

# Redes de Computadores A

## Lab. 1

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# IP e Máscara de Rede

- Endereço IP - Responsável por identificar um computador, em que este trocará pacotes de dados entre outros computadores pela rede (LAN & WAN)
  - contém 32 Bits.
  - 192.168.1.4
  - 11000000.10101000.0000001.00000100
  - Octetos
- Máscara de Rede - Máscara parte do IP, dividindo em endereço de rede e host
  - Rede - 192.168.1 e Host - 4

# IP e Máscara de Rede

Classe	Máscara de sub-rede padrão
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0

- Ex. de máscara
  - Máscara: 255.255.255.0
  - Binário: 1111111.11111111.11111111.0000000
  - 0 - Host e 1 - Rede
  - 254 hosts possíveis (1-254)
  - 1 broadcast (255)
  - 1 rede (0)

# IP e Máscara de Rede

11000000.10101000.0000001.00001001 (IP estático 1 - 192.168.1.9)

11111111.11111111.11111111.00000000 (Máscara - 255.255.255.0)

AND

11000000.10101000.0000001.00000000 (Rede local - 192.168.1.0)

11000000.10101000.0000001.00000100 (IP estático 2 - 192.168.1.4)

11111111.11111111.11111111.00000000 (Máscara - 255.255.255.0)

AND

11000000.10101000.0000001.00000000 (Rede local - 192.168.1.0)

11000000.10101000.0000001.00000000 (Rede local - 192.168.1.0)

11000000.10101000.0000001.00000000 (Rede local - 192.168.1.0)

XOR

00000000.00000000.00000000.00000000 (Comparação - 000.000.000.000)

# SCP (Secure Copy)

- Protocolo de Rede para transferência de arquivos
- Troca segura - entre dois locais
- Mistura entre RCP(Remote Copy Protocol) e SSH(Secure Shell)
- RCP - Cópia Remota de de um ou mais arquivos entre máquinas
- SSH - permite que os usuários controlem e modifiquem seus servidores remotos na internet

# Configurando IP estático

1

```
aluno@p: /etc/netplan
aluno@p:~$ cd /etc/netplan
aluno@p:/etc/netplan$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 78:2b:cb:ec:71:aa brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.114/22 brd 172.16.3.255 scope global dynamic noprefixroute enp2s0
        valid_lft 84536sec preferred_lft 84536sec
    inet6 fe80::7a2b:cbff:feec:71aa/64 scope link
        valid_lft forever preferred_lft forever
aluno@p:/etc/netplan$
```

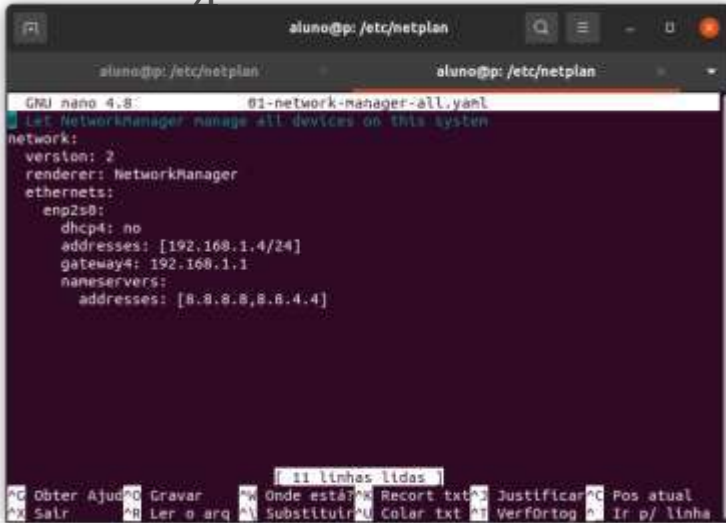
2

```
aluno@p: /etc/netplan
aluno@p:/etc/netplan$ sudo nano 01-network-manager-all.yaml
```

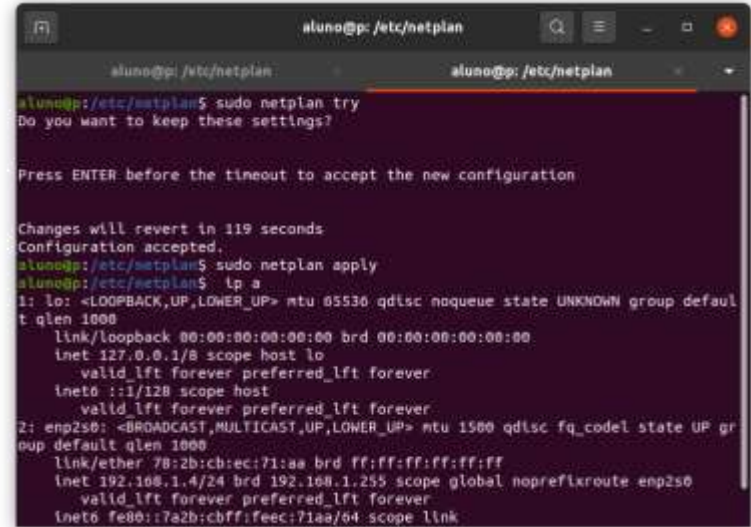
# Configurando IP estático

3

4



```
aluno@pi: /etc/netplan
aluno@pi: /etc/netplan
GNU nano 4.8 @1-network-manager-all.yaml
# Let NetworkManager manage all devices on this system
network:
  version: 2
  renderer: NetworkManager
  ethernet:
    enp2s0:
      dhcp4: no
      addresses: [192.168.1.4/24]
      gateway4: 192.168.1.1
      nameservers:
        addresses: [8.8.8.8,8.8.4.4]
```



```
aluno@pi: /etc/netplan
aluno@pi: /etc/netplan
aluno@pi: /etc/netplan$ sudo netplan try
Do you want to keep these settings?

Press ENTER before the timeout to accept the new configuration

Changes will revert in 119 seconds
Configuration accepted.
aluno@pi: /etc/netplan$ sudo netplan apply
aluno@pi: /etc/netplan$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 78:2b:cb:ec:71:aa brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.4/24 brd 192.168.1.255 scope global noprefroute enp2s0
        valid_lft forever preferred_lft forever
    inet6 fe80::7a2b:cbff:feec:71aa/64 scope link
```

/24 -> Quantidade de 1s antes do primeiro 0

# IPs antes e depois da configuração

```
aluno@:~/Downloads$ cat pc1_007a.txt
ifconfig

enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 172.16.0.114 netmask 255.255.252.0 broadcast 172.16.3.255
inet6 fe80::7a2b:cbff:feec:71aa prefixlen 64 scopeid 0x20<link>
ether 78:2b:cb:ec:71:aa txqueuelen 1000 (Ethernet)
RX packets 342337 bytes 242239484 (242.2 MB)
RX errors 0 dropped 1128 overruns 0 frame 0
TX packets 126239 bytes 23160091 (23.1 MB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Loopback Local)
RX packets 450 bytes 33825 (33.8 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 450 bytes 33825 (33.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

após colocar ip estatico

```
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.1.9 netmask 255.255.255.0 broadcast 192.168.1.255
inet6 fe80::7a2b:cbff:feec:71f9 prefixlen 64 scopeid 0x20<link>
ether 78:2b:cb:ec:71:f9 txqueuelen 1000 (Ethernet)
RX packets 617 bytes 50220 (50.2 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 330 bytes 46681 (46.6 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Loopback Local)
RX packets 9006 bytes 662447 (662.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 9006 bytes 662447 (662.4 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
aluno@:~/Downloads$ cat pc2_007c.txt
ifconfig

enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 172.16.1.92 netmask 255.255.252.0 broadcast 172.16.3.255
inet6 fe80::7a2b:cbff:feec:71aa prefixlen 64 scopeid 0x20<link>
ether 78:2b:cb:ec:71:aa txqueuelen 1000 (Ethernet)
RX packets 9271 bytes 6081465 (6.0 MB)
RX errors 0 dropped 44 overruns 0 frame 0
TX packets 3105 bytes 301211 (301.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Loopback Local)
RX packets 466 bytes 47803 (47.8 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 466 bytes 47803 (47.8 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

ifconfig depois de setar o ip estático:

```
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 192.168.1.4 netmask 255.255.255.0 broadcast 192.168.1.255
inet6 fe80::7a2b:cbff:feec:71aa prefixlen 64 scopeid 0x20<link>
ether 78:2b:cb:ec:71:aa txqueuelen 1000 (Ethernet)
RX packets 102039 bytes 15076932 (15.0 MB)
RX errors 0 dropped 667 overruns 0 frame 0
TX packets 7957 bytes 1096890 (1.0 MB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
inet 127.0.0.1 netmask 255.0.0.0
inet6 ::1 prefixlen 128 scopeid 0x10<host>
loop txqueuelen 1000 (Loopback Local)
RX packets 3252 bytes 296760 (296.7 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 3252 bytes 296760 (296.7 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



# Comandos SCP para envio e coleta de arquivo

- Enviando para o PC 1

```
scp /home/aluno/Downloads/PC2_007C.txt  
aluno@192.168.1.9:/home/aluno/Downloads
```

```
scp /home/aluno/Downloads/PC2_007C.txt aluno@192.168.1.9:/home/aluno/Downloads
```

- Pegando do PC 1

```
scp aluno@192.168.1.9:/home/aluno/Downloads/PC1_007A.txt  
aluno@192.168.1.4:/home/aluno/Downloads
```

```
scp aluno@192.168.1.9:/home/aluno/Downloads/PC1_007A.txt aluno@192.168.1.4:/home/aluno/Downloads
```

# Wireshark

The screenshot shows the Wireshark network protocol analyzer interface. The main window title is \*enp2s0. The menu bar includes File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Wireless, Tools, and Help. The toolbar contains various icons for capture, analysis, and display. The packet list pane shows a list of captured packets with columns for No., Time, Source, Destination, Protocol, and Length. The selected packet (No. 325) is highlighted in blue. The packet details pane shows the structure of the selected packet, including Ethernet II, Internet Protocol Version 4, and Transmission Control Protocol. The status bar at the bottom indicates that 772 packets are displayed, with 59 (7.6%) shown. The profile is set to Default.

No.	Time	Source	Destination	Protocol	Length	Info
325	127.638190469	192.168.1.4	192.168.1.9	TCP	74	41872 → 22 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 SACK_PERM=1 T...
326	127.638128237	192.168.1.9	192.168.1.4	TCP	74	22 → 41872 [SYN, ACK] Seq=0 Ack=1 Win=65168 Len=0 MSS=1460 SA...
327	127.638410085	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSval=2492168248...
328	127.638643980	192.168.1.4	192.168.1.9	SSHv2	187	Client: Protocol (SSH-2.0-OpenSSH.8.2p1 Ubuntu-4ubuntu0.4)
329	127.638699177	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1 Ack=42 Win=65157 Len=0 TSval=917685886...
330	127.652784065	192.168.1.9	192.168.1.4	SSHv2	187	Server: Protocol (SSH-2.0-OpenSSH.8.2p1 Ubuntu-4ubuntu0.4)
331	127.652866129	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=42 Ack=42 Win=64256 Len=0 TSval=24921682...
332	127.653593418	192.168.1.9	192.168.1.4	SSHv2	1122	Server: Key Exchange Init
333	127.653729035	192.168.1.4	192.168.1.9	SSHv2	1578	Client: Key Exchange Init
334	127.653743201	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1898 Ack=1554 Win=63872 Len=0 TSval=9176...
335	127.653929450	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1554 Ack=1898 Win=64128 Len=0 TSval=2492...
336	127.657890493	192.168.1.4	192.168.1.9	SSHv2	114	Client: Diffie-Hellman Key Exchange Init
337	127.657825762	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1898 Ack=1862 Win=64128 Len=0 TSval=9176...
338	127.662911744	192.168.1.9	192.168.1.4	SSHv2	574	Server: Diffie-Hellman Key Exchange Reply, New Keys, Encrypts...
339	127.663145888	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1692 Ack=1898 Win=64128 Len=0 TSval=2492...
340	127.666668879	192.168.1.4	192.168.1.9	SSHv2	82	Client: New Keys
341	127.666710885	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1696 Ack=1618 Win=64128 Len=0 TSval=9176...
342	127.667291989	192.168.1.4	192.168.1.9	SSHv2	118	Client: Encrypted packet (len=44)
343	127.667226795	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1696 Ack=1662 Win=64128 Len=0 TSval=9176...
344	127.667361883	192.168.1.9	192.168.1.4	SSHv2	118	Server: Encrypted packet (len=44)
345	127.667456995	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1682 Ack=1650 Win=64128 Len=0 TSval=2492...
346	127.667490896	192.168.1.4	192.168.1.9	SSHv2	134	Client: Encrypted packet (len=68)
347	127.667506839	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1650 Ack=1730 Win=64128 Len=0 TSval=9176...
348	127.673171544	192.168.1.9	192.168.1.4	SSHv2	118	Server: Encrypted packet (len=52)
349	127.673261330	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1730 Ack=1792 Win=64128 Len=0 TSval=2492...
350	132.625709577	192.168.1.4	192.168.1.9	SSHv2	214	Client: Encrypted packet (len=148)
351	132.625764277	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1702 Ack=1878 Win=64128 Len=0 TSval=9176...
352	132.648245470	192.168.1.9	192.168.1.4	SSHv2	94	Server: Encrypted packet (len=28)
353	132.648397954	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1878 Ack=1730 Win=64128 Len=0 TSval=2492...
354	132.648582853	192.168.1.4	192.168.1.9	SSHv2	178	Client: Encrypted packet (len=112)
355	132.691934974	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=1730 Ack=1990 Win=64128 Len=0 TSval=9176...
356	132.757688705	192.168.1.9	192.168.1.4	SSHv2	694	Server: Encrypted packet (len=626)
357	132.890718493	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1990 Ack=2350 Win=64128 Len=0 TSval=2492...
358	132.890777451	192.168.1.9	192.168.1.4	SSHv2	118	Server: Encrypted packet (len=44)
359	132.881883864	192.168.1.4	192.168.1.9	TCP	66	41872 → 22 [ACK] Seq=1990 Ack=2492 Win=64128 Len=0 TSval=2492...
360	132.881369317	192.168.1.4	192.168.1.9	SSHv2	226	Client: Encrypted packet (len=166)
361	132.881415851	192.168.1.9	192.168.1.4	TCP	66	22 → 41872 [ACK] Seq=2492 Ack=2150 Win=64128 Len=0 TSval=9176...
362	132.883248342	192.168.1.9	192.168.1.4	SSHv2	138	Server: Encrypted packet (len=72)

Frame 325: 74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface enp2s0, id 0  
78 2b cb ec 71 f9 78 2b cb ec 71 aa 08 00 45 00 \*x\* q x\* q . E

wireshark\_enp2s0\_20220223061515\_Zukmsb.pcapng Packets: 772 · Displayed: 59 (7.6%) Profile: Default

# Wireshark

The screenshot displays the Wireshark interface with a list of captured packets. The interface includes a menu bar (File, Edit, Capture, Analyze, Statistics, Telephony, Wireless, Tools, Help), a toolbar with various icons, and a packet list pane. The packet list pane shows a table of captured packets with columns for Source, Destination, Protocol, and Length. The selected packet (packet 214) is highlighted in blue. Below the packet list, the packet bytes pane shows the raw data of the selected packet, which is an encrypted SSHv2 packet. The status bar at the bottom indicates that 74 bytes (592 bits) were captured on interface emp2s0, and 59 packets (7.0%) are currently displayed.

Source	Destination	Protocol	Length	Info
192.168.1.4	192.168.1.9	SSHv2	134	Client: Encrypted packet (len=68)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=1650 Ack=1738 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	118	Server: Encrypted packet (len=52)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=1730 Ack=1782 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	214	Client: Encrypted packet (len=148)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=1702 Ack=1878 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	94	Server: Encrypted packet (len=28)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=1878 Ack=1738 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	178	Client: Encrypted packet (len=112)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=1730 Ack=1990 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	694	Server: Encrypted packet (len=628)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=1900 Ack=2358 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	110	Server: Encrypted packet (len=44)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=1900 Ack=2402 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	226	Client: Encrypted packet (len=160)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=2402 Ack=2150 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	138	Server: Encrypted packet (len=72)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=2150 Ack=2474 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	182	Client: Encrypted packet (len=36)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=2474 Ack=2186 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	126	Server: Encrypted packet (len=60)
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=2186 Ack=2534 Win=64128 Len=0 TSval=2492...
192.168.1.4	192.168.1.9	SSHv2	182	Client: Encrypted packet (len=36)
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=2534 Ack=2222 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	SSHv2	1514	Server: Encrypted packet (len=5448)
192.168.1.9	192.168.1.4	SSHv2	286	Server: Encrypted packet (len=220)
192.168.1.4	192.168.1.9	TCP	66	41872 -> 22 [ACK] Seq=2222 Ack=4202 Win=63872 Len=0 TSval=2492...
192.168.1.9	192.168.1.4	SSHv2	192	Client: Encrypted packet (len=36)
192.168.1.4	192.168.1.9	TCP	66	22 -> 41872 [ACK] Seq=4202 Ack=2258 Win=64128 Len=0 TSval=9176...
192.168.1.9	192.168.1.4	SSHv2	242	Server: Encrypted packet (len=176)
192.168.1.4	192.168.1.9	TCP	66	41872 -> 22 [ACK] Seq=2258 Ack=4378 Win=64128 Len=0 TSval=2492...
192.168.1.9	192.168.1.4	SSHv2	182	Client: Encrypted packet (len=36)
192.168.1.4	192.168.1.9	TCP	66	22 -> 41872 [ACK] Seq=4378 Ack=2294 Win=64128 Len=0 TSval=9176...
192.168.1.9	192.168.1.4	SSHv2	126	Client: Encrypted packet (len=60)
192.168.1.4	192.168.1.9	TCP	66	41872 -> 22 [FIN, ACK] Seq=2354 Ack=4378 Win=64128 Len=0 TSval=...
192.168.1.9	192.168.1.4	TCP	66	22 -> 41872 [ACK] Seq=4378 Ack=2354 Win=64128 Len=0 TSval=9176...
192.168.1.4	192.168.1.9	TCP	66	22 -> 41872 [FIN, ACK] Seq=4378 Ack=2355 Win=64128 Len=0 TSval=...
192.168.1.9	192.168.1.4	TCP	66	41872 -> 22 [ACK] Seq=2355 Ack=4379 Win=64128 Len=0 TSval=2492...

74 bytes on wire (592 bits), 74 bytes captured (592 bits) on interface emp2s0, id 0  
b ec 71 f9 78 78 cd ec 71 88 80 45 80 x+ q h+ :q E

ark\_emp2s0\_20220223061515\_Zukmsb.pcapng

Packets: 840 · Displayed: 59 (7.0%) Profile: Default

# Referências Bibliográficas

- [youtu.be/NjmcUYLmhj0](https://youtu.be/NjmcUYLmhj0)
- [youtu.be/hhELDjHRz\\_0](https://youtu.be/hhELDjHRz_0)
- [hostinger.com.br/tutoriais/usar-comando-scp-linux-para-transferir-arquivos](https://hostinger.com.br/tutoriais/usar-comando-scp-linux-para-transferir-arquivos)
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