	172.16.0.112	172.16.0.113 - 172.16.0.126	172.16.0.127
8	172.16.0.128	172.16.0.129 - 172.16.0.142	172.16.0.143
9	172.16.0.144	172.16.0.145 - 172.16.0.158	172.16.0.159
10	172.16.0.160	172.16.0.161 - 172.16.0.174	172.16.0.175
11	172.16.0.176	172.16.0.177 - 172.16.0.190	172.16.0.191
12	172.16.0.192	172.16.0.193 - 172.16.0.206	172.16.0.207
13	172.16.0.208	172.16.0.209 - 172.16.0.222	172.16.0.223
14	172.16.0.224	172.16.0.225 - 172.16.0.238	172.16.0.239
15	172.16.0.240	172.16.0.241 - 172.16.0.254	172.16.0.255

c) 10.10.27.0/18

**SUBNET MASK: 255.255.255.240/28**

Numarul subretei	Adresa subretei	Range-ul adreselor de host utilizabile		Adresa de broadcast in subretea
		FIRST	LAST	
0	10.10.0.0	10.10.0.1	10.10.0.14	10.10.0.15
1	10.10.0.16	10.10.0.15	10.10.0.30	10.10.0.31
2	10.10.0.32	10.10.0.33	10.10.0.46	10.10.0.47
3	10.10.0.48	10.10.0.49	10.10.0.62	10.10.0.63
4	10.10.0.64	10.10.0.65	10.10.0.78	10.10.0.79
5	10.10.0.80	10.10.0.81	10.10.0.94	10.10.0.95
6	10.10.0.96	10.10.0.97	10.10.0.110	10.10.0.111
7	10.10.0.112	10.10.0.113	10.10.0.126	10.10.0.127
8	10.10.0.128	10.10.0.129	10.10.0.142	10.10.0.143
9	10.10.0.144	10.10.0.145	10.10.0.158	10.10.0.159
10	10.10.0.160	10.10.0.161	10.10.0.174	10.10.0.175
11	10.10.0.176	10.10.0.177	10.10.0.190	10.10.0.191
12	10.10.0.192	10.10.0.193	10.10.0.206	10.10.0.207
13	10.10.0.208	10.10.0.209	10.10.0.222	10.10.0.223
14	10.10.0.224	10.10.0.225	10.10.0.238	10.10.0.239
15	10.10.0.240	10.10.0.241	10.10.0.254	10.10.0.255

\*Pentru vizualizarea configuratiilor AS1 AS2 AS3 de retea integrala, accesati documentul atasat in cadrul ZIP-ului: **subnet tables**

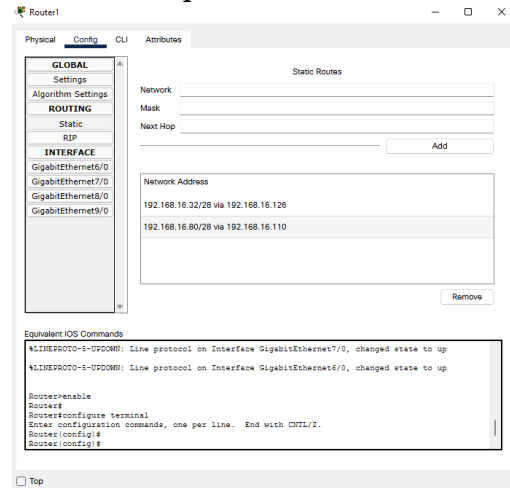
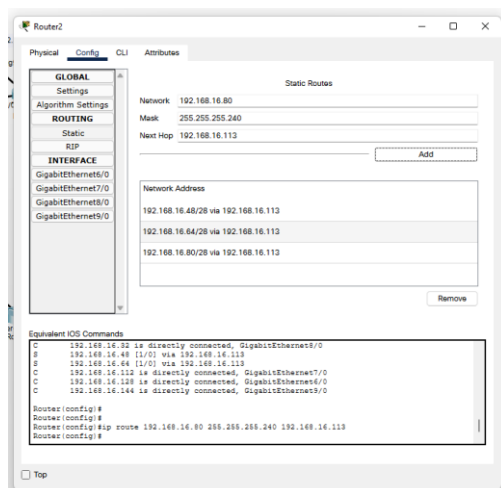
2. Folosind rutarea statică, configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS1. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5a.pkt**

Dispozitiv	Interfata	IP adresa	Masca de subretea	Adresa implicita a routerului
R1	Gig 0/6	192.168.16.65	255.255.255.240	N/A
	Gig 0/7	192.168.16.49	255.255.255.240	
	Gig 0/8	192.168.16.97	255.255.255.240	
	Gig 0/9	192.168.16.113	255.255.255.240	
R2	Gig 0/6	192.168.16.129	255.255.255.240	N/A
	Gig 0/7	192.168.16.126	255.255.255.240	
	Gig 0/8	192.168.16.33	255.255.255.240	
	Gig 0/9	192.168.16.145	255.255.255.240	

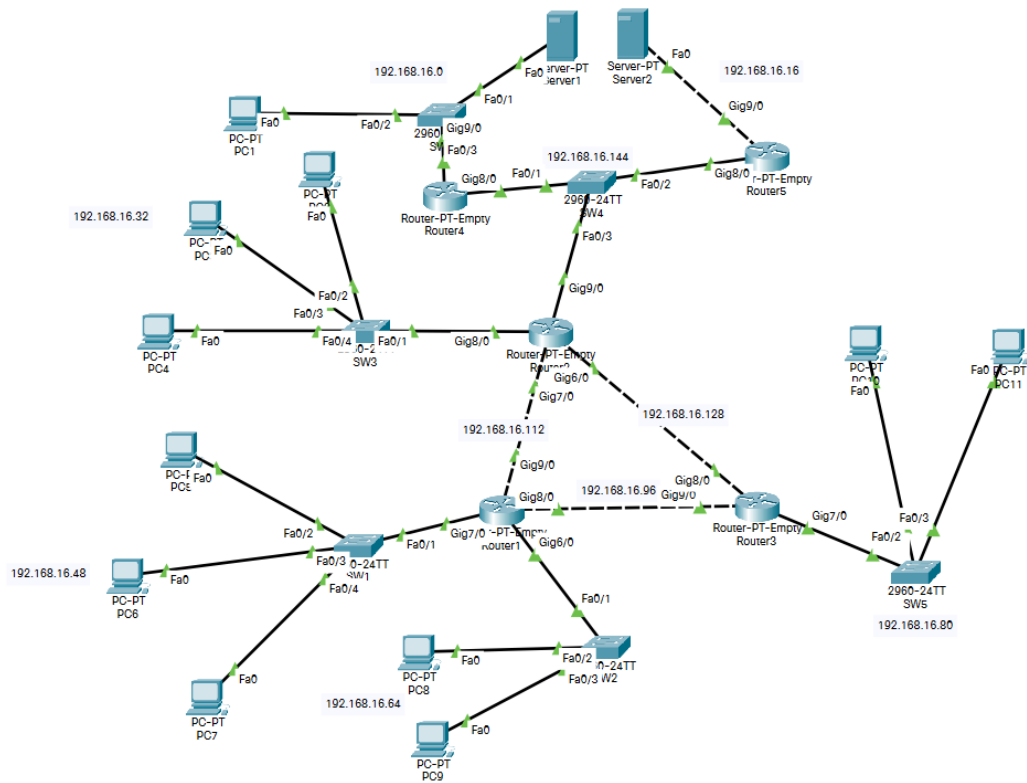


R3	Gig 0/7	192.168.16.81	255.255.255.240	N/A
	Gig 0/8	192.168.16.142	255.255.255.240	
	Gig 0/9	192.168.16.110	255.255.255.240	
R4	Gig 0/8	192.168.16.146	255.255.255.240	N/A
	Gig 0/9	192.168.16.1	255.255.255.240	
	---			
R5	Gig 0/8	192.168.16.147	255.255.255.240	N/A
	Gig 0/9	192.168.16.17	255.255.255.240	
	---			
Server1	Fa0	192.168.16.3	255.255.255.240	192.168.16.1
Server2	Fa0	192.168.16.18	255.255.255.240	192.168.16.17
PC1	Fa0	192.168.16.2	255.255.255.240	192.168.16.1
PC2	Fa0	192.168.16.34	255.255.255.240	192.168.16.33
PC3	Fa0	192.168.16.35	255.255.255.240	192.168.16.33
PC4	Fa0	192.168.16.36	255.255.255.240	192.168.16.33
PC5	Fa0	192.168.16.50	255.255.255.240	192.168.16.49
PC6	Fa0	192.168.16.51	255.255.255.240	192.168.16.49
PC7	Fa0	192.168.16.52	255.255.255.240	192.168.16.49
PC8	Fa0	192.168.16.66	255.255.255.240	192.168.16.65
PC9	Fa0	192.168.16.67	255.255.255.240	192.168.16.65
PC10	Fa0	192.168.16.82	255.255.255.240	192.168.16.81
PC11	Fa0	192.168.16.83	255.255.255.240	192.168.16.81

\*Configuratia PC-urilor si a serverelor este conform tabelului din punctul a).



^ Respectiv configurăm si conexiunile statice dintre toate celelalte routere, conform tabelului de adrese.



```

Packet Tracer PC Command Line 1.0
C:\>ping 192.168.16.83

Pinging 192.168.16.83 with 32 bytes of data:

Request timed out.
Request timed out.
Reply from 192.168.16.83: bytes=32 time<1ms TTL=126
Reply from 192.168.16.83: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.16.83:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.16.83

Pinging 192.168.16.83 with 32 bytes of data:

Reply from 192.168.16.83: bytes=32 time<1ms TTL=126
Reply from 192.168.16.83: bytes=32 time<1ms TTL=126
Reply from 192.168.16.83: bytes=32 time<1ms TTL=126
Reply from 192.168.16.83: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.16.83:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>

```

```

Packet Tracer PC Command Line 1.0
C:\>tracert 192.168.16.50

Tracing route to 192.168.16.50 over a maximum of 30 hops:

  0  15 ms  0 ms  0 ms  192.168.16.81
  1  14 ms  0 ms  0 ms  192.168.16.97
  2  10 ms  0 ms  0 ms  192.168.16.50

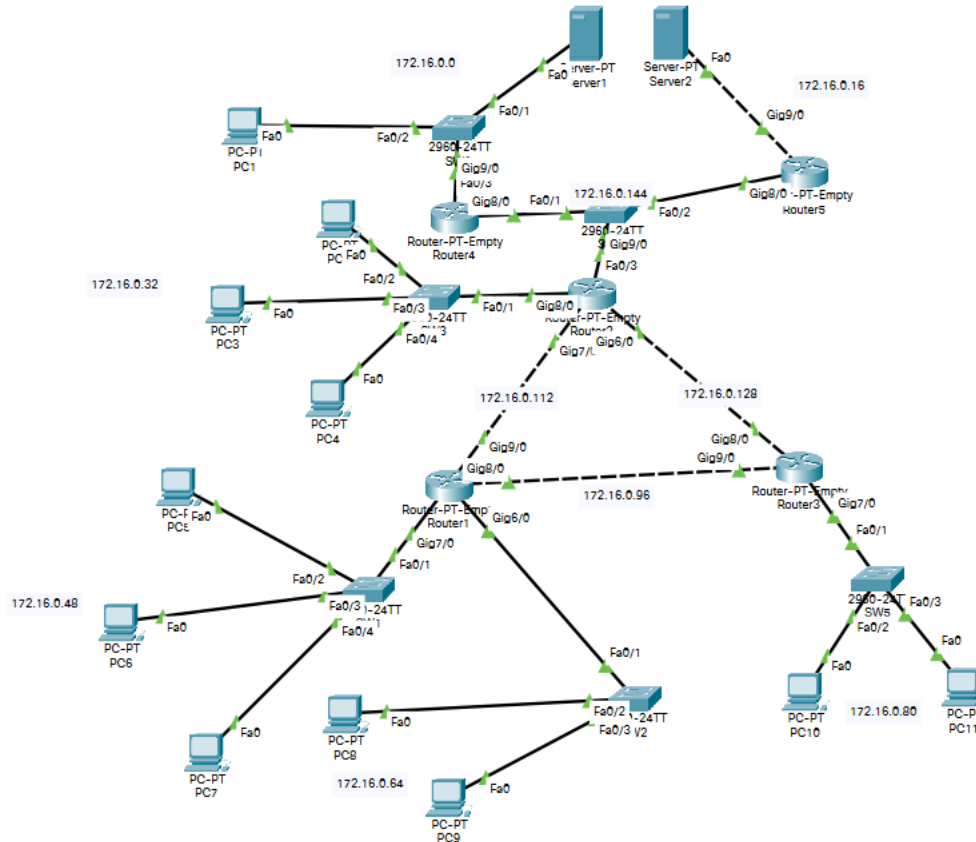
Trace complete.

C:\>

```

### 3. Folosind protocolul de rutare dinamică

- ✓ RIP (pentru k un număr din mulțimea {1,3,5,7,9,11,13,15,17,19,21,23,25}),
- ✓ EIGRP (pentru k un număr din mulțimea {2,4,6,8,10,12,14,16,18,20,22,24}),



configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS2. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5b.pkt**  
**k = 11 => RIP**

#### Router 4

```
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 172.16.0.0
Router(config-router)#no auto-summary
Router(config-router)#exit
Router(config)#do wr
Building configuration...
[OK]
```

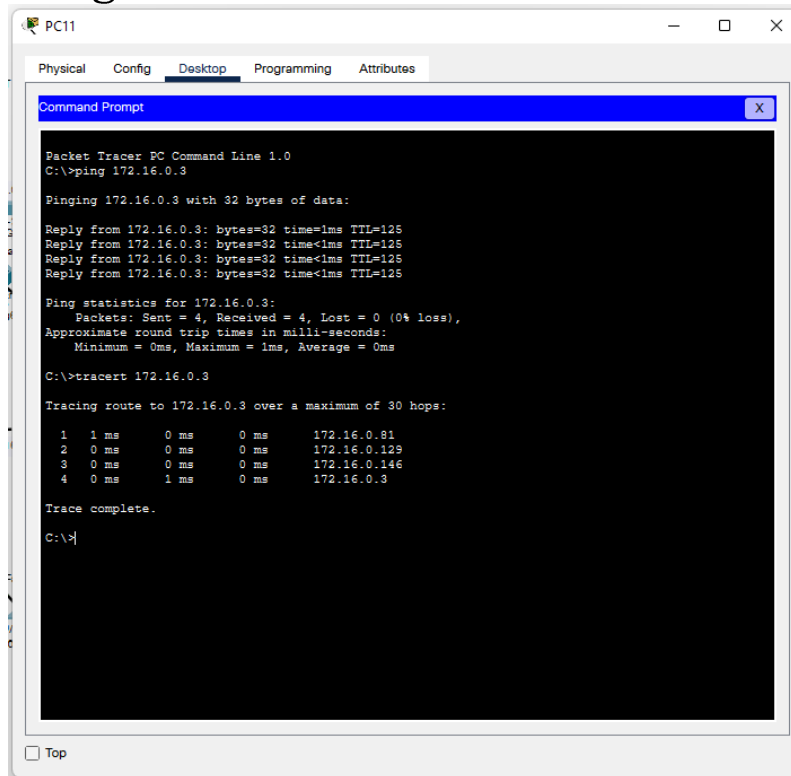
^respectiv procedam si la alte routere

## BEFORE/AFTER

Router 1	
<pre>Router(config)#do 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  172.16.0.0/28 is subnetted, 9 subnets S    172.16.0.0 [1/0] via 172.16.0.126 S    172.16.0.16 [1/0] via 172.16.0.126 S    172.16.0.32 [1/0] via 172.16.0.126 C    172.16.0.48 is directly connected, GigabitEthernet7/0 C    172.16.0.64 is directly connected, GigabitEthernet6/0 S    172.16.0.80 [1/0] via 172.16.0.110 C    172.16.0.96 is directly connected, GigabitEthernet8/0 C    172.16.0.112 is directly connected, GigabitEthernet9/0 R    172.16.0.128 [120/1] via 172.16.0.110, 00:00:15, GigabitEthernet8/0</pre>	<pre>172.16.0.0/28 is subnetted, 10 subnets S    172.16.0.0 [1/0] via 172.16.0.126 S    172.16.0.16 [1/0] via 172.16.0.126 S    172.16.0.32 [1/0] via 172.16.0.126 C    172.16.0.48 is directly connected, GigabitEthernet7/0 C    172.16.0.64 is directly connected, GigabitEthernet6/0 S    172.16.0.80 [1/0] via 172.16.0.110 C    172.16.0.96 is directly connected, GigabitEthernet8/0 C    172.16.0.112 is directly connected, GigabitEthernet9/0 R    172.16.0.128 [120/1] via 172.16.0.110, 00:00:12, GigabitEthernet8/0 R    172.16.0.144 [120/1] via 172.16.0.126, 00:00:18, GigabitEthernet9/0</pre>
Router 3	

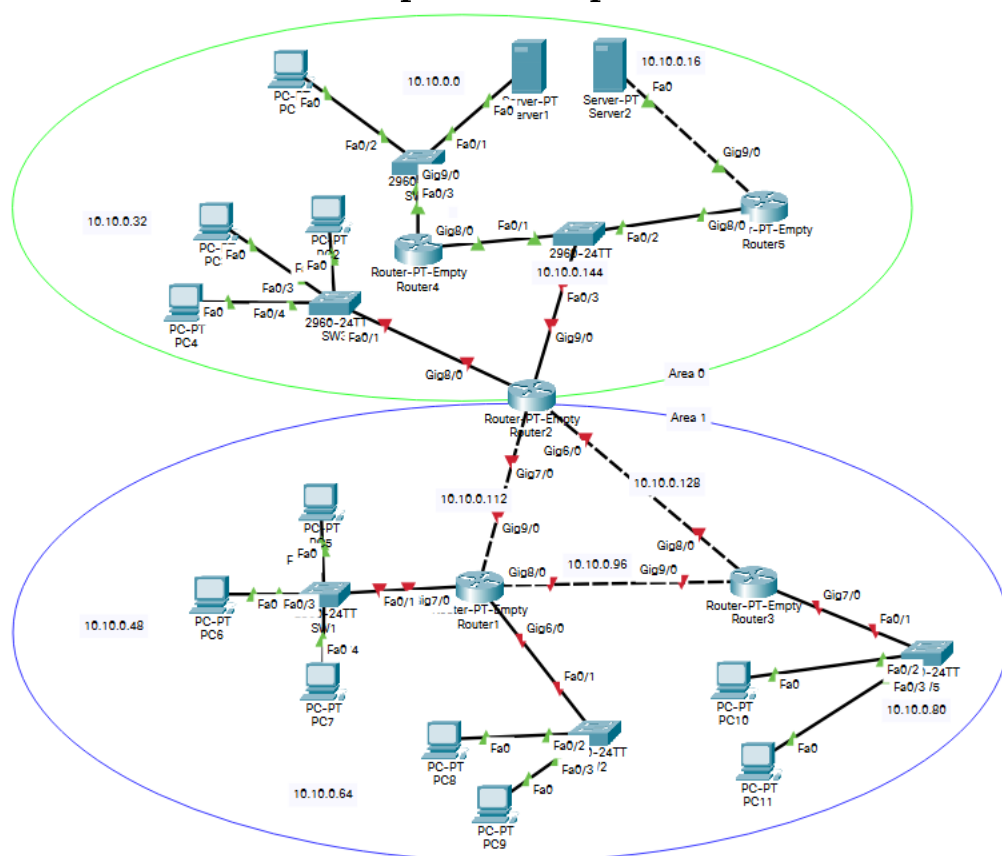
172.16.0.0/28 is subnetted, 8 subnets S 172.16.0.0 [1/0] via 172.16.0.129 S 172.16.0.16 [1/0] via 172.16.0.129 S 172.16.0.32 [1/0] via 172.16.0.129 S 172.16.0.48 [1/0] via 172.16.0.97 S 172.16.0.64 [1/0] via 172.16.0.97 C 172.16.0.80 is directly connected, GigabitEthernet7/0 C 172.16.0.96 is directly connected, GigabitEthernet9/0 C 172.16.0.128 is directly connected, GigabitEthernet8/0	172.16.0.0/28 is subnetted, 10 subnets S 172.16.0.0 [1/0] via 172.16.0.129 S 172.16.0.16 [1/0] via 172.16.0.129 S 172.16.0.32 [1/0] via 172.16.0.129 S 172.16.0.48 [1/0] via 172.16.0.97 S 172.16.0.64 [1/0] via 172.16.0.97 C 172.16.0.80 is directly connected, GigabitEthernet7/0 C 172.16.0.96 is directly connected, GigabitEthernet9/0 R 172.16.0.112 [120/1] via 172.16.0.97, 00:00:08, GigabitEthernet9/0 C 172.16.0.128 is directly connected, GigabitEthernet8/0 R 172.16.0.144 [120/1] via 172.16.0.129, 00:00:27, GigabitEthernet8/0
<b>Router 2</b>	
172.16.0.0/28 is subnetted, 9 subnets S 172.16.0.0 [1/0] via 172.16.0.146 S 172.16.0.16 [1/0] via 172.16.0.147 C 172.16.0.32 is directly connected, GigabitEthernet8/0 S 172.16.0.48 [1/0] via 172.16.0.113 S 172.16.0.64 [1/0] via 172.16.0.113 S 172.16.0.80 [1/0] via 172.16.0.142 C 172.16.0.112 is directly connected, GigabitEthernet7/0 C 172.16.0.128 is directly connected, GigabitEthernet6/0 C 172.16.0.144 is directly connected, GigabitEthernet9/0	172.16.0.0/28 is subnetted, 10 subnets S 172.16.0.0 [1/0] via 172.16.0.146 S 172.16.0.16 [1/0] via 172.16.0.147 C 172.16.0.32 is directly connected, GigabitEthernet8/0 S 172.16.0.48 [1/0] via 172.16.0.113 S 172.16.0.64 [1/0] via 172.16.0.113 S 172.16.0.80 [1/0] via 172.16.0.142 R 172.16.0.96 [120/1] via 172.16.0.142, 00:00:20, GigabitEthernet6/0 C 172.16.0.112 [120/1] via 172.16.0.113, 00:00:14, GigabitEthernet7/0 C 172.16.0.128 is directly connected, GigabitEthernet7/0 C 172.16.0.128 is directly connected, GigabitEthernet6/0 C 172.16.0.144 is directly connected, GigabitEthernet9/0
<b>Router 4</b>	
172.16.0.0/28 is subnetted, 7 subnets C 172.16.0.0 is directly connected, GigabitEthernet9/0 S 172.16.0.16 [1/0] via 172.16.0.147 S 172.16.0.32 [1/0] via 172.16.0.145 S 172.16.0.48 [1/0] via 172.16.0.145 S 172.16.0.64 [1/0] via 172.16.0.145 S 172.16.0.80 [1/0] via 172.16.0.145 C 172.16.0.144 is directly connected, GigabitEthernet8/0	172.16.0.0/28 is subnetted, 10 subnets C 172.16.0.0 is directly connected, GigabitEthernet9/0 S 172.16.0.16 [1/0] via 172.16.0.147 S 172.16.0.32 [1/0] via 172.16.0.145 S 172.16.0.48 [1/0] via 172.16.0.145 S 172.16.0.64 [1/0] via 172.16.0.145 S 172.16.0.80 [1/0] via 172.16.0.145 R 172.16.0.96 [120/2] via 172.16.0.145, 00:00:00, GigabitEthernet8/0 R 172.16.0.112 [120/1] via 172.16.0.145, 00:00:00, GigabitEthernet8/0 R 172.16.0.128 [120/1] via 172.16.0.145, 00:00:00, GigabitEthernet8/0 C 172.16.0.144 is directly connected, GigabitEthernet8/0
<b>Router 5</b>	
172.16.0.0/28 is subnetted, 7 subnets C 172.16.0.0 [1/0] via 172.16.0.146 C 172.16.0.16 is directly connected, GigabitEthernet9/0 S 172.16.0.32 [1/0] via 172.16.0.145 S 172.16.0.48 [1/0] via 172.16.0.145 S 172.16.0.64 [1/0] via 172.16.0.145 S 172.16.0.80 [1/0] via 172.16.0.145 C 172.16.0.144 is directly connected, GigabitEthernet8/0	172.16.0.0/28 is subnetted, 10 subnets S 172.16.0.0 [1/0] via 172.16.0.146 C 172.16.0.16 is directly connected, GigabitEthernet9/0 S 172.16.0.32 [1/0] via 172.16.0.145 S 172.16.0.48 [1/0] via 172.16.0.145 S 172.16.0.64 [1/0] via 172.16.0.145 S 172.16.0.80 [1/0] via 172.16.0.145 R 172.16.0.96 [120/2] via 172.16.0.145, 00:00:11, GigabitEthernet8/0 R 172.16.0.112 [120/1] via 172.16.0.145, 00:00:11, GigabitEthernet8/0 R 172.16.0.128 [120/1] via 172.16.0.145, 00:00:11, GigabitEthernet8/0 C 172.16.0.144 is directly connected, GigabitEthernet8/0

## Connection Testing:



4. Routerile sistemului autonom AS3 sunt divizate în două domenii, Area 0 și Area 1. Folosind protocolul de rutare dinamică OSPF cu două domenii, Area0 și Area 1 (a se vedea Figura 2), configurați tabelele de rutare ale routerelor R1, R2, R3, R4 și R5 din sistemul autonom AS3, astfel încât să fie

asigurată conexiune între oricare două dispozitive ale rețelei inițiale. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea5c.pkt**.



^In momentul dat încă nu este configurat tot

```

Router3
Physical Config CLI Attributes
IOS Command Line Interface

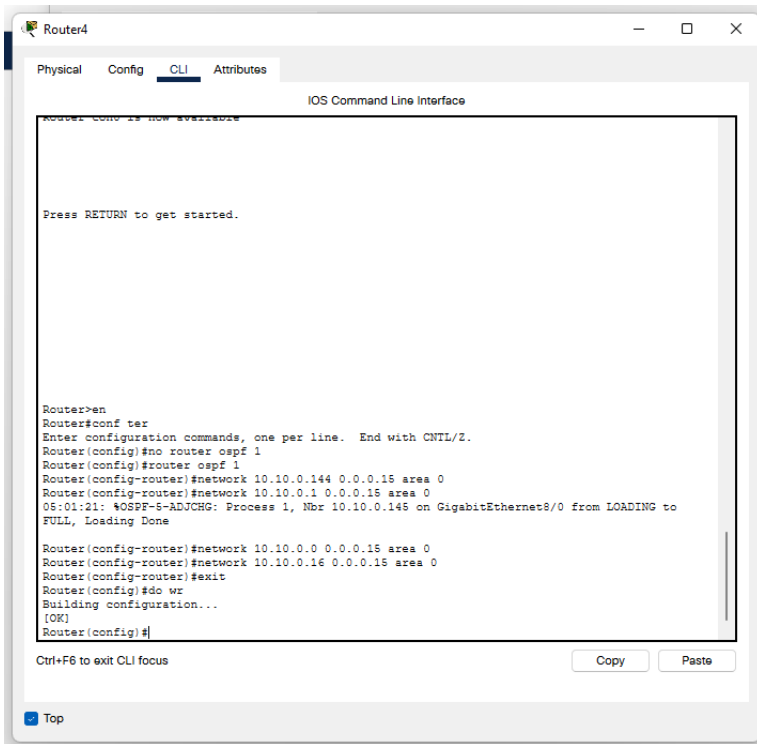
Press RETURN to get started.

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no router ospf 1
Router(config)#router ospf 1
Router(config-router)#network 10.10.0.96 0.0.0.15 area 1
Router(config-router)#network 10.10.0.64 0.0.0.15 area 1
Router(config-router)#network 10.10.0.64 0.0.0.15 area 1
04:49:04: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.113 on GigabitEthernet9/0 from LOADING to FULL, Loading Done

Router(config-router)#network 10.10.0.48 0.0.0.15 area 1
Router(config-router)#network 10.10.0.128 0.0.0.15 area 1
Router(config-router)#exit
04:51:26: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.145 on GigabitEthernet8/0 from LOADING to FULL, Loading Done

Router(config)#do wr
Building configuration...
[OK]
Router(config)#
  
```

<- respectiv configuram R1 si R3



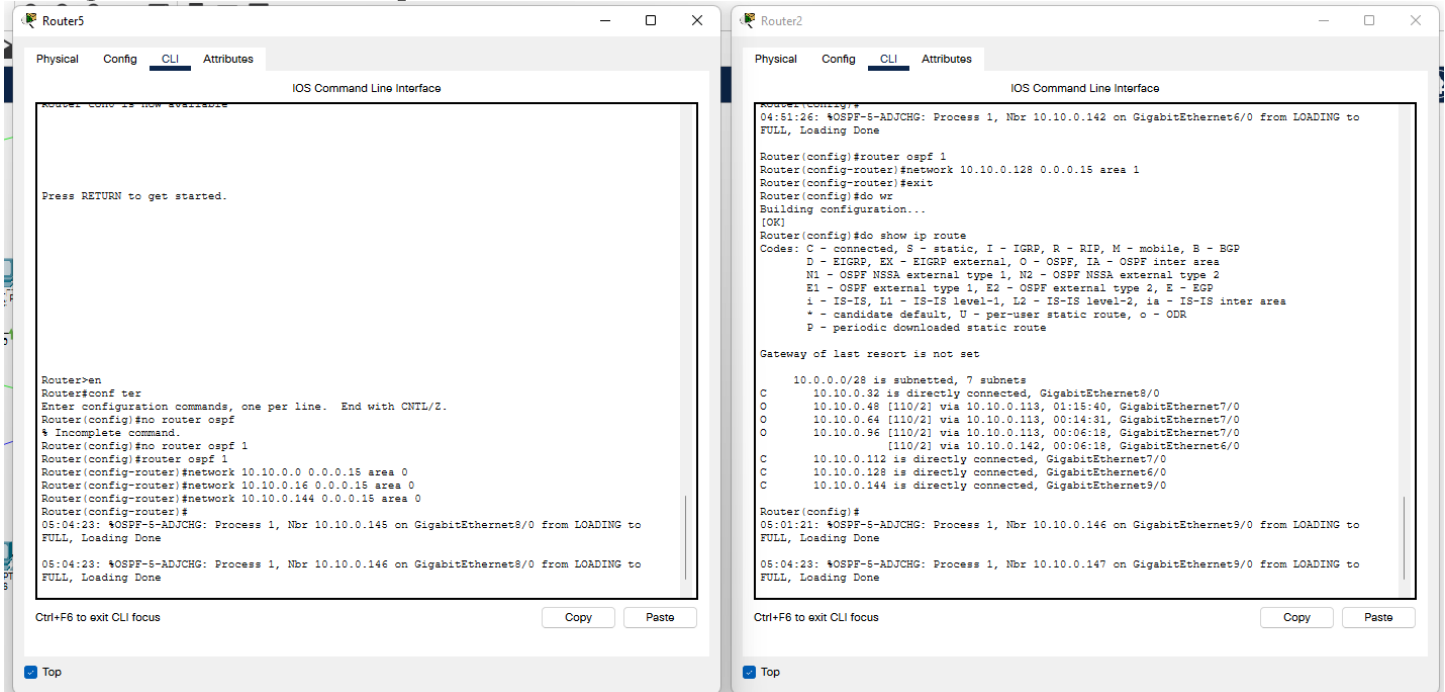
<- respectiv configuram R4 & R5

## Configurarea routerului 2 pentru Area 1

```

Router(config)#router ospf 1
Router(config-router)#network 10.10.0.64 0.0.0.15 area 1
Router(config-router)#network 10.10.0.80 0.0.0.15 area 1
Router(config-router)#network 10.10.0.84 0.0.0.15 area 1
Router(config-router)#no network 10.10.0.84 0.0.0.15 area 1
Router(config-router)#network 10.10.0.48 0.0.0.15 area 1
Router(config)#router ospf 1
Router(config-router)#network 10.10.0.128 0.0.0.15 area 1
Router(config-router)#exit
Router(config)#do wr
Building configuration...
[OK]
  
```

## Configurarea routerului 2 pentru Area 0



- Routerul 2 a fost configurat anterior pentru Area 0

Mărim prioritatea interfețelor acestuia după care vom reinițializa procesul de alegere a router-ului DR, în urma căruia acesta va fi ales.

```
Router(config)#int gig 6/0
Router(config-if)#ip ospf priority 100
Router(config-if)#int gig 7/0
Router(config-if)#ip ospf priority 100
Router(config-if)#int gig 8/0
Router(config-if)#ip ospf priority 100
Router(config-if)#int gig 9/0
Router(config-if)#ip ospf priority 100
Router(config-if)#exit
Router(config)#do clear ip ospf process
Reset ALL OSPF processes? [no]: y

Router(config)#
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.146 on GigabitEthernet9/0 from FULL to DOWN, Neighbor Down: Adjacency forced to reset
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.147 on GigabitEthernet9/0 from FULL to DOWN, Neighbor Down: Adjacency forced to reset
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.146 on GigabitEthernet9/0 from FULL to DOWN, Neighbor Down: Interface down or detached
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.147 on GigabitEthernet9/0 from FULL to DOWN, Neighbor Down: Interface down or detached
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.142 on GigabitEthernet6/0 from FULL to DOWN, Neighbor Down: Adjacency forced to reset
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.142 on GigabitEthernet6/0 from FULL to DOWN, Neighbor Down: Interface down or detached
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.113 on GigabitEthernet7/0 from FULL to DOWN, Neighbor Down: Adjacency forced to reset
05:11:14: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.113 on GigabitEthernet7/0 from FULL to DOWN, Neighbor Down: Interface down or detached
05:11:17: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.147 on GigabitEthernet9/0 from LOADING to FULL, Loading Done
05:11:17: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.146 on GigabitEthernet9/0 from LOADING to FULL, Loading Done
05:11:22: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.113 on GigabitEthernet7/0 from LOADING to FULL, Loading Done
05:11:25: %OSPF-5-ADJCHG: Process 1, Nbr 10.10.0.142 on GigabitEthernet6/0 from LOADING to FULL, Loading Done

Router(config)#do show ip ospf neighbor

Neighbor ID      Pri   State           Dead Time   Address        Interface
10.10.0.147      1     FULL/BDP        00:00:37    10.10.0.147    GigabitEthernet9/0
10.10.0.146      1     FULL/DROTHER    00:00:32    10.10.0.146    GigabitEthernet9/0
10.10.0.142      1     FULL/BDP        00:00:33    10.10.0.142    GigabitEthernet6/0
10.10.0.113      1     FULL/BDP        00:00:30    10.10.0.113    GigabitEthernet7/0
Router(config)#
```

## Connection Testing:

Command Prompt

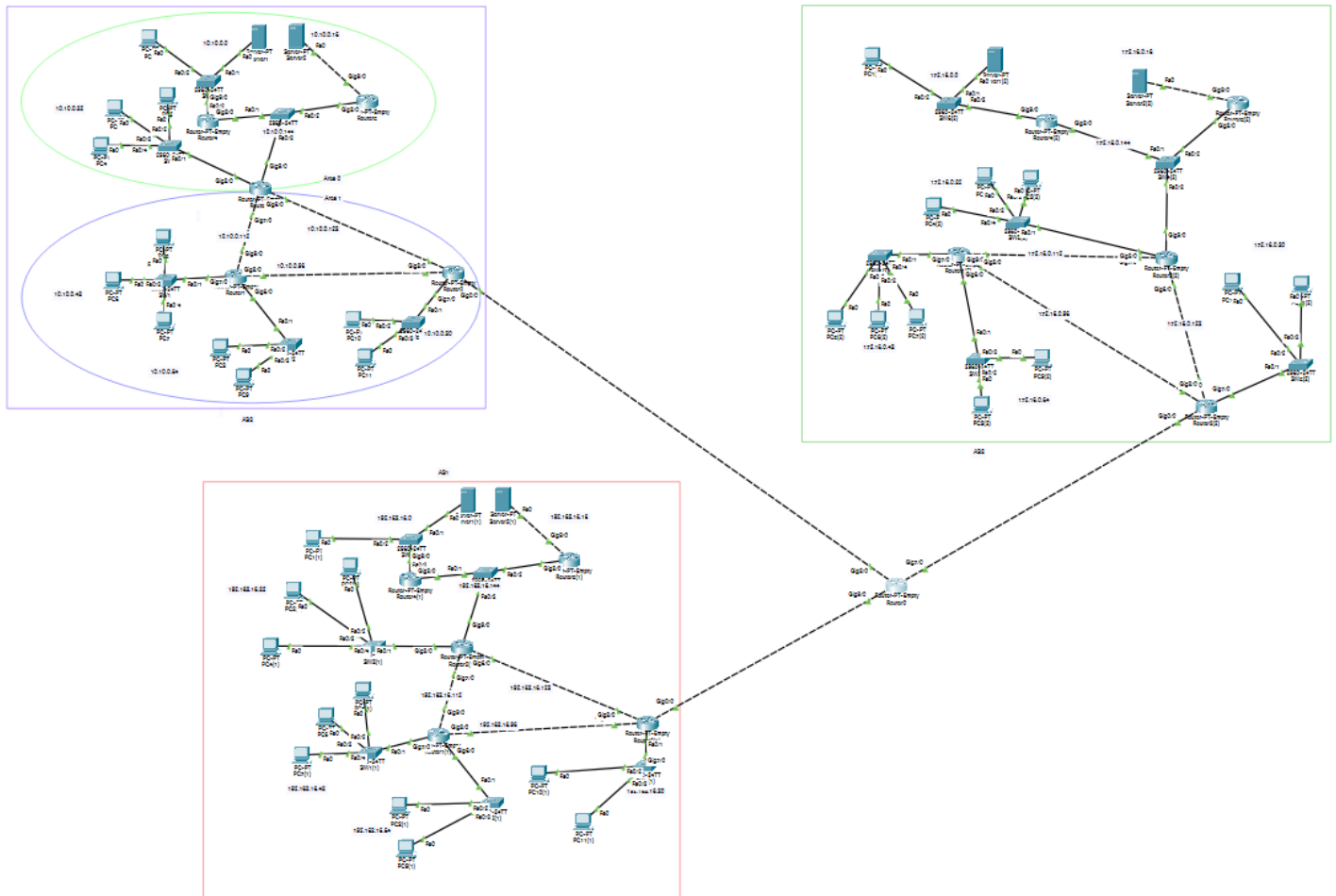
Packet Tracer PC Command Line 1.0  
C:\>  
C:\>ping 10.10.0.67  
  
Pinging 10.10.0.67 with 32 bytes of data:  
  
Reply from 10.10.0.67: bytes=32 time<1ms TTL=127  
Reply from 10.10.0.67: bytes=32 time<1ms TTL=127  
Reply from 10.10.0.67: bytes=32 time<1ms TTL=127  
Reply from 10.10.0.67: bytes=32 time<1ms TTL=127  
  
Ping statistics for 10.10.0.67:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 0ms, Maximum = 0ms, Average = 0ms  
C:\>

Command Prompt

Packet Tracer PC Command Line 1.0  
C:\>  
C:\>tracert 10.10.0.52  
  
Tracing route to 10.10.0.52 over a maximum of 30 hops:  
  
 1 0 ms 0 ms 0 ms 10.10.0.65  
 2 \* 0 ms 0 ms 10.10.0.52  
  
Trace complete.  
C:\>tracert 10.10.0.52  
  
Tracing route to 10.10.0.52 over a maximum of 30 hops:  
  
 1 0 ms 0 ms 6 ms 10.10.0.65  
 2 0 ms 0 ms 0 ms 10.10.0.52  
  
Trace complete.  
C:\>

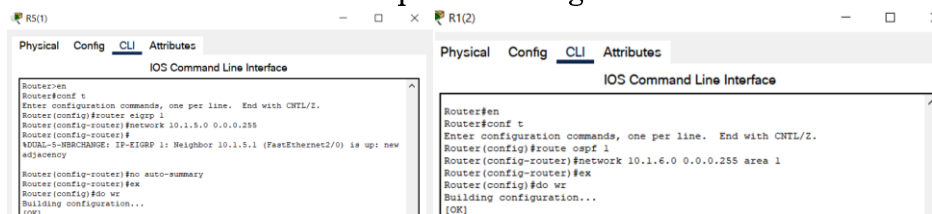


5. Se consideră rețeaua formată din trei sisteme autonome AS1, AS2 și AS3 (a se vedea Figura 3), care sunt conectate între ele prin routerul R0. Subrețelelor ce conectează routerul R0 cu AS1, AS2 și AS3 li se vor atribui corespunzător IP adresele 10.1.k.0/24, 10.1.k+1.0/24 și 10.1.k+2.0/24. În AS1 este configurată rutarea statică realizată la punctul 2. În AS2 este configurată rutarea dinamică realizată la punctul 3, iar în AS3 - rutarea dinamică realizată la punctul 4.

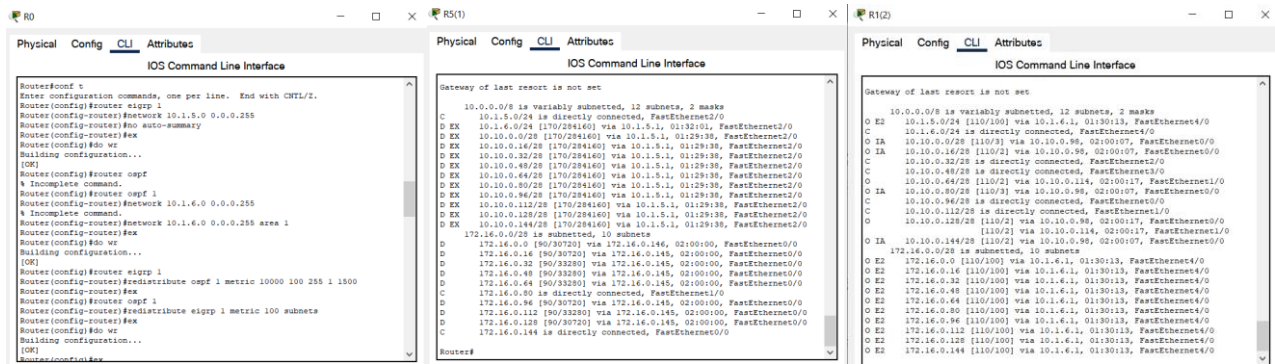


5.1. Realizați o redistribuire a rutelor între AS1, AS2 și AS3 fără a utiliza protocolul BGP. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea4d.pkt**

Setam conexiunea dintre routerul AS2 și R0 să fie inclusă în rețeaua RIP, iar cea dintre AS3 și R0 setăm protocolul OSPF. În R0 este configurat atât RiP cât și OSFP. Folosind comenzile de redistribuire a fiecărui protocol și metrica specifică, am completat toate routerule din ambele rețele (Exemplu :AS2 și AS3 cu IP-urile necesare pentru a asigura conexiunea între oricare 2 hosturi din ambele rețele.

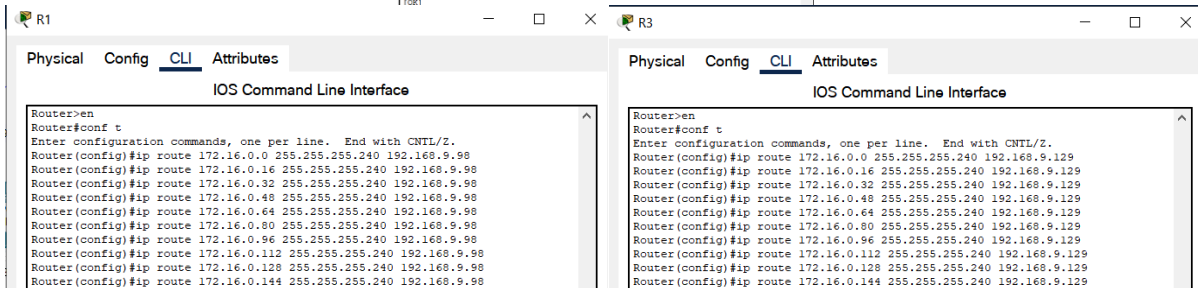
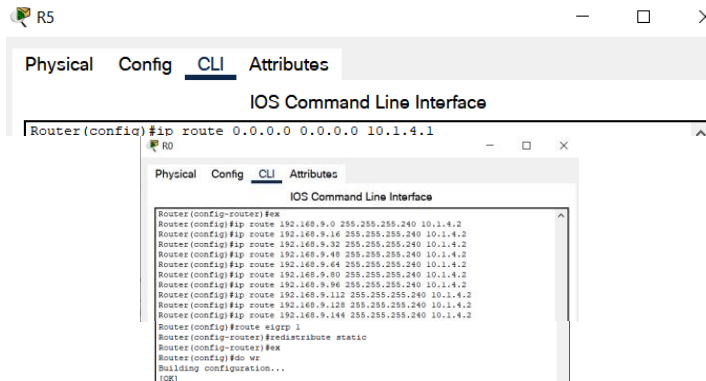






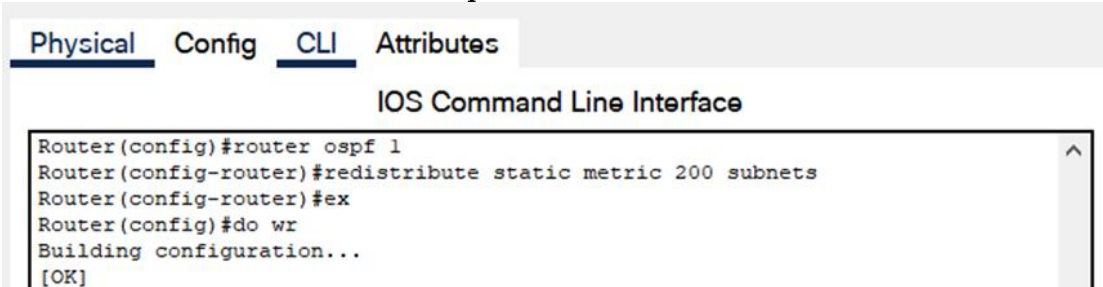
## **RIP-Retea Statica:**

Stabilim rute statice intre AS1 si R0 cu toate adresele IP ce apartin AS2 in routele din AS1 si toate adresele din AS1 in R0. Redistribuirea in AS2 se face cu comanda de redistribuire a rutelor statice a protocolului RIP.

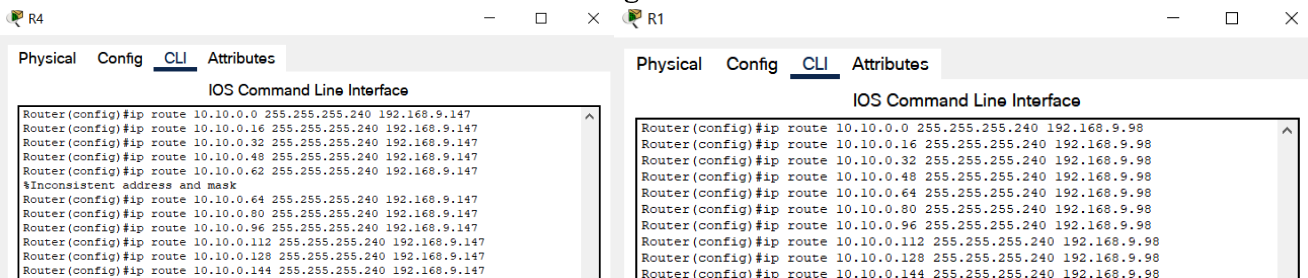


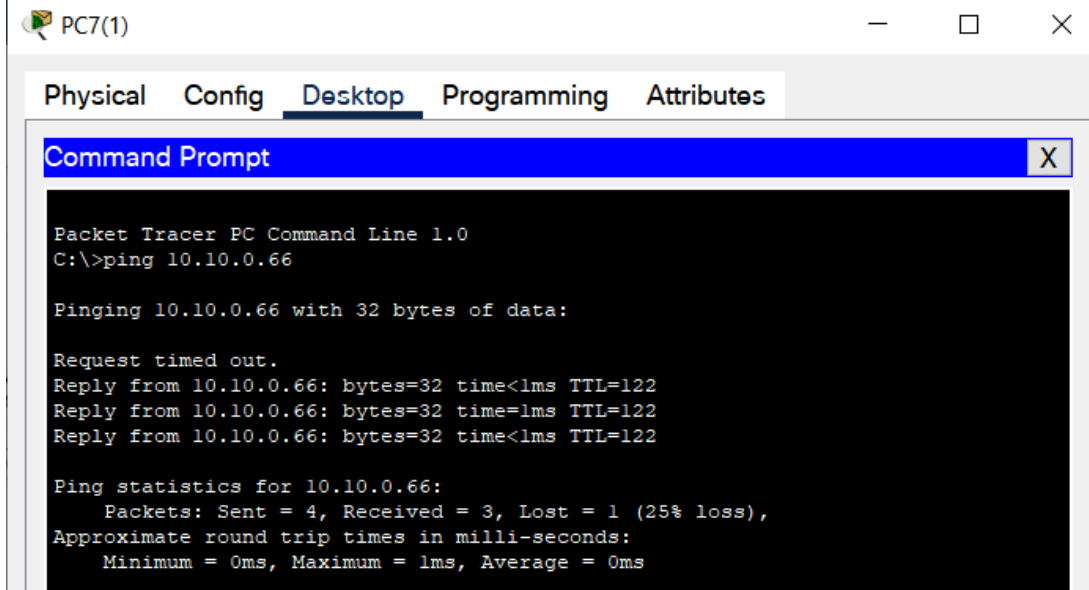
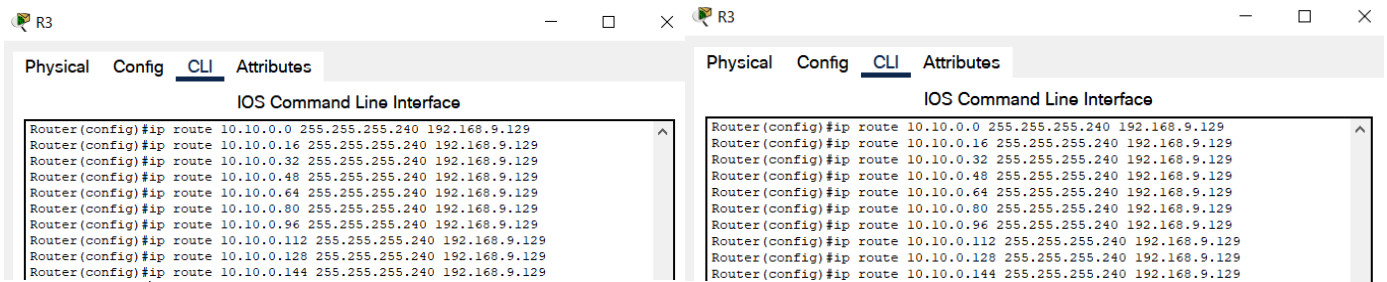
## **Redistribuirea OSPF-Retea Statica:**

Setam rute statice cu toate adresele IP ce apartin AS3 in routele din. Redistribuirea in AS3 se face cu comanda de redistribuire a rutelor statice a protocolului OSPF.

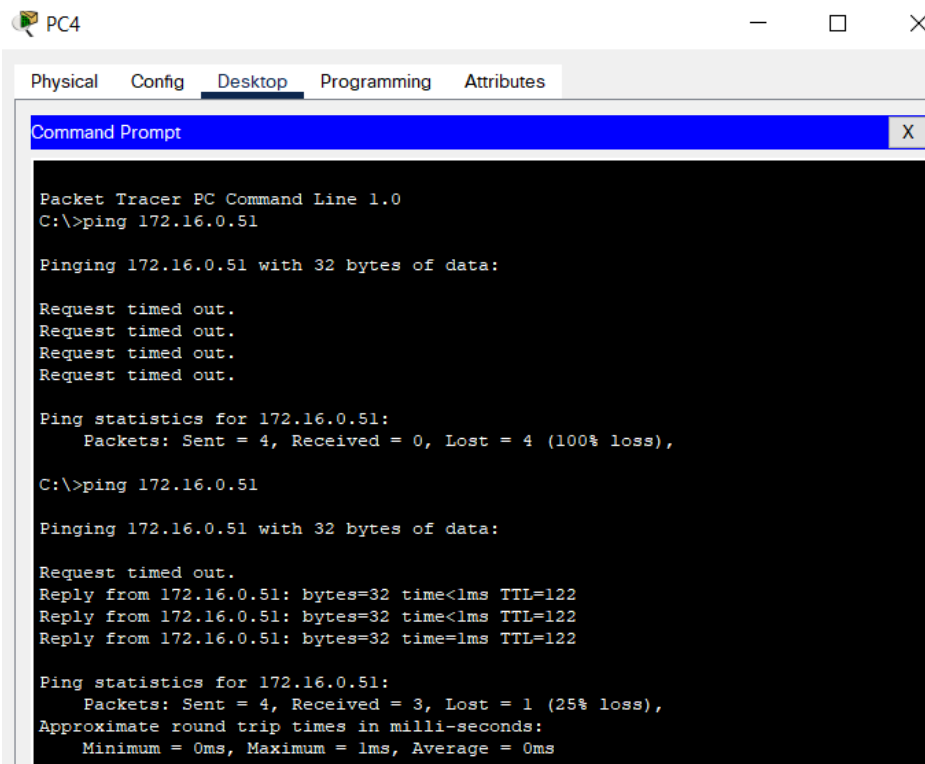


^configuratia R0





^ AS2 -AS3



< AS1 -AS2

5.2. Realizați o redistribuire a rutelor între AS1, AS2 și AS3, folosind protocolul de rutare dinamică BGP. Salvați configurația de rețea realizată în fișierul **Nume\_Prenume\_Grupa\_Retea4e.pkt**

Stabilim in AS1 protocolul BGP cu toate adresele din rețeaua curenta. Acesta va avea conexiune cu AS4(care defapt reprezinta R0). In R0 setam protocolul BGP cu AS4 care va avea cate o

conexiune(interfata) cu celelalte 3 router, astfel in urma schimbarii de date intre aceste 4 routere, fiecare din ele vor avea inscise toate adresele IP din cele 3 retele (Exemplu: R0 si AS2.)

R0

Physical Config CLI Attributes

IOS Command Line Interface

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#route bgp 4
Router(config-router)#neighbor 10.1.4.2 remote-as 1
Router(config-router)#%BGP-5-ADJCHANGE: neighbor 10.1.4.2 Up

Router(config-router)#neighbor 10.1.5.2 remote-as 2
Router(config-router)#%BGP-5-ADJCHANGE: neighbor 10.1.5.2 Up

Router(config-router)#neighbor 10.1.6.2 remote-as 3
Router(config-router)#%BGP-5-ADJCHANGE: neighbor 10.1.6.2 Up
```

R5(1)

Physical Config CLI Attributes

IOS Command Line Interface

```
Router(config)#router bgp 2
Router(config-router)#neighbor 10.1.5.1 remote-as 4
Router(config-router)#network 172.16.0.0 mask 255.255.255.240
Router(config-router)#network 172.16.0.16 mask 255.255.255.240
Router(config-router)#network 172.16.0.32 mask 255.255.255.240
Router(config-router)#network 172.16.0.48 mask 255.255.255.240
Router(config-router)#network 172.16.0.64 mask 255.255.255.240
Router(config-router)#network 172.16.0.80 mask 255.255.255.240
Router(config-router)#network 172.16.0.96 mask 255.255.255.240
Router(config-router)#network 172.16.0.112 mask 255.255.255.240
Router(config-router)#network 172.16.0.128 mask 255.255.255.240
Router(config-router)#network 172.16.0.144 mask 255.255.255.240
Router(config-router)#exit
Router(config)#%BGP-5-ADJCHANGE: neighbor 10.1.5.1 Up

172.16.0.0/28 is subnetted, 10 subnets
D 172.16.0.0 [90/30720] via 172.16.0.146, 00:11:07, FastEthernet0/0
D 172.16.0.16 [90/30720] via 172.16.0.145, 00:11:07, FastEthernet0/0
D 172.16.0.32 [90/33280] via 172.16.0.145, 00:11:07, FastEthernet0/0
D 172.16.0.48 [90/33280] via 172.16.0.145, 00:11:07, FastEthernet0/0
D 172.16.0.64 [90/33280] via 172.16.0.145, 00:11:07, FastEthernet0/0
C 172.16.0.80 is directly connected, FastEthernet1/0
D 172.16.0.96 [90/30720] via 172.16.0.145, 00:11:07, FastEthernet0/0
D 172.16.0.112 [90/33280] via 172.16.0.145, 00:11:07, FastEthernet0/0
D 172.16.0.128 [90/30720] via 172.16.0.145, 00:11:07, FastEthernet0/0
C 172.16.0.144 is directly connected, FastEthernet0/0
192.168.9.0/28 is subnetted, 7 subnets
B 192.168.9.0 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.16 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.32 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.48 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.64 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.80 [20/0] via 10.1.5.1, 00:00:00
B 192.168.9.144 [20/0] via 10.1.5.1, 00:00:00
```

R0

Physical Config CLI Attributes

IOS Command Line Interface

```
Router(config-router)#do 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

10.0.0.0/8 is variably subnetted, 13 subnets, 2 masks
C 10.1.4.0/24 is directly connected, FastEthernet0/0
C 10.1.5.0/24 is directly connected, FastEthernet1/0
C 10.1.6.0/24 is directly connected, FastEthernet2/0
B 10.10.0.0/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.16/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.32/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.48/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.64/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.80/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.96/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.112/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.128/28 [20/0] via 10.1.6.2, 00:00:00
B 10.10.0.144/28 [20/0] via 10.1.6.2, 00:00:00
172.16.0.0/28 is subnetted, 10 subnets
B 172.16.0.0 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.16 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.32 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.48 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.64 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.80 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.96 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.112 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.128 [20/0] via 10.1.5.2, 00:00:00
B 172.16.0.144 [20/0] via 10.1.5.2, 00:00:00
192.168.9.0/28 is subnetted, 7 subnets
B 192.168.9.0 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.16 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.32 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.48 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.64 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.80 [20/0] via 10.1.4.2, 00:00:00
B 192.168.9.144 [20/0] via 10.1.4.2, 00:00:00

Router(config-router)#
```

Folosind comenzile de redistribuire a protocolului RIP si OSPF, completam toate routele (Exemplu: AS2 si AS3) din AS2 si AS3 cu toate adresele IP obtinute de protocolul BGP.

R5(1)

Physical Config CLI Attributes

IOS Command Line Interface

```
Router(config)#router eigrp 1
Router(config-router)#redistribute bgp 2 metric 10000 100 255 1 1500
Router(config-router)#exit
```

R1(2)

Physical Config CLI Attributes

IOS Command Line Interface

```
Router(config)#router ospf 1
Router(config-router)#redistribute bgp 3 subnets
```

R1(1)

Physical Config CLI Attributes

IOS Command Line Interface

```

10.0.0.0/28 is subnetted, 10 subnets
D EX 10.10.0.0 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.16 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.32 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.48 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.64 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.80 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.96 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.112 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.128 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 10.10.0.144 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
172.16.0.0/28 is subnetted, 10 subnets
D 172.16.0.0 [90/33280] via 172.16.0.98, 00:14:29, FastEthernet0/0
D 172.16.0.16 [90/30720] via 172.16.0.98, 00:15:00, FastEthernet0/0
C 172.16.0.32 is directly connected, FastEthernet2/0
C 172.16.0.48 is directly connected, FastEthernet3/0
D 172.16.0.64 [90/30720] via 172.16.0.114, 00:15:00, FastEthernet1/0
D 172.16.0.80 [90/33280] via 172.16.0.98, 00:14:29, FastEthernet0/0
D 172.16.0.96 is directly connected, FastEthernet0/0
D 172.16.0.112 is directly connected, FastEthernet1/0
D 172.16.0.128 [90/30720] via 172.16.0.98, 00:15:00, FastEthernet0/0
D 172.16.0.144 [90/30720] via 172.16.0.114, 00:15:00, FastEthernet1/0
D 172.16.0.160 [90/30720] via 172.16.0.98, 00:15:00, FastEthernet0/0
192.168.9.0/28 is subnetted, 7 subnets
D EX 192.168.9.0 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.16 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.32 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.48 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.64 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.80 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0
D EX 192.168.9.144 [170/517120] via 172.16.0.98, 00:00:18, FastEthernet0/0

```

R4(2)

Physical Config CLI Attributes

IOS Command Line Interface

```

10.0.0.0/28 is subnetted, 10 subnets
C 10.10.0.0 is directly connected, FastEthernet1/0
O 10.10.0.16 [110/2] via 10.10.0.145, 00:16:51, FastEthernet0/0
O IA 10.10.0.32 [110/3] via 10.10.0.145, 00:16:41, FastEthernet0/0
O IA 10.10.0.48 [110/3] via 10.10.0.145, 00:16:41, FastEthernet0/0
O IA 10.10.0.64 [110/3] via 10.10.0.145, 00:16:41, FastEthernet0/0
O 10.10.0.80 [110/2] via 10.10.0.147, 00:16:51, FastEthernet0/0
O IA 10.10.0.96 [110/2] via 10.10.0.145, 00:16:51, FastEthernet0/0
O IA 10.10.0.112 [110/3] via 10.10.0.145, 00:16:41, FastEthernet0/0
O IA 10.10.0.128 [110/2] via 10.10.0.145, 00:16:51, FastEthernet0/0
C 10.10.0.144 is directly connected, FastEthernet0/0
172.16.0.0/28 is subnetted, 10 subnets
O E2 172.16.0.0 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.16 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.32 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.48 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.64 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.80 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.96 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.112 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.128 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 172.16.0.144 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
192.168.9.0/28 is subnetted, 7 subnets
O E2 192.168.9.0 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.16 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.32 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.48 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.64 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.80 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0
O E2 192.168.9.144 [110/20] via 10.10.0.145, 00:00:17, FastEthernet0/0

```

```

C:\>tracert 172.16.0.51

Tracing route to 172.16.0.51 over a maximum of 30 hops:

  1  0 ms    0 ms    13 ms    192.168.9.17
  2  3 ms    0 ms    0 ms    192.168.9.147
  3  0 ms    0 ms    0 ms    10.1.4.1
  4  10 ms   1 ms    0 ms    10.1.5.2
  5  10 ms   10 ms   10 ms   172.16.0.145
  6  11 ms   1 ms    10 ms   172.16.0.97
  7  11 ms   12 ms   11 ms   172.16.0.51

Trace complete.

```

< AS1 AS2

PC7

Physical Config Desktop Programming Attributes

Command Prompt

```

Packet Tracer PC Command Line 1.0
C:\>ping 172.16.0.3

Pinging 172.16.0.3 with 32 bytes of data:

Request timed out.
Reply from 172.16.0.3: bytes=32 time=1ms TTL=122
Reply from 172.16.0.3: bytes=32 time<1ms TTL=122
Reply from 172.16.0.3: bytes=32 time=1ms TTL=122

Ping statistics for 172.16.0.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>tracert 172.16.0.3

Tracing route to 172.16.0.3 over a maximum of 30 hops:

  1  0 ms    0 ms    0 ms    192.168.9.33
  2  0 ms    0 ms    1 ms    192.168.9.98
  3  0 ms   10 ms    1 ms    192.168.9.147
  4  0 ms    0 ms   10 ms    10.1.4.1
  5  10 ms   10 ms   13 ms    10.1.5.2
  6  11 ms   10 ms   14 ms    172.16.0.146
  7  10 ms   10 ms    0 ms    172.16.0.3

Trace complete.

```

< AS1 AS2

## BIBLIOGRAFIE

- [How to calculate a subnet mask from hosts and subnets \(techtarget.com\)](https://www.techtarget.com/whatis/definition/subnet-mask)
- [IP Calculator / IP Subnetting \(jodies.de\)](https://jodies.de/ipcalc)
- [Online IP Subnet Calculator \(subnet-calculator.com\)](https://subnet-calculator.com)
- [Subnet Masks Reference Table \(www.cloudaccess.net\)](https://www.cloudaccess.net/subnet-masks-reference-table)
- [Host and Subnet Quantities - Cisco](https://www.cisco.com/c/en/us/solutions/enterprise-networks/subnetting-101.html)
- [Subnetting Cisco CCNA -Part 1 The Magic Number - YouTube](https://www.youtube.com/watch?v=...)
- [Microsoft Word - Cheatsheet RL.docx \(pub.ro\)](https://pub.ro/microsoft-word-cheatsheet-rl.docx)
- [IP Subnet Calculator for IPv4 | Online Subnet Mask Calculator - Site24x7](https://www.site24x7.com/tools/ip-subnet-calculator-for-ipv4)
- [routersecurity.org](https://www.routersecurity.org)
- [IP Routing: OSPF Configuration Guide - Configuring OSPF \[Cisco Cloud Services Router 1000V Series\] - Cisco](https://www.cisco.com/c/en/us/solutions/enterprise-networks/ip-routing-ospf-configuration-guide.html)
- [Wildcard mask - Wikipedia](https://en.wikipedia.org/wiki/Wildcard_mask)