

Encaminhamento de Dados  
2020/2021

# Relatório

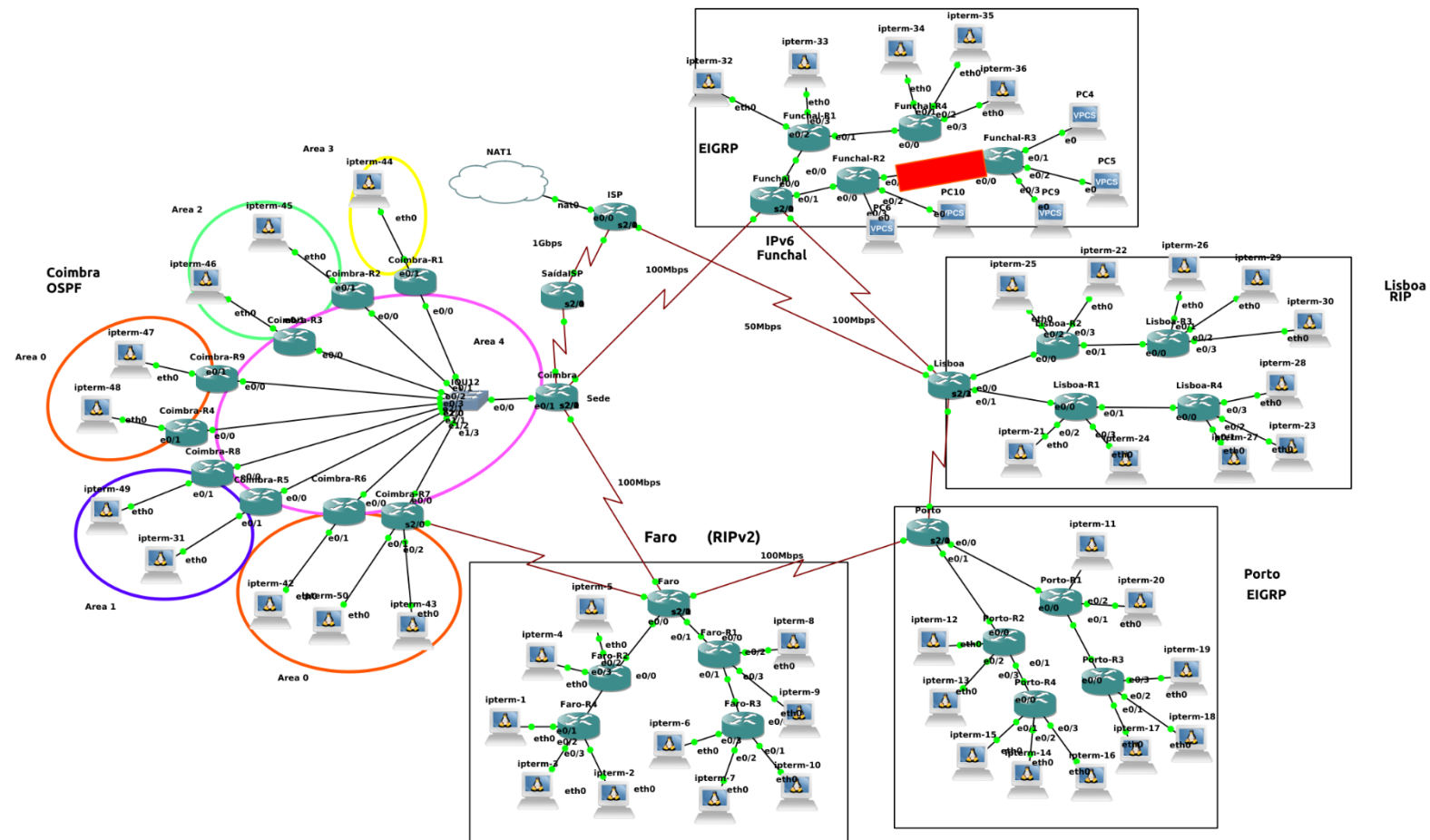
## Trabalho Prático

Vitor Manuel Ferreira Simões  
2019127806

## Índice

Topologia.....	3
Protocolos de Encaminhamento implementados.....	3
Endereçamento.....	4
Rede Faro 194.65.12.0 .....	4
Rede Porto 194.65.12.160 .....	4
Rede Lisboa 194.65.13.0 .....	5
Rede Funchal .....	5
Rede Coimbra .....	6
Túnel estático e IPV6.....	7
Área OSPF .....	8
Prefix-List em Lisboa .....	9
Conectividade entre a empresa e o exterior.....	10
Conexão entre a empresa .....	10
Conexão com o exterior .....	10

## Topologia



## Protocolos de Encaminhamento implementados

- Faro – RipV2
- Porto – EIGRP
- Lisboa – RipV2
- Funchal – EIGRP
- Coimbra – OSPF

Endereçamento

Rede Faro 194.65.12.0

ID	Máscara	Rede	Primeiro End.	Último End.	Endereço Broadcast
Lan1	/28	194.65.12.0	194.65.12.1	194.65.12.14	194.65.12.15
Lan2	/28	194.65.12.16	194.65.12.17	194.65.12.30	194.65.12.31
Lan3	/28	194.65.12.32	194.65.12.33	194.65.12.46	194.65.12.47
Lan4	/28	194.65.12.48	194.65.12.49	194.65.12.62	194.65.12.63
Lan5	/28	194.65.12.64	194.65.12.65	194.65.12.78	194.65.12.79
Lan6	/28	194.65.12.80	194.65.12.81	194.65.12.94	194.65.12.95
Lan7	/28	194.65.12.96	194.65.12.97	194.65.12.110	194.65.12.111
Lan8	/28	194.65.12.112	194.65.12.113	194.65.12.126	194.65.12.127
Lan9	/29	194.65.12.128	194.65.12.129	194.65.12.134	194.65.12.135
Lan10	/29	194.65.12.136	194.65.12.137	194.65.12.142	194.65.12.143

Rede Porto 194.65.12.160

ID	Máscara	Rede	Primeiro End.	Último End.	Endereço Broadcast
Lan1	/28	194.65.12.160	194.65.12.161	194.65.12.174	194.65.12.175
Lan2	/28	194.65.12.176	194.65.12.177	194.65.12.190	194.65.12.191
Lan3	/29	194.65.12.192	194.65.12.193	194.65.12.198	194.65.12.199
Lan4	/29	194.65.12.200	194.65.12.201	194.65.12.206	194.65.12.207
Lan5	/29	194.65.12.208	194.65.12.209	194.65.12.214	194.65.12.215
Lan6	/29	194.65.12.216	194.65.12.217	194.65.12.222	194.65.12.223
Lan7	/29	194.65.12.224	194.65.12.225	194.65.12.230	194.65.12.231
Lan8	/29	194.65.12.232	194.65.12.233	194.65.12.238	194.65.12.239
Lan9	/29	194.65.12.240	194.65.12.241	194.65.12.246	194.65.12.247
Lan10	/29	194.65.12.248	194.65.12.249	194.65.12.254	194.65.12.255

## Rede Lisboa 194.65.13.0

ID	Máscara	Rede	Primeiro End.	Último End.	Endereço Broadcast
Lan1	/29	194.65.13.0	194.65.13.1	194.65.13.6	194.65.13.7
Lan2	/29	194.65.13.8	194.65.13.9	194.65.13.14	194.65.13.15
Lan3	/29	194.65.13.16	194.65.13.17	194.65.13.22	194.65.13.23
Lan4	/30	194.65.13.24	194.65.123.25	194.65.13.26	194.65.13.27
Lan5	/30	194.65.13.28	194.65.13.29	194.65.13.30	194.65.13.31
Lan6	/28	194.65.13.32	194.65.13.33	194.65.13.46	194.65.13.47
Lan7	/29	194.65.13.48	194.65.13.49	194.65.13.54	194.65.13.55
Lan8	/29	194.65.13.56	194.65.13.57	194.65.13.62	194.65.13.63
Lan9	/29	194.65.13.64	194.65.13.65	194.65.13.70	194.65.13.71
Lan10	/29	194.65.13.72	194.65.13.73	194.65.13.78	194.65.13.79

## Rede Funchal 194.65.13.0

ID	Máscara	Rede	Primeiro End.	Último End.	Endereço Broadcast
Lan1	/29	194.65.13.80	194.65.13.81	194.65.13.86	194.65.13.87
Lan2	/29	194.65.13.88	194.65.13.89	194.65.13.94	194.65.13.95
Lan3	/29	194.65.13.96	194.65.13.97	194.65.13.102	194.65.13.103
Lan4	/30	194.65.13.104	194.65.123.105	194.65.13.106	194.65.13.107
Lan5	/30	194.65.13.108	194.65.13.109	194.65.13.110	194.65.13.111
Lan6	/30	194.65.13.112	194.65.13.113	194.65.13.114	194.65.13.115
Lan7	/30	194.65.13.116	194.65.13.117	194.65.13.118	194.65.13.119
Lan8	/30	194.65.13.120	194.65.13.121	194.65.13.122	194.65.13.123
Lan9	/30	194.65.13.124	194.65.13.125	194.65.13.126	194.65.13.127
Lan10	/30	194.65.13.128	194.65.13.129	194.65.13.130	194.65.13.131

Parte vermelha é IPv6

Lan1 /125 2002::c241:d51 2002::c241:d56

Lan2 /125 2002::c241:d59 2002::c241:d5e

Lan3 /125 2002::c241:d61 2002::c241:d66

Lan4 /125 2002::c241:d69 2002::c241:d6a

Lan5 /125 2002::c241:d6d 2002::c241:d6e

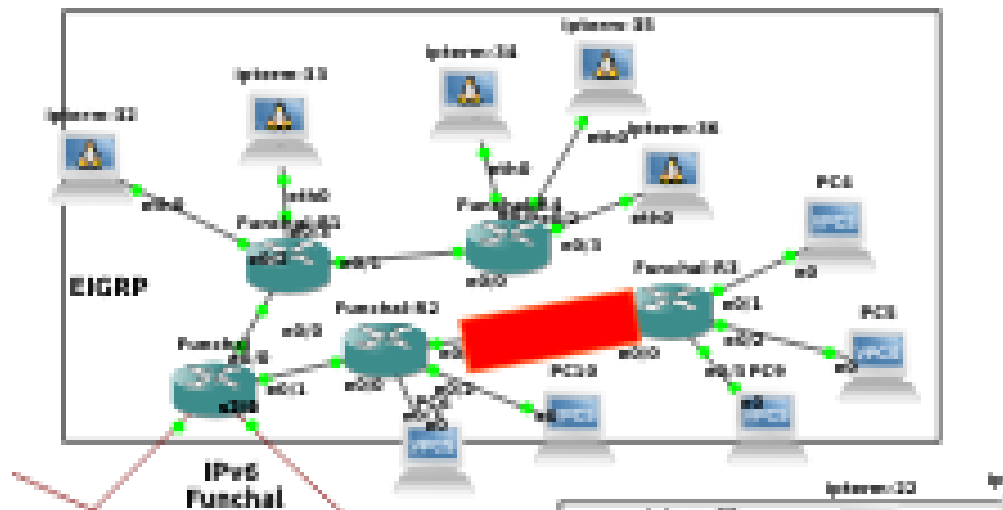
Rede Coimbra 194.65.13.132

ID	Máscara	Rede	Primeiro End.	Último End.	Endereço Broadcast
Lan1	/30	194.65.13.132	194.65.13.133	194.65.13.134	194.65.13.135
Lan2	/30	194.65.13.136	194.65.13.137	194.65.13.138	194.65.13.138
Lan3	/30	194.65.13.140	194.65.13.141	194.65.13.142	194.65.13.143
Lan4	/30	194.65.13.144	194.65.123.145	194.65.13.146	194.65.13.147
Lan5	/30	194.65.13.148	194.65.13.149	194.65.13.150	194.65.13.151
Lan6	/30	194.65.13.152	194.65.13.153	194.65.13.154	194.65.13.155
Lan7	/30	194.65.13.156	194.65.13.157	194.65.13.158	194.65.13.159
Lan8	/30	194.65.13.160	194.65.13.161	194.65.13.162	194.65.13.163
Lan9	/30	194.65.13.164	194.65.13.165	194.65.13.166	194.65.13.167
Lan10	/30	194.65.13.168	194.65.13.169	194.65.13.170	194.65.13.171

## Túnel estático e IPV6

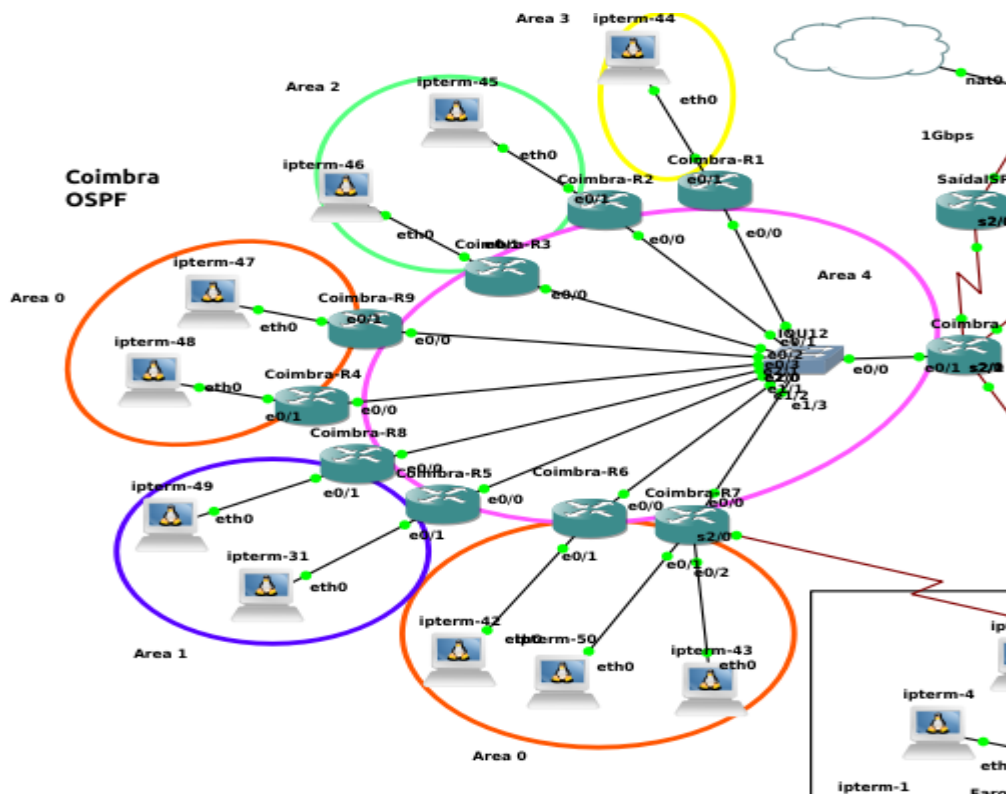
O túnel estático foi implementado do router Funchal-R2 para Funchal R3.

O ipv6 foi implementado nos VPCs, PC6, PC10, PC9 e PC5.

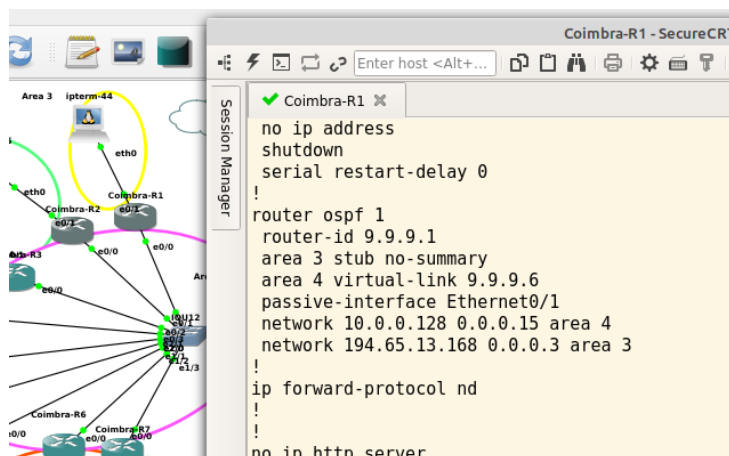


## Área OSPF

Foram implementadas 4 áreas na sede Coimbra com protocolo de encaminhamento OSPF, com a implementação de multiáreas com links virtuais.



A área 3 é uma área stub.



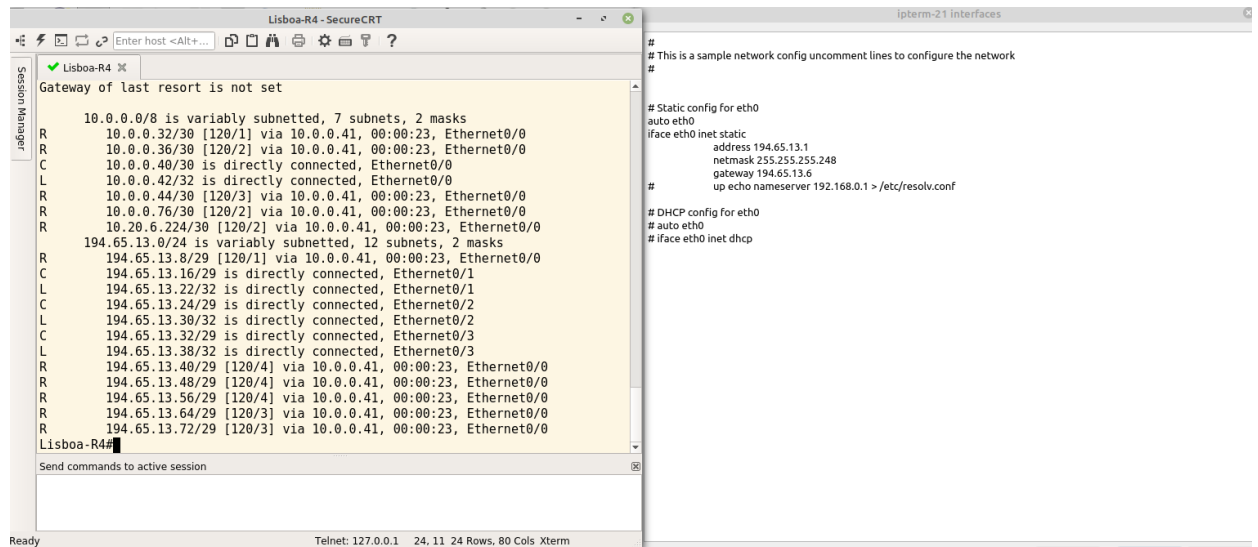
PS: Esta rede de Coimbra contém um problema, que não consegui resolver, foi tudo implementado, mas as redes dos iptermers não conseguem pingar o exterior (1.1.1.1).

Devido à rota que não foi automaticamente implementada pelo Coimbra Sede (0.0.0.0).



## Prefix-List em Lisboa

A Prefix-list foi implementada na filial de Lisboa no router Lisboa-R4, este impede que o ipterm-21 receba anúncios RIP.



The screenshot shows a SecureCRT terminal window with two panes. The left pane, titled 'Lisboa-R4', displays the output of a network command, showing a summary of subnets and their status. The right pane, titled 'ipterm-21 interfaces', shows a sample network configuration script for the router.

```
Lisboa-R4#
Gateway of last resort is not set

10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
R 10.0.0.32/30 [120/1] via 10.0.0.41, 00:00:23, Ethernet0/0
R 10.0.0.36/30 [120/2] via 10.0.0.41, 00:00:23, Ethernet0/0
C 10.0.0.40/30 is directly connected, Ethernet0/0
L 10.0.0.42/32 is directly connected, Ethernet0/0
R 10.0.0.44/30 [120/3] via 10.0.0.41, 00:00:23, Ethernet0/0
R 10.0.0.76/30 [120/2] via 10.0.0.41, 00:00:23, Ethernet0/0
R 10.20.6.224/30 [120/2] via 10.0.0.41, 00:00:23, Ethernet0/0
194.65.13.0/24 is variably subnetted, 12 subnets, 2 masks
R 194.65.13.8/29 [120/1] via 10.0.0.41, 00:00:23, Ethernet0/0
C 194.65.13.16/29 is directly connected, Ethernet0/1
L 194.65.13.22/32 is directly connected, Ethernet0/1
C 194.65.13.24/29 is directly connected, Ethernet0/2
L 194.65.13.30/32 is directly connected, Ethernet0/2
C 194.65.13.32/29 is directly connected, Ethernet0/3
L 194.65.13.38/32 is directly connected, Ethernet0/3
R 194.65.13.40/29 [120/4] via 10.0.0.41, 00:00:23, Ethernet0/0
R 194.65.13.48/29 [120/4] via 10.0.0.41, 00:00:23, Ethernet0/0
R 194.65.13.56/29 [120/4] via 10.0.0.41, 00:00:23, Ethernet0/0
R 194.65.13.64/29 [120/3] via 10.0.0.41, 00:00:23, Ethernet0/0
R 194.65.13.72/29 [120/3] via 10.0.0.41, 00:00:23, Ethernet0/0

Lisboa-R4#
```

```
# This is a sample network config uncomment lines to configure the network
#
# Static config for eth0
auto eth0
iface eth0 inet static
    address 194.65.13.1
    netmask 255.255.255.248
    gateway 194.65.13.6
    up echo nameserver 192.168.0.1 > /etc/resolv.conf
#
# DHCP config for eth0
# auto eth0
# iface eth0 inet dhcp
```

## Conectividade entre a empresa e o exterior

### Conexão entre a empresa

**Terminal Output (ipterm-5 - SecureCRT):**

```
ipterm-5 console is now available... Press RETURN to get started.  
root@ipterm-5:~# ping 194.65.12.241    Pinngar Porto  
PING 194.65.12.241 (194.65.12.241) 56(84) bytes of data.  
64 bytes from 194.65.12.241: icmp_seq=1 ttl=60 time=21.6 ms  
64 bytes from 194.65.12.241: icmp_seq=2 ttl=60 time=1.77 ms  
^C  
--- 194.65.12.241 ping statistics ---  
2 packets transmitted, 2 received, 0% packet loss, time 1001ms  
rtt min/avg/max/mdev = 1.777/11.737/21.698/9.961 ms  
root@ipterm-5:~# ping 194.65.13.17    Pinngar Lisboa  
PING 194.65.13.17 (194.65.13.17) 56(84) bytes of data.  
64 bytes from 194.65.13.17: icmp_seq=1 ttl=58 time=3.49 ms  
64 bytes from 194.65.13.17: icmp_seq=2 ttl=58 time=15.1 ms  
64 bytes from 194.65.13.17: icmp_seq=3 ttl=58 time=15.8 ms  
^C  
--- 194.65.13.17 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
```

**Network Diagram:** The diagram shows a complex network topology. Key components include:

- ISP:** Internet Service Provider at the top left.
- Funchal:** A central hub with multiple interfaces (e0/0, e0/1, e0/2, e0/3) connected to various other nodes.
- Lisboa:** A cluster of routers (Lisboa-R1, Lisboa-R2, Lisboa-R3, Lisboa-R4) and hosts (Lisboa-PC1, Lisboa-PC2, Lisboa-PC3, Lisboa-PC4).
- Porto:** A cluster of routers (Porto-R1, Porto-R2, Porto-R3, Porto-R4) and hosts (Porto-PC1, Porto-PC2, Porto-PC3, Porto-PC4).
- Faro:** A cluster of routers (Faro-R1, Faro-R2, Faro-R3, Faro-R4) and hosts (Faro-PC1, Faro-PC2, Faro-PC3, Faro-PC4).
- Sede:** A central node connected to the main network.
- Other nodes:** Various other routers and hosts labeled with 'ipterm' and 'eth' interfaces.

### Conexão com o exterior

Coimbra:

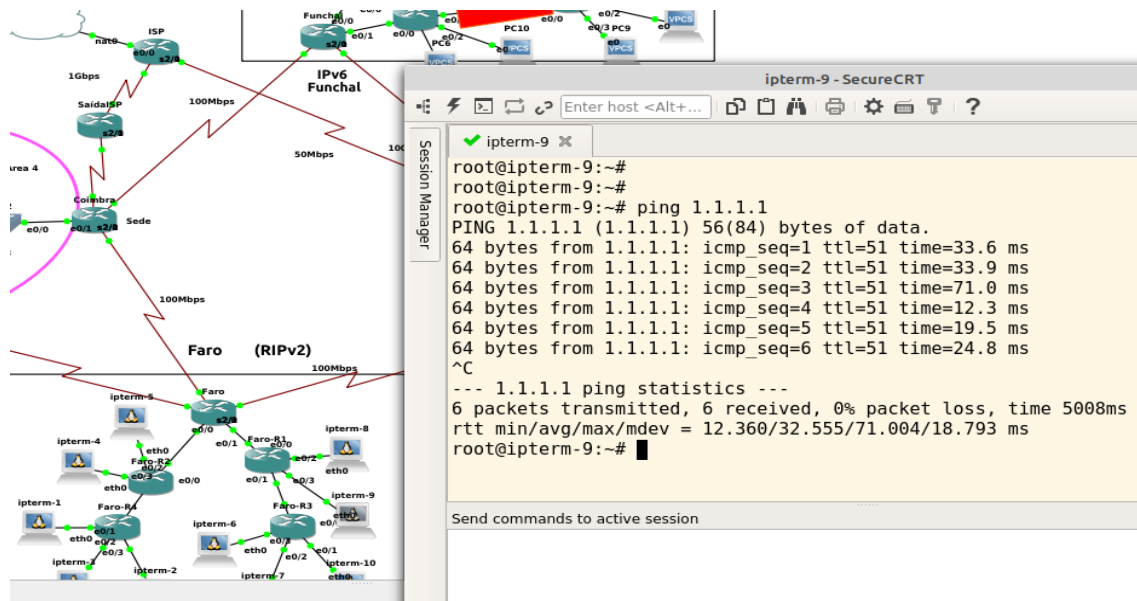
**Terminal Output (ipterm-43 - SecureCRT):**

```
root@ipterm-43:~# ping 1.1.1.1  
PING 1.1.1.1 (1.1.1.1) 56(84) bytes of data.  
64 bytes from 1.1.1.1: icmp_seq=1 ttl=52 time=36.3 ms  
64 bytes from 1.1.1.1: icmp_seq=2 ttl=52 time=25.7 ms  
64 bytes from 1.1.1.1: icmp_seq=3 ttl=52 time=19.7 ms  
64 bytes from 1.1.1.1: icmp_seq=4 ttl=52 time=17.6 ms  
64 bytes from 1.1.1.1: icmp_seq=5 ttl=52 time=17.5 ms  
64 bytes from 1.1.1.1: icmp_seq=6 ttl=52 time=16.9 ms  
64 bytes from 1.1.1.1: icmp_seq=7 ttl=52 time=55.5 ms  
^C  
--- 1.1.1.1 ping statistics ---  
7 packets transmitted, 7 received, 0% packet loss, time 6009ms  
rtt min/avg/max/mdev = 16.924/27.075/55.580/13.294 ms  
root@ipterm-43:~#
```

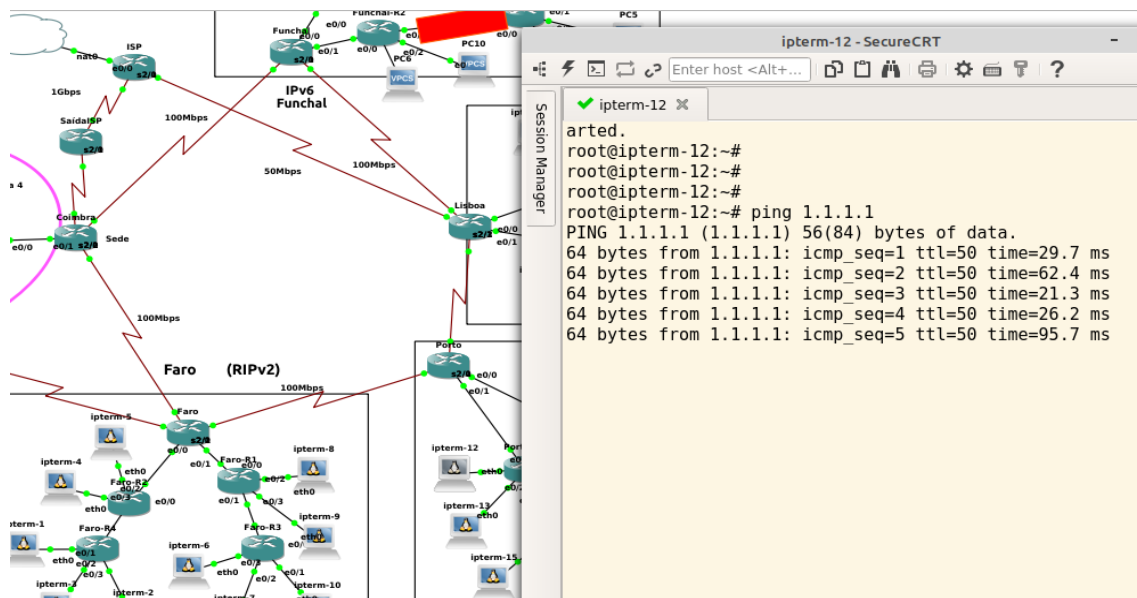
**Network Diagram:** The diagram shows a network topology with Coimbra as a central node. Key components include:

- Coimbra:** A central hub with multiple interfaces (e0/0, e0/1, e0/2, e0/3) connected to various other nodes.
- ISP:** Internet Service Provider at the top left.
- Funchal:** A central hub with multiple interfaces (e0/0, e0/1, e0/2, e0/3) connected to various other nodes.
- Porto:** A cluster of routers (Porto-R1, Porto-R2, Porto-R3, Porto-R4) and hosts (Porto-PC1, Porto-PC2, Porto-PC3, Porto-PC4).
- Faro:** A cluster of routers (Faro-R1, Faro-R2, Faro-R3, Faro-R4) and hosts (Faro-PC1, Faro-PC2, Faro-PC3, Faro-PC4).
- Sede:** A central node connected to the main network.
- Other nodes:** Various other routers and hosts labeled with 'ipterm' and 'eth' interfaces.

Faro:



Porto:



Lisboa:

