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LABORATÓRIO 11

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11 INTERLIGAÇÃO DE DUAS REDES ATRAVÉS DE UM ROTEADOR

- Anotar os endereços de hardware (ou MAC) e IP de cada dispositivo na rede. No terminal de cada PC execute:

```
root@pc1:/# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.20 netmask 255.255.255.0 broadcast 0.0.0.0
    inet6 fe80::4000:aaff:fe00:0 prefixlen 64 scopeid 0x20<link>
    ether 42:00:aa:00:00:00 txqueuelen 50 (Ethernet)
    RX packets 108 bytes 8656 (8.4 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
root@pc2:/# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.0.21 netmask 255.255.255.0 broadcast 0.0.0.0
    inet6 fe80::4000:aaff:fe00:1 prefixlen 64 scopeid 0x20<link>
    ether 42:00:aa:00:00:01 txqueuelen 50 (Ethernet)
    RX packets 106 bytes 8476 (8.2 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
root@pc3:/# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::4000:aaff:fe00:3 prefixlen 64 scopeid 0x20<link>
    ether 42:00:aa:00:00:03 txqueuelen 50 (Ethernet)
    RX packets 105 bytes 8426 (8.2 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
root@pc4:/# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.1.21 netmask 255.255.255.0 broadcast 0.0.0.0
    inet6 fe80::4000:aaff:fe00:4 prefixlen 64 scopeid 0x20<link>
    ether 42:00:aa:00:00:04 txqueuelen 50 (Ethernet)
    RX packets 105 bytes 8426 (8.2 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 866 (866.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

- Observar, interpretar e anotar a tabela de roteamento em todos os hospedeiros pc1 - pc4 e no roteador router 1. Identificar os *default gateways* em cada PC.

```
root@pc1:/# route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
default          10.0.0.1        0.0.0.0         UG    0      0      0 eth0
10.0.0.0          0.0.0.0         255.255.255.0   U      0      0      0 eth0
```

```
root@pc2:/# route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
default          10.0.0.1        0.0.0.0         UG    0      0      0 eth0
10.0.0.0          0.0.0.0         255.255.255.0   U      0      0      0 eth0
```

```
root@pc3:/# route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
root@pc3:/#
```

```
root@pc4:/# route
Kernel IP routing table
Destination      Gateway         Genmask         Flags Metric Ref    Use Iface
default          10.0.1.1        0.0.0.0         UG    0      0      0 eth0
10.0.1.0          0.0.0.0         255.255.255.0   U      0      0      0 eth0
```

- Observar, "provar" e anotar que pacotes indo do pc1 para pc2 são enviados diretamente para pc2, ou seja, entrega direta. Explique a entrega direta.

The screenshot displays a network traffic capture tool interface with a list of captured packets. The packets show ICMP echo requests from 10.0.0.1 to 224.0.0.9 and responses from 224.0.0.9 to 10.0.0.1. A terminal window titled 'IMUNES: pc1 (console) bash' is overlaid on the bottom, showing the output of a 'ping' command, which displays the size of the packets (64 bytes), the sequence number (icmp_seq), the TTL (64), and the round-trip time (ranging from 0.064 ms to 0.140 ms).

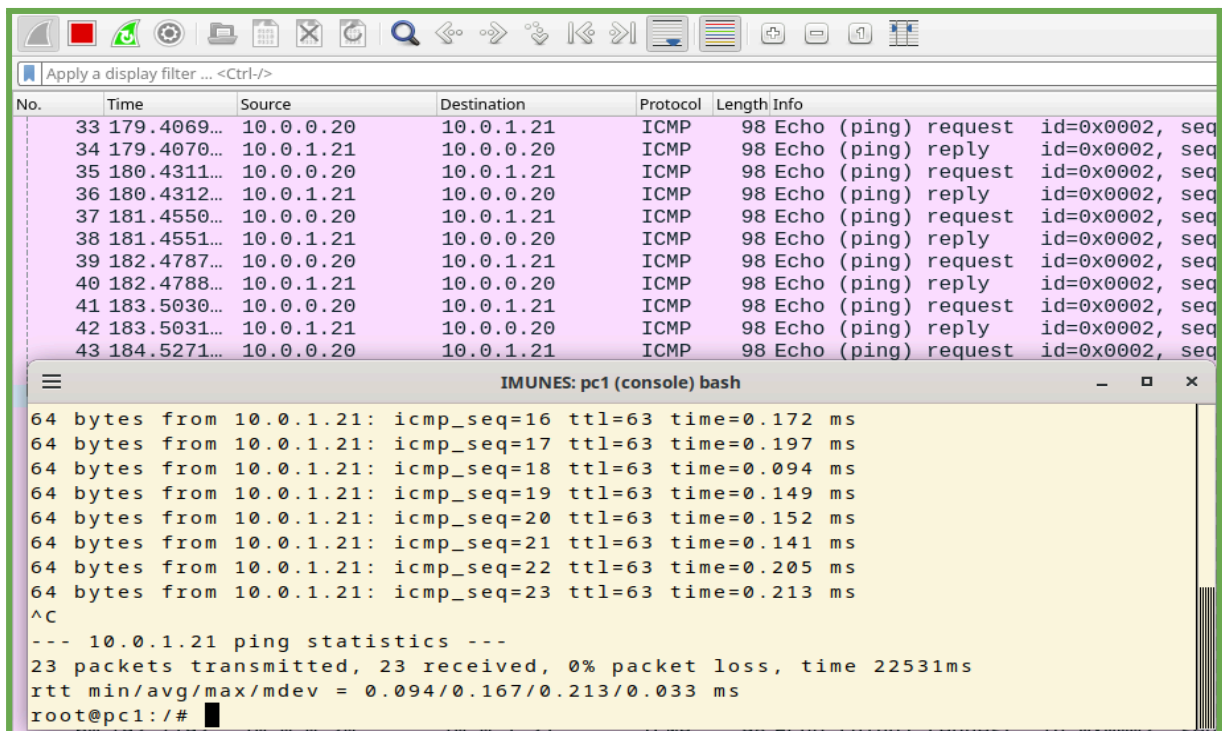
No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.0.0.1	224.0.0.9	RIPv2	66	Request
2	0.000054	fe80::4000:aaf...	ff02::9	RIPng	86	Command Request, Version 1
3	0.011176	10.0.0.1	224.0.0.22	IGMP...	54	Membership Report / Join group 224.0.0.9 for any sources
4	0.686721	10.0.0.1	224.0.0.22	IGMP...	54	Membership Report / Join group 224.0.0.9 for any sources
5	9.274527	42:00:aa:00:00...	Broadcast	ARP	42	Who has 10.0.0.21? Tell 10.0.0.20
6	32.517821	10.0.0.1	224.0.0.9	RIPv2	66	Response

```
IMUNES: pc1 (console) bash
64 bytes from 10.0.0.21: icmp_seq=11 ttl=64 time=0.099 ms
64 bytes from 10.0.0.21: icmp_seq=12 ttl=64 time=0.140 ms
64 bytes from 10.0.0.21: icmp_seq=13 ttl=64 time=0.093 ms
64 bytes from 10.0.0.21: icmp_seq=14 ttl=64 time=0.108 ms
64 bytes from 10.0.0.21: icmp_seq=15 ttl=64 time=0.150 ms
64 bytes from 10.0.0.21: icmp_seq=16 ttl=64 time=0.099 ms
64 bytes from 10.0.0.21: icmp_seq=17 ttl=64 time=0.107 ms
64 bytes from 10.0.0.21: icmp_seq=18 ttl=64 time=0.064 ms
```

- Observar, "provar" e anotar que pacotes indo de pc1 para pc4 são encaminhados ao roteador e, em seguida, entregues ao destino, ou seja, entrega indireta.

Explique a entrega indireta:

A entrega indireta acontece quando tentamos se comunicar com um dispositivo com uma faixa de IP e Máscara de Rede diferente do mesmo, para isso configuramos um Roteador Padrão (Gateway), para cada dispositivo de uma sub-rede, com isso os dados são enviados ao roteador responsável por ligar as duas sub-redes, e quem faz a entrega de uma para a outra é o roteador de uma interface para a outra!



No.	Time	Source	Destination	Protocol	Length	Info
33	179.4069...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...
34	179.4070...	10.0.1.21	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0002, seq=...
35	180.4311...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...
36	180.4312...	10.0.1.21	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0002, seq=...
37	181.4550...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...
38	181.4551...	10.0.1.21	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0002, seq=...
39	182.4787...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...
40	182.4788...	10.0.1.21	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0002, seq=...
41	183.5030...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...
42	183.5031...	10.0.1.21	10.0.0.20	ICMP	98	Echo (ping) reply id=0x0002, seq=...
43	184.5271...	10.0.0.20	10.0.1.21	ICMP	98	Echo (ping) request id=0x0002, seq=...


```

IMUNES: pc1 (console) bash
64 bytes from 10.0.1.21: icmp_seq=16 ttl=63 time=0.172 ms
64 bytes from 10.0.1.21: icmp_seq=17 ttl=63 time=0.197 ms
64 bytes from 10.0.1.21: icmp_seq=18 ttl=63 time=0.094 ms
64 bytes from 10.0.1.21: icmp_seq=19 ttl=63 time=0.149 ms
64 bytes from 10.0.1.21: icmp_seq=20 ttl=63 time=0.152 ms
64 bytes from 10.0.1.21: icmp_seq=21 ttl=63 time=0.141 ms
64 bytes from 10.0.1.21: icmp_seq=22 ttl=63 time=0.205 ms
64 bytes from 10.0.1.21: icmp_seq=23 ttl=63 time=0.213 ms
^C
--- 10.0.1.21 ping statistics ---
23 packets transmitted, 23 received, 0% packet loss, time 22531ms
rtt min/avg/max/mdev = 0.094/0.167/0.213/0.033 ms
root@pc1:/#

```

11.3 Configuração básica de interface de rede

- Configurando PC3

```

root@pc3:/# ping 10.0.0.20
ping 10.0.1.21
ping: connect: Network is unreachable
ping: connect: Network is unreachable
root@pc3:/#

```

- CONFIGURAÇÃO ATRAVÉS DOS COMANDOS NO SSH.

```
ip addr add 10.0.1.22/24 dev eth0
ip route add default via 10.0.1.1
```

```
root@pc3:/# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          10.0.1.1         0.0.0.0          UG    0      0      0 eth0
10.0.1.0         0.0.0.0         255.255.255.0    U      0      0      0 eth0
root@pc3:/# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 10.0.1.22 netmask 255.255.255.0  broadcast 0.0.0.0
    inet6 fe80::4000:aaff:fe00:3  prefixlen 64  scopeid 0x20<link>
    ether 42:00:aa:00:00:03  txqueuelen 50  (Ethernet)
    RX packets 219  bytes 16066 (15.6 KiB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 15  bytes 1146 (1.1 KiB)
    TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo0: flags=73<UP,LOOPBACK,RUNNING>  mtu 16384
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1  prefixlen 128  scopeid 0x10<host>
    loop txqueuelen 1000  (Local Loopback)
    RX packets 4  bytes 324 (324.0 B)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 4  bytes 324 (324.0 B)
    TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

root@pc3:/# █
```

- TESTES DE PING

DE PC3 PARA PC4

DE PC4 PARA PC1

```
root@pc3:/# ping 10.0.1.21
PING 10.0.1.21 (10.0.1.21) 56(84) bytes of data.
64 bytes from 10.0.1.21: icmp_seq=1 ttl=64 time=0.090 ms
64 bytes from 10.0.1.21: icmp_seq=2 ttl=64 time=0.149 ms
64 bytes from 10.0.1.21: icmp_seq=3 ttl=64 time=0.139 ms
^C
--- 10.0.1.21 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2047ms
rtt min/avg/max/mdev = 0.090/0.126/0.149/0.025 ms
root@pc3:/# ping 10.0.0.20
PING 10.0.0.20 (10.0.0.20) 56(84) bytes of data.
64 bytes from 10.0.0.20: icmp_seq=1 ttl=63 time=0.133 ms
64 bytes from 10.0.0.20: icmp_seq=2 ttl=63 time=0.207 ms
64 bytes from 10.0.0.20: icmp_seq=3 ttl=63 time=0.156 ms
^C
--- 10.0.0.20 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2033ms
rtt min/avg/max/mdev = 0.133/0.165/0.207/0.030 ms
root@pc3:/# █
```

DE PC2 PARA PC3

```
root@pc2:/# ping 10.0.1.22
PING 10.0.1.22 (10.0.1.22) 56(84) bytes of data.
64 bytes from 10.0.1.22: icmp_seq=1 ttl=63 time=0.135 ms
64 bytes from 10.0.1.22: icmp_seq=2 ttl=63 time=0.170 ms
64 bytes from 10.0.1.22: icmp_seq=3 ttl=63 time=0.198 ms
64 bytes from 10.0.1.22: icmp_seq=4 ttl=63 time=0.206 ms
^C
--- 10.0.1.22 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3069ms
rtt min/avg/max/mdev = 0.135/0.177/0.206/0.027 ms
```