

Objetivo

Semelhante ao que se fez anteriormente, esta fase do projeto fisa a configuração de uma rede e de todos os seus componentes. Desta vez uma rede virtual já estabelecida e mais complexa. Pondo de lado os obstáculos criados pelo hardware utilizado, foca-se mais na divisão da rede – criação de sub-redes e atribuição de IPs e gateways estáticos.

Desenvolvimento

A topologia de rede fornecida consiste de três LANs interligadas. Primeiro passo foi a divisão da rede e atribuição de IPs.

Os clientes das LANs foram calculados da seguinte forma:

$$\text{Hosts_LAN_A} = \sum_{k=0}^n (\text{numero_de_aluno}_k) \% 100$$

Sendo,

$n = 2$

AlunoA = 42355

AlunoB = 42357

$$\text{Hosts_LAN_A} = (42355 + 42357) \% 100 = 12$$

Gama de IPs mais próxima abrange 14 hosts

Máscara = /28

$$\text{Hosts_LAN_B} = \text{Hosts_LAN_A} / 2 = 6$$

Máscara = /29

LAN T usa uma máscara de endereço de /30

Hosts_LAN_T = 2

Máscara = /30

LAN C de usar próximo maior bloco de IPs. Assim, ficou que

Hosts_LAN_C = 30

Máscara = /27

	LAN A	LAN B	LAN C	LAN T
CLIENTES [GAMA IPs]	14 (12)[16]	6[8]	30[32]	2[4]
	\28	\29	\27	\30
Máscara	255.255.255.240	255.255.255.248	255.255.255.224	255.255.255.252

NETWORK - 192.168.1.0	192.168.1.224	192.168.1.240	192.168.1.192	192.168.1.248
e0	192.168.1.225	192.168.1.241	192.168.1.193	192.168.1.249
e1	192.168.1.226	192.168.1.242	192.168.1.194	192.168.1.250
e2			192.168.1.195	
e3			192.168.1.196	
BROADCAST - 192.168.1.X, X = CLTS + 1	192.168.1.239	192.168.1.247	192.168.1.223	192.168.1.251

No contexto da topologia utilizada:

LAN A e0 = eth0

LAN A e1 = e0

LAN B e0 = eth0

LAN B e1 = e1

LAN T e0 = e3

LAN T e1 = fa0/0

LAN C e0 = e1/0

LAN C e1 = e0

LAN C e2 = e0

LAN C e3 = e0

Foi necessário um emulador de redes – EVE-NG, acessível a partir da rede do ISEL (Continha uma rede pré-estabelecida que só pedia configuração de cada componente), e um cliente telnet – PuTTy, já usado na fase anterior, que permite aceder ao terminal de cada componente.

Foram usados três terminais diferentes: VPC, Mikrotik e Cisco.

Foi feita a ativação e configuração de cada componente separadamente e, de seguida testou-se a ligação entre os mesmos.

Para PCA e PCB, os terminais não pedem especificação da interface, apenas IP e gateway.

VPC_LAN_A

```
VPCS>ip 192.168.1.225 255.255.255.240 192.168.1.226  
VPCS>save
```

```
VPCS> show ip  
  
NAME      : VPCS[1]  
IP/MASK   : 192.168.1.225/28  
GATEWAY   : 192.168.1.226  
DNS       :  
MAC       : 00:50:79:66:68:04  
LPORT     : 20000  
RHOST:PORT : 127.0.0.1:30000  
MTU       : 1500
```

VPC_LAN_B

```
VPCS>ip 192.168.1.241 255.255.255.248 192.168.1.242
```

```
VPCS>save
```

```
VPCS> show ip  
  
NAME      : VPCS[1]  
IP/MASK   : 192.168.1.241/29  
GATEWAY   : 192.168.1.242  
DNS       :  
MAC       : 00:50:79:66:68:05  
LPORT     : 20000  
RHOST:PORT : 127.0.0.1:30000  
MTU       : 1500
```

Os terminais Mikrotik já necessitam da interface. Devido à maneira como estas são atribuídas na consola, decidiu-se:

LAN A e1 = e0 = ether1

LAN B e1 = e1 = ether2

LAN T e0 = e3 = ether4

Mikrotik Router 1

MikroTik 6.41.2 (stable)

MikroTik Login: admin

Password:

```
[admin@MikroTik] >ip address add address=192.168.1.226/28 interface=ether1
```

```
[admin@MikroTik] >ip address add address=192.168.1.242/29 interface=ether2
```

```
[admin@MikroTik] >ip address add address=192.168.1.249/30 interface=ether4
```

```
[admin@MikroTik] >ip route add gateway=192.168.1.250
```

Ctrl X

```
[admin@MikroTik] > ip address print
Flags: X - disabled, I - invalid, D - dynamic
#   ADDRESS           NETWORK           INTERFACE
0   192.168.1.226/28  192.168.1.224  ether1
1   192.168.1.242/29  192.168.1.240  ether2
2   192.168.1.249/30  192.168.1.248  ether4
[admin@MikroTik] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
#      DST-ADDRESS       PREF-SRC        GATEWAY        DISTANCE
0 A S  0.0.0.0/0          192.168.1.250    1
1 ADC  192.168.1.224/28  192.168.1.226  ether1
2 ADC  192.168.1.240/29  192.168.1.242  ether2
3 ADC  192.168.1.248/30  192.168.1.249  ether4
[admin@MikroTik] >
```

Cisco Router 2

Router>Enable

Router#Config terminal

Router(config)#Interface fa0/0

Router(config)#Ip address 192.168.1.250 255.255.255.252

Router(config)#no shutdown

Ctrl Z

Router#Config terminal

```
Router(config)#Interface e1/0
Router(config)#ip address 192.168.1.193 255.255.255.224
Router(config)#no shutdown
Ctrl Z
```

```
Router#Config terminal
Router(config)#Interface fa0/0
Router(config)#ip route 0.0.0.0 0.0.0.0 192.168.1.249
Ctrl Z
```

```
copy running-config startup-config
```

```
Router>show ip interface brief
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/0    192.168.1.250  YES NVRAM  up        up
Ethernet1/0         192.168.1.193  YES NVRAM  up        up
Ethernet1/1         unassigned     YES NVRAM  administratively down  down
Ethernet1/2         unassigned     YES NVRAM  administratively down  down
Ethernet1/3         unassigned     YES NVRAM  administratively down  down
Router>show ip route
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       + - replicated route, % - next hop override

Gateway of last resort is 192.168.1.249 to network 0.0.0.0

S*   0.0.0.0/0 [1/0] via 192.168.1.249
     192.168.1.0/24 is variably subnetted, 4 subnets, 3 masks
C     192.168.1.192/27 is directly connected, Ethernet1/0
L     192.168.1.193/32 is directly connected, Ethernet1/0
C     192.168.1.248/30 is directly connected, FastEthernet0/0
L     192.168.1.250/32 is directly connected, FastEthernet0/0
Router>
```

Para os Servidores procedeu-se da mesma maneira

Mikrotik Server_DHCP

MikroTik 6.41.2 (stable)

MikroTik Login: admin

Password:

```
[admin@MikroTik] >ip address add address=192.168.1.194/27 interface=ether1
```

```
[admin@MikroTik] >ip route add gateway=192.168.1.193
```

Ctrl X

```
[admin@MikroTik] > ip address print
Flags: X - disabled, I - invalid, D - dynamic
#   ADDRESS           NETWORK           INTERFACE
0   192.168.1.194/27  192.168.1.192  ether1
[admin@MikroTik] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
#      DST-ADDRESS       PREF-SRC        GATEWAY        DISTANCE
0  A  S  0.0.0.0/0          192.168.1.193          1
1  ADC  192.168.1.192/27  192.168.1.194  ether1          0
```

Mikrotik Server_Web

MikroTik 6.41.2 (stable)

MikroTik Login: admin

Password:

```
[admin@MikroTik] >ip address add address=192.168.1.195/27 interface=ether1
```

```
[admin@MikroTik] >ip route add gateway=192.168.1.193
```

Ctrl X

```
[admin@MikroTik] > ip address print
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.1.195/27 192.168.1.192 ether1
[admin@MikroTik] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
# DST-ADDRESS PREF-SRC GATEWAY DISTANCE
0 A S 0.0.0.0/0 192.168.1.193 1
1 ADC 192.168.1.192/27 192.168.1.195 ether1 0
```

Mikrotik Server_DNS

MikroTik 6.41.2 (stable)

MikroTik Login: admin

Password:

[admin@MikroTik] >ip address add address=192.168.1.196/27 interface=ether1

[admin@MikroTik] >ip route add gateway=192.168.1.193

Ctrl X

```
[admin@MikroTik] > ip address print
Flags: X - disabled, I - invalid, D - dynamic
# ADDRESS NETWORK INTERFACE
0 192.168.1.196/27 192.168.1.192 ether1
[admin@MikroTik] > ip route print
Flags: X - disabled, A - active, D - dynamic,
C - connect, S - static, r - rip, b - bgp, o - ospf, m - mme,
B - blackhole, U - unreachable, P - prohibit
# DST-ADDRESS PREF-SRC GATEWAY DISTANCE
0 A S 0.0.0.0/0 192.168.1.193 1
1 ADC 192.168.1.192/27 192.168.1.196 ether1 0
```

TESTES

Procedeu-se aos testes. Começou-se por fazer ping a todos os nós a partir do PCA e PCB.

```
VPCS> ping 192.168.1.226
```

```
84 bytes from 192.168.1.226 icmp_seq=1 ttl=64 time=0.675 ms
84 bytes from 192.168.1.226 icmp_seq=2 ttl=64 time=0.493 ms
84 bytes from 192.168.1.226 icmp_seq=3 ttl=64 time=0.495 ms
84 bytes from 192.168.1.226 icmp_seq=4 ttl=64 time=0.555 ms
84 bytes from 192.168.1.226 icmp_seq=5 ttl=64 time=0.479 ms
```

```
VPCS> ping 192.168.1.241
```

```
84 bytes from 192.168.1.241 icmp_seq=1 ttl=63 time=0.944 ms
84 bytes from 192.168.1.241 icmp_seq=2 ttl=63 time=1.038 ms
84 bytes from 192.168.1.241 icmp_seq=3 ttl=63 time=0.880 ms
84 bytes from 192.168.1.241 icmp_seq=4 ttl=63 time=1.096 ms
84 bytes from 192.168.1.241 icmp_seq=5 ttl=63 time=0.956 ms
```

```
VPCS> ping 192.168.1.249
```

```
84 bytes from 192.168.1.249 icmp_seq=1 ttl=64 time=0.549 ms
84 bytes from 192.168.1.249 icmp_seq=2 ttl=64 time=0.525 ms
84 bytes from 192.168.1.249 icmp_seq=3 ttl=64 time=0.445 ms
84 bytes from 192.168.1.249 icmp_seq=4 ttl=64 time=0.550 ms
84 bytes from 192.168.1.249 icmp_seq=5 ttl=64 time=0.473 ms
```

```
VPCS> ping 192.168.1.250
```

```
84 bytes from 192.168.1.250 icmp_seq=1 ttl=254 time=3.988 ms
84 bytes from 192.168.1.250 icmp_seq=2 ttl=254 time=6.504 ms
84 bytes from 192.168.1.250 icmp_seq=3 ttl=254 time=5.643 ms
84 bytes from 192.168.1.250 icmp_seq=4 ttl=254 time=6.657 ms
84 bytes from 192.168.1.250 icmp_seq=5 ttl=254 time=5.926 ms
```

```
VPCS> ping 192.168.1.193
```

```
84 bytes from 192.168.1.193 icmp_seq=1 ttl=254 time=3.786 ms
84 bytes from 192.168.1.193 icmp_seq=2 ttl=254 time=8.751 ms
84 bytes from 192.168.1.193 icmp_seq=3 ttl=254 time=6.595 ms
84 bytes from 192.168.1.193 icmp_seq=4 ttl=254 time=5.501 ms
84 bytes from 192.168.1.193 icmp_seq=5 ttl=254 time=8.180 ms
```

```
VPCS> ping 192.168.1.194
```

```
84 bytes from 192.168.1.194 icmp_seq=1 ttl=62 time=11.381 ms
84 bytes from 192.168.1.194 icmp_seq=2 ttl=62 time=17.867 ms
84 bytes from 192.168.1.194 icmp_seq=3 ttl=62 time=16.897 ms
84 bytes from 192.168.1.194 icmp_seq=4 ttl=62 time=16.509 ms
84 bytes from 192.168.1.194 icmp_seq=5 ttl=62 time=17.693 ms
```

```
VPCS> ping 192.168.1.195
```

```
84 bytes from 192.168.1.195 icmp_seq=1 ttl=62 time=19.161 ms
84 bytes from 192.168.1.195 icmp_seq=2 ttl=62 time=16.868 ms
84 bytes from 192.168.1.195 icmp_seq=3 ttl=62 time=16.540 ms
84 bytes from 192.168.1.195 icmp_seq=4 ttl=62 time=17.463 ms
84 bytes from 192.168.1.195 icmp_seq=5 ttl=62 time=14.328 ms
```

```
VPCS> ping 192.168.1.196
```

```
84 bytes from 192.168.1.196 icmp_seq=1 ttl=62 time=18.506 ms
84 bytes from 192.168.1.196 icmp_seq=2 ttl=62 time=12.214 ms
84 bytes from 192.168.1.196 icmp_seq=3 ttl=62 time=16.898 ms
84 bytes from 192.168.1.196 icmp_seq=4 ttl=62 time=17.109 ms
84 bytes from 192.168.1.196 icmp_seq=5 ttl=62 time=17.096 ms
```

```
VPCS> ping 192.168.1.242
```

```
84 bytes from 192.168.1.242 icmp_seq=1 ttl=64 time=0.456 ms
84 bytes from 192.168.1.242 icmp_seq=2 ttl=64 time=0.469 ms
84 bytes from 192.168.1.242 icmp_seq=3 ttl=64 time=0.564 ms
84 bytes from 192.168.1.242 icmp_seq=4 ttl=64 time=0.469 ms
84 bytes from 192.168.1.242 icmp_seq=5 ttl=64 time=0.477 ms
```

```
VPCS> ping 192.168.1.225
```

```
84 bytes from 192.168.1.225 icmp_seq=1 ttl=63 time=1.229 ms
84 bytes from 192.168.1.225 icmp_seq=2 ttl=63 time=1.020 ms
84 bytes from 192.168.1.225 icmp_seq=3 ttl=63 time=0.965 ms
84 bytes from 192.168.1.225 icmp_seq=4 ttl=63 time=0.883 ms
84 bytes from 192.168.1.225 icmp_seq=5 ttl=63 time=1.073 ms
```

```
VPCS> ping 192.168.1.249
```

```
84 bytes from 192.168.1.249 icmp_seq=1 ttl=64 time=0.684 ms
84 bytes from 192.168.1.249 icmp_seq=2 ttl=64 time=0.501 ms
84 bytes from 192.168.1.249 icmp_seq=3 ttl=64 time=0.590 ms
84 bytes from 192.168.1.249 icmp_seq=4 ttl=64 time=0.547 ms
84 bytes from 192.168.1.249 icmp_seq=5 ttl=64 time=0.534 ms
```

```
VPCS> ping 192.168.1.250
```

```
84 bytes from 192.168.1.250 icmp_seq=1 ttl=254 time=11.605 ms
84 bytes from 192.168.1.250 icmp_seq=2 ttl=254 time=7.394 ms
84 bytes from 192.168.1.250 icmp_seq=3 ttl=254 time=7.047 ms
84 bytes from 192.168.1.250 icmp_seq=4 ttl=254 time=8.158 ms
84 bytes from 192.168.1.250 icmp_seq=5 ttl=254 time=7.141 ms
```

```
VPCS> ping 192.168.1.193
```

```
84 bytes from 192.168.1.193 icmp_seq=1 ttl=254 time=2.970 ms
84 bytes from 192.168.1.193 icmp_seq=2 ttl=254 time=3.102 ms
84 bytes from 192.168.1.193 icmp_seq=3 ttl=254 time=6.303 ms
84 bytes from 192.168.1.193 icmp_seq=4 ttl=254 time=7.685 ms
84 bytes from 192.168.1.193 icmp_seq=5 ttl=254 time=7.223 ms
```

```
VPCS> ping 192.168.1.194
```

```
84 bytes from 192.168.1.194 icmp_seq=1 ttl=62 time=15.146 ms
84 bytes from 192.168.1.194 icmp_seq=2 ttl=62 time=16.755 ms
84 bytes from 192.168.1.194 icmp_seq=3 ttl=62 time=18.730 ms
84 bytes from 192.168.1.194 icmp_seq=4 ttl=62 time=16.581 ms
84 bytes from 192.168.1.194 icmp_seq=5 ttl=62 time=17.332 ms
```

```
VPCS> ping 192.168.1.195
```

```
84 bytes from 192.168.1.195 icmp_seq=1 ttl=62 time=15.336 ms
84 bytes from 192.168.1.195 icmp_seq=2 ttl=62 time=17.668 ms
84 bytes from 192.168.1.195 icmp_seq=3 ttl=62 time=16.376 ms
84 bytes from 192.168.1.195 icmp_seq=4 ttl=62 time=17.151 ms
84 bytes from 192.168.1.195 icmp_seq=5 ttl=62 time=16.184 ms
```

```
VPCS> ping 192.168.1.196
```

```
84 bytes from 192.168.1.196 icmp_seq=1 ttl=62 time=14.895 ms
84 bytes from 192.168.1.196 icmp_seq=2 ttl=62 time=17.696 ms
84 bytes from 192.168.1.196 icmp_seq=3 ttl=62 time=16.499 ms
84 bytes from 192.168.1.196 icmp_seq=4 ttl=62 time=16.394 ms
84 bytes from 192.168.1.196 icmp_seq=5 ttl=62 time=17.042 ms
```

De seguida testou-se ligação entre os servidores DHCP, Web e DNS e os PCA e PCB

```
[admin@MikroTik] > ping 192.168.1.225
SEQ HOST SIZE TTL TIME STATUS
 0 192.168.1.225      56  62 19ms
 1 192.168.1.225      56  62 18ms
 2 192.168.1.225      56  62 12ms
 3 192.168.1.225      56  62 13ms
 4 192.168.1.225      56  62 12ms
 5 192.168.1.225      56  62 17ms
 6 192.168.1.225      56  62 11ms
 7 192.168.1.225      56  62 11ms
 8 192.168.1.225      56  62 18ms
 9 192.168.1.225      56  62 13ms
10 192.168.1.225     56  62 13ms
11 192.168.1.225     56  62 12ms
12 192.168.1.225     56  62 13ms
13 192.168.1.225     56  62 12ms
14 192.168.1.225     56  62 14ms
15 192.168.1.225     56  62 20ms
16 192.168.1.225     56  62 12ms
17 192.168.1.225     56  62 19ms
18 192.168.1.225     56  62 18ms
19 192.168.1.225     56  62 14ms
sent=20 received=20 packet-loss=0% min-rtt=11ms avg-rtt=14ms max-rtt=20ms
SEQ HOST SIZE TTL TIME STATUS
20 192.168.1.225     56  62 14ms
21 192.168.1.225     56  62 14ms
22 192.168.1.225     56  62 13ms
23 192.168.1.225     56  62 14ms
sent=24 received=24 packet-loss=0% min-rtt=11ms avg-rtt=14ms max-rtt=20ms

[admin@MikroTik] > ping 192.168.1.241
SEQ HOST SIZE TTL TIME STATUS
 0 192.168.1.241      56  62 18ms
 1 192.168.1.241      56  62 17ms
 2 192.168.1.241      56  62 12ms
 3 192.168.1.241      56  62 11ms
 4 192.168.1.241      56  62 11ms
 5 192.168.1.241      56  62 13ms
 6 192.168.1.241      56  62 12ms
 7 192.168.1.241      56  62 13ms
sent=8 received=8 packet-loss=0% min-rtt=11ms avg-rtt=13ms max-rtt=18ms
```

```
[admin@MikroTik] > ping 192.168.1.225
SEQ HOST SIZE TTL TIME STATUS
0 192.168.1.225 56 62 13ms
1 192.168.1.225 56 62 17ms
2 192.168.1.225 56 62 11ms
3 192.168.1.225 56 62 11ms
4 192.168.1.225 56 62 14ms
5 192.168.1.225 56 62 14ms
sent=6 received=6 packet-loss=0% min-rtt=11ms avg-rtt=13ms max-rtt=17ms

[admin@MikroTik] > ping 192.168.1.241
SEQ HOST SIZE TTL TIME STATUS
0 192.168.1.241 56 62 13ms
1 192.168.1.241 56 62 12ms
2 192.168.1.241 56 62 12ms
3 192.168.1.241 56 62 11ms
4 192.168.1.241 56 62 12ms
5 192.168.1.241 56 62 12ms
6 192.168.1.241 56 62 20ms
sent=7 received=7 packet-loss=0% min-rtt=11ms avg-rtt=13ms max-rtt=20ms

[admin@MikroTik] > ping 192.168.1.225
SEQ HOST SIZE TTL TIME STATUS
0 192.168.1.225 56 62 18ms
1 192.168.1.225 56 62 18ms
2 192.168.1.225 56 62 11ms
3 192.168.1.225 56 62 14ms
4 192.168.1.225 56 62 14ms
5 192.168.1.225 56 62 11ms
6 192.168.1.225 56 62 12ms
7 192.168.1.225 56 62 13ms
sent=8 received=8 packet-loss=0% min-rtt=11ms avg-rtt=13ms max-rtt=18ms

[admin@MikroTik] > ping 192.168.1.241
SEQ HOST SIZE TTL TIME STATUS
0 192.168.1.241 56 62 17ms
1 192.168.1.241 56 62 17ms
2 192.168.1.241 56 62 14ms
3 192.168.1.241 56 62 13ms
4 192.168.1.241 56 62 14ms
5 192.168.1.241 56 62 13ms
6 192.168.1.241 56 62 14ms
sent=7 received=7 packet-loss=0% min-rtt=13ms avg-rtt=14ms max-rtt=17ms
```

Testou-se ainda ligação entre os Routers:

```
Router>ping 192.168.1.249
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.249, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/37/48 ms
Router>
```

```
[admin@MikroTik] > ping 192.168.1.250
SEQ HOST SIZE TTL TIME STATUS
 0 192.168.1.250      56 255 10ms
 1 192.168.1.250      56 255 9ms
 2 192.168.1.250      56 255 2ms
 3 192.168.1.250      56 255 7ms
 4 192.168.1.250      56 255 2ms
 5 192.168.1.250      56 255 3ms
sent=6 received=6 packet-loss=0% min-rtt=2ms avg-rtt=5ms max-rtt=10ms
```

Finalmente, correu-se o comando traceroute entre o servidor_DHCP e o PCA

```
VPCS> trace 192.168.1.194
trace to 192.168.1.194, 8 hops max, press Ctrl+C to stop
 1  192.168.1.226    0.472 ms  0.389 ms  0.412 ms
 2  192.168.1.250    5.042 ms  9.775 ms  9.194 ms
 3  *192.168.1.194   19.734 ms (ICMP type:3, code:3, Destination port unreachable)

[admin@MikroTik] > tool
[admin@MikroTik] /tool> traceroute 192.168.1.225
# ADDRESS          LOSS SENT LAST AVG BEST WORST
1 192.168.1.193    0% 10 5.3ms 6.5 2.5 10.4
2 192.168.1.249    0% 10 21.5ms 20.5 19.6 23.3
3 192.168.1.225    0% 10 20ms 20.4 20 21.3
```

Conclusões

Este projeto permitiu compreender melhor as minúcias da configuração de redes e dos seus componentes, bem a criação de sub-redes. Visto que é retirada a preocupação de estabelecer ligações físicas corretas, pode-se focar mais atenção nos detalhes programáticos da rede, routers, PCs e servidores.