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LABORATÓRIO 1

USANDO MINHA MÁQUINA

USANDO IFCONFIG OU IP A

1. Quantas e quais interfaces de rede sua máquina possui? Liste.
2. Quais são os endereços da camada 2 atribuídos às mesmas? De onde o sistema obteve esses endereços?
3. Quais são os endereços IPv4? De onde o sistema obteve esses endereços?
4. Suas interfaces tem IPv6 configurado? Qual o endereço e escopo dos mesmos?
5. Use o link Verificando a estrutura do endereço IP para explorar a estrutura do seu endereço IPv4 da interface eth0. Recorte e cole no relatório.

```
nathan1@nathan1:~$ 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 noprefixroute
        valid_lft forever preferred_lft forever
2: wlp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 00:45:e2:96:98:c3 brd ff:ff:ff:ff:ff:ff
    inet 191.36.11.22/23 brd 191.36.11.255 scope global dynamic noprefixroute wlp1s0
        valid_lft 2413sec preferred_lft 2413sec
    inet6 2804:1454:1004:530::10d1/128 scope global dynamic noprefixroute
        valid_lft 603614sec preferred_lft 603614sec
    inet6 2804:1454:1004:530:ff4f:dc9c:4912:8ae9/64 scope global dynamic noprefixroute
        valid_lft 2591594sec preferred_lft 604394sec
    inet6 fe80::e2a8:caff:3038:f446/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

1-

Possui ao total duas interfaces de rede, elas são “lo” e “wlp1s0”.

2-

Para “lo” o endereço de camada 2 é “00:00:00:00:00:00”.

O endereço de Camada 2 de uma interface de loopback não existe porque a interface de loopback opera na camada de rede (Camada 3) e não possui uma conexão física ou lógica com a rede, sendo um circuito virtual.

Para “wlp1s0” o endereço de camada 2 é “00:45:e2:96:98:c3”.

Este endereço MAC (Media Access Control) foi gravado no hardware da placa de rede pelo fabricante. É um identificador único globalmente que permite que a placa de rede seja identificada de forma única em uma rede local.

3-

Os endereços ipv4 são:

Para interface “lo”: **inet 127.0.0.1/8 scope host lo**

*Este é um endereço fixo e universalmente padronizado

Para interface “wlp1s0”: **inet 191.36.11.22/23 brd 191.36.11.255 scope global dynamic
noprefixroute wlp1s0**

*Este endereço foi obtido de forma dinâmica através de um servidor DHCP

4-

Sim, tem ipv6 configurado para ambas interfaces.

Para interface “lo”: **inet6 ::1/128 scope host noprefixroute**

Escopo: “host”.

Para interface “wlp1s0”:

inet6 2804:1454:1004:530::10d1/128 scope global dynamic noprefixroute

Escopo: “global” .

inet6 2804:1454:1004:530:ff4f:dc9c:4912:8ae9/64 scope global dynamic noprefixroute

Escopo: “global” .

inet6 fe80::e2a8:caff:3038:f446/64 scope link noprefixroute

Escopo: “link” .

5-



Address (Host or Network)	Netmask (i.e. 24)	Netmask for sub/supernet (optional)
<input type="text" value="191.36.11.22"/>	<input type="text" value="23"/>	move to: <input type="text"/>
<input type="button" value="Calculate"/>	<input type="button" value="Help"/>	

```
Address: 191.36.11.22      10111111.00100100.0000101 1.00010110
Netmask: 255.255.254.0 = 23 11111111.11111111.1111111 0.00000000
Wildcard: 0.0.1.255        00000000.00000000.0000000 1.11111111
=>
Network: 191.36.10.0/23    10111111.00100100.0000101 0.00000000 (Class B)
Broadcast: 191.36.11.255  10111111.00100100.0000101 1.11111111
HostMin: 191.36.10.1      10111111.00100100.0000101 0.00000001
HostMax: 191.36.11.254    10111111.00100100.0000101 1.11111110
Hosts/Net: 510
```

USANDO O COMANDO PING

Tarefa:

- Envie **ping4** para diferentes *hosts* e compare os tempos de resposta:
 - No endereço local de *loopback*;
 - servidores externos:
 - ifsc.edu.br
 - www.uol.com.br
 - www.aaa.jp
 - Explique as diferenças entre os tempos de resposta dos **ping** realizados:
 - Entre ping para diferentes destinos.
 - Entre respostas recebidas de um mesmo destino.
 - Consulte as páginas **man** e teste o ping com os parâmetros abaixo e descreva suas funcionalidades:
 - c count
 - i intervalo
 - s packetsize
 - t ttl (para um site distante inicie com 1 e vá incrementando, observe as mensagens). Com essa estratégia é possível mapear os roteadores no caminho entre a origem e o destino de um pacote e é exatamente a estratégia utilizada pelo **traceroute**.
- Observe que também é possível realizar ping em endereços no formato IPv6, desde que seu computador tenha IPv6 configurado, por exemplo:

```
ping6 ipv6.br
```

- Tente o ping6 para outros sites.

1.1 - LOCALHOST

```
nathan1@nathan1:~$ ping4 127.0.0.1
PING 127.0.0.1 (127.0.0.1) 56(84) bytes of data.
64 bytes from 127.0.0.1: icmp_seq=1 ttl=64 time=0.045 ms
64 bytes from 127.0.0.1: icmp_seq=2 ttl=64 time=0.064 ms
64 bytes from 127.0.0.1: icmp_seq=3 ttl=64 time=0.064 ms
64 bytes from 127.0.0.1: icmp_seq=4 ttl=64 time=0.061 ms
64 bytes from 127.0.0.1: icmp_seq=5 ttl=64 time=0.061 ms
64 bytes from 127.0.0.1: icmp_seq=6 ttl=64 time=0.061 ms
64 bytes from 127.0.0.1: icmp_seq=7 ttl=64 time=0.062 ms
64 bytes from 127.0.0.1: icmp_seq=8 ttl=64 time=0.064 ms
64 bytes from 127.0.0.1: icmp_seq=9 ttl=64 time=0.064 ms
^C
--- 127.0.0.1 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8176ms
rtt min/avg/max/mdev = 0.045/0.060/0.064/0.005 ms
```

1.2 - EXTERNOS

```
nathan1@nathan1:~$ ping4 ifsc.edu.br
PING ifsc.edu.br (191.36.0.94) 56(84) bytes of data.
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=1 ttl=54 time=16.1 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=2 ttl=54 time=14.1 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=3 ttl=54 time=13.1 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=4 ttl=54 time=21.5 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=5 ttl=54 time=14.3 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=6 ttl=54 time=14.6 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=7 ttl=54 time=16.7 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=8 ttl=54 time=16.0 ms
^C
--- ifsc.edu.br ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7013ms
rtt min/avg/max/mdev = 13.129/15.813/21.474/2.415 ms
```

```
nathan1@nathan1:~$ ping4 www.uol.com.br
PING (108.139.182.81) 56(84) bytes of data.
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=1 ttl=246 time=255 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=2 ttl=246 time=74.1 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=3 ttl=246 time=97.7 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=4 ttl=246 time=120 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=5 ttl=246 time=144 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=6 ttl=246 time=30.7 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=7 ttl=246 time=189 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=8 ttl=246 time=110 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=9 ttl=246 time=31.6 ms
64 bytes from server-108-139-182-81.gru3.r.cloudfront.net (108.139.182.81): icmp_seq=10 ttl=246 time=54.9 ms
^C
--- ping statistics ---
11 packets transmitted, 10 received, 9.09091% packet loss, time 10008ms
rtt min/avg/max/mdev = 30.696/110.633/254.531/67.311 ms

nathan1@nathan1:~$ ping4 www.aaa.jp
PING aaa.jp (219.94.128.109) 56(84) bytes of data.
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=1 ttl=47 time=419 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=2 ttl=47 time=409 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=3 ttl=47 time=638 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=4 ttl=47 time=457 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=5 ttl=47 time=481 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=6 ttl=47 time=505 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=7 ttl=47 time=528 ms
64 bytes from www899.sakura.ne.jp (219.94.128.109): icmp_seq=8 ttl=47 time=539 ms
^C
--- aaa.jp ping statistics ---
9 packets transmitted, 8 received, 11.1111% packet loss, time 9572ms
rtt min/avg/max/mdev = 409.392/497.064/638.148/69.277 ms
```

3 - DIFERENÇA DOS PINGS

3.1 -

A principal diferença entre os “pings” para diferentes destinos, acontece por conta da distância física. Percebemos essa diferença do tempo percorrido, de maneira significativa ao “pingar” em um servidor hospedado no Japão e outro no Brasil como o “ifsc.edu.br”.

Pode-se falar também do número de saltos.

Caminho para “ifsc.edu.br”: Um caminho curto, com poucos saltos.

Caminho para o “www.aaa.jp”: Um caminho muito mais longo, passando por dezenas de roteadores em diferentes países e continentes. Mais saltos significam mais tempo de processamento acumulado.

3.2 -

Esse fator é conhecido como “Jitter”, pode ser definido como atrasos irregulares no tempo de chegada dos pacotes de dados numa rede. Ele pode ser causado por diversos fatores como, congestionamento da rede, a conexão local (principalmente Wi-Fi), carga no servidor de destino.

4 - PARÂMETROS NO PING

-c count:

Define-se o número de pacotes que queremos enviar.

“Stop after sending count ECHO_REQUEST packets. With deadline option, ping waits for count ECHO_REPLY packets, until the timeout expires.”

```
nathan1@nathan1:~$ ping -c 5 ifsc.edu.br
PING ifsc.edu.br (191.36.0.94) 56(84) bytes of data.
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=1 ttl=54 time=61.3 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=2 ttl=54 time=17.3 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=3 ttl=54 time=19.4 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=4 ttl=54 time=14.5 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=5 ttl=54 time=12.8 ms

--- ifsc.edu.br ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4002ms
rtt min/avg/max/mdev = 12.772/25.073/61.344/18.278 ms
```

-i intervalo:

Define-se o intervalo de tempo (em segundos) entre os envios de pacotes.

“Wait interval seconds between sending each packet. Real number allowed with dot as a decimal separator (regardless locale setup). The default is to wait for one second between each packet normally, or not to wait in flood mode. Only super-user may set interval to values less than 2ms.”

```
nathan1@nathan1:~$ ping -c 5 -i 2 ifsc.edu.br
PING ifsc.edu.br (191.36.0.94) 56(84) bytes of data.
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=1 ttl=54 time=59.2 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=2 ttl=54 time=10.8 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=3 ttl=54 time=17.7 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=4 ttl=54 time=13.5 ms
64 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=5 ttl=54 time=17.9 ms

--- ifsc.edu.br ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 8012ms
rtt min/avg/max/mdev = 10.820/23.831/59.243/17.905 ms
```

-s packetsize:

Define-se o tamanho (em bytes) do pacote ICMP.

“Specifies the number of data bytes to be sent. The default is 56, which translates into 64 ICMP data bytes when combined with the 8 bytes of ICMP header data.”

```
nathan1@nathan1:~$ ping -c 5 -s 100 ifsc.edu.br
PING ifsc.edu.br (191.36.0.94) 100(128) bytes of data.
108 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=1 ttl=54 time=48.0 ms
108 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=2 ttl=54 time=15.2 ms
108 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=3 ttl=54 time=11.3 ms
108 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=4 ttl=54 time=21.8 ms
108 bytes from 191.36.0.94 (191.36.0.94): icmp_seq=5 ttl=54 time=134 ms

--- ifsc.edu.br ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 11.345/46.146/134.468/45.974 ms
```

-t ttl:

Configura o Time To Live (TTL), que limita o número de saltos (roteadores) que o pacote pode atravessar.

“ping only. Set the IP Time to Live.”

```
nathan1@nathan1:~$ ping -c 2 -t 1 www.aaa.jp
PING aaa.jp (219.94.128.109) 56(84) bytes of data.
From _gateway (192.168.0.1) icmp_seq=1 Time to live exceeded
From _gateway (192.168.0.1) icmp_seq=2 Time to live exceeded

--- aaa.jp ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1002ms

nathan1@nathan1:~$ ping -c 2 -t 2 www.aaa.jp
PING aaa.jp (219.94.128.109) 56(84) bytes of data.
From 10.44.0.1 (10.44.0.1) icmp_seq=1 Time to live exceeded
From 10.44.0.1 (10.44.0.1) icmp_seq=2 Time to live exceeded

--- aaa.jp ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1000ms

nathan1@nathan1:~$ ping -c 2 -t 3 www.aaa.jp
PING aaa.jp (219.94.128.109) 56(84) bytes of data.
From bd046749.virtua.com.br (189.4.103.73) icmp_seq=1 Time to live exceeded
From bd046749.virtua.com.br (189.4.103.73) icmp_seq=2 Time to live exceeded

--- aaa.jp ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1001ms

nathan1@nathan1:~$ ping -c 2 -t 4 www.aaa.jp
PING aaa.jp (219.94.128.109) 56(84) bytes of data.
From embratel-H0-5-0-0-4003-agg01.soons.embratel.net.br (201.72.74.189) icmp_seq=1 Time to live exceeded
From embratel-H0-5-0-0-4003-agg01.soons.embratel.net.br (201.72.74.189) icmp_seq=2 Time to live exceeded

--- aaa.jp ping statistics ---
2 packets transmitted, 0 received, +2 errors, 100% packet loss, time 1001ms
```

USANDO/TESTANDO PING COM IPV6

```
nathan1@nathan1:~$ ping6 ifsc.edu.br
ping6: ifsc.edu.br: Família de endereços não suportada para nome de máquina
nathan1@nathan1:~$ ping6 google.com
PING google.com(2800:3f0:4001:814::200e (2800:3f0:4001:814::200e)) 56 data bytes
64 bytes from 2800:3f0:4001:814::200e (2800:3f0:4001:814::200e): icmp_seq=1 ttl=113 time=108 ms
64 bytes from 2800:3f0:4001:814::200e (2800:3f0:4001:814::200e): icmp_seq=2 ttl=113 time=227 ms
64 bytes from 2800:3f0:4001:814::200e (2800:3f0:4001:814::200e): icmp_seq=3 ttl=113 time=45.8 ms
64 bytes from 2800:3f0:4001:814::200e (2800:3f0:4001:814::200e): icmp_seq=4 ttl=113 time=67.7 ms
^C
--- google.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 45.840/112.235/226.879/69.904 ms
nathan1@nathan1:~$ ping6 www.aaa.jp
ping6: www.aaa.jp: Família de endereços não suportada para nome de máquina
nathan1@nathan1:~$ ping6 www.gl.globo.com
ping6: www.gl.globo.com: Família de endereços não suportada para nome de máquina
nathan1@nathan1:~$ ping6 www.youtube.com
PING www.youtube.com(2800:3f0:4001:837::200e (2800:3f0:4001:837::200e)) 56 data bytes
64 bytes from 2800:3f0:4001:837::200e (2800:3f0:4001:837::200e): icmp_seq=1 ttl=114 time=230 ms
64 bytes from 2800:3f0:4001:837::200e (2800:3f0:4001:837::200e): icmp_seq=2 ttl=114 time=49.7 ms
64 bytes from 2800:3f0:4001:837::200e (2800:3f0:4001:837::200e): icmp_seq=3 ttl=114 time=71.7 ms
64 bytes from 2800:3f0:4001:837::200e (2800:3f0:4001:837::200e): icmp_seq=4 ttl=114 time=93.9 ms
64 bytes from 2800:3f0:4001:837::200e (2800:3f0:4001:837::200e): icmp_seq=5 ttl=114 time=116 ms
^C
--- www.youtube.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 49.663/112.350/230.057/62.921 ms
```