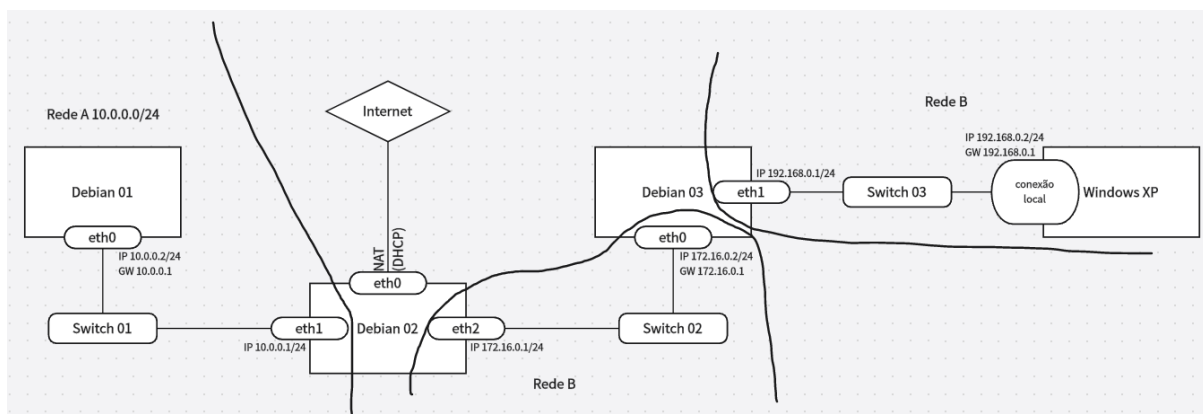


Mateus Francisco Venâncio de Oliveira

Configuração rede interna

22 de março de 2025

O tutorial a seguir, demonstra como configurar uma rede baseada na topologia abaixo



Configuração máquinas virtuais

1 – Instale o Oracle VM e os arquivos .ISO das máquinas debian através desses links:

<https://thiago.fatecourinhos.edu.br/arquivos.ISO/appliance> na aba Recursos

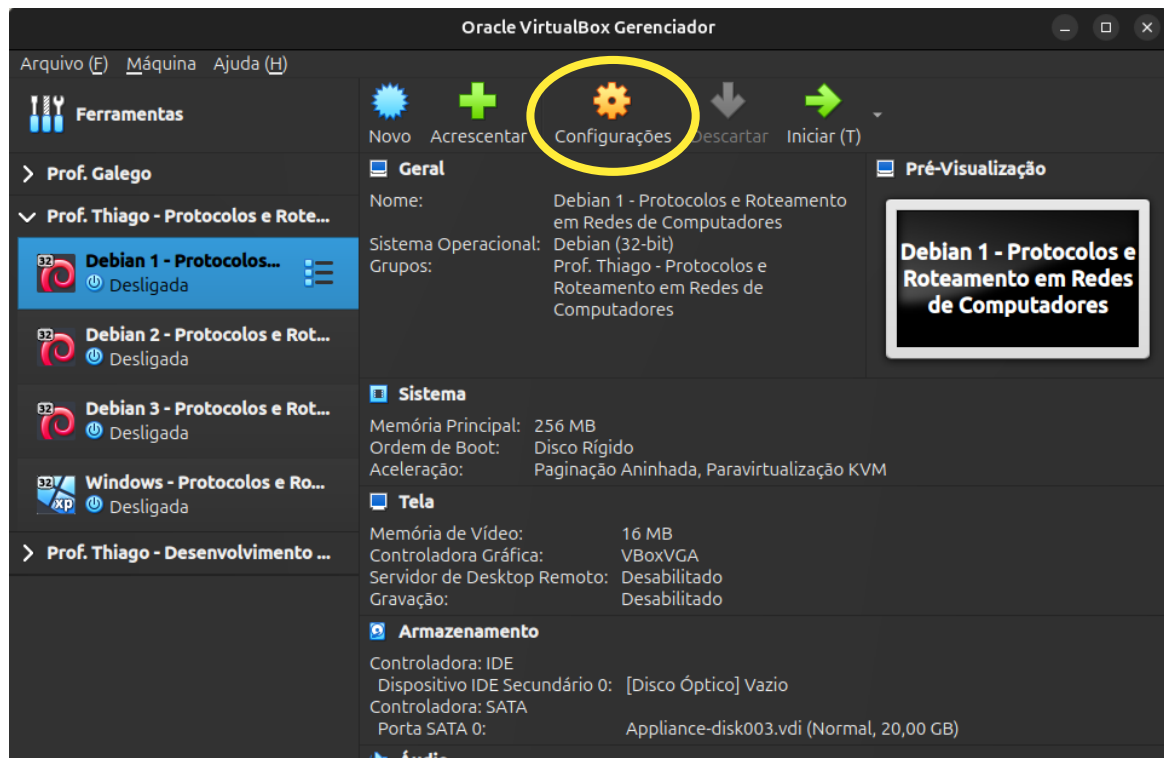
<https://www.oracle.com/br/virtualization/technologies/vm/downloads/virtualbox-downloads.html> Oracle VM

1.1 - Execute o instalador do Oracle e abra o software para início de configuração das máquinas virtuais

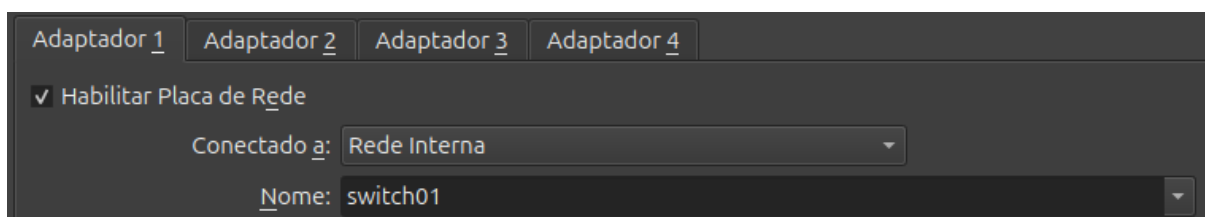
1.2 - Aqui clique em arquivo e importe a appliance baixada



1.3 - Após configuração inicial das máquinas virtuais, abra as preferências de cada uma para alteração de rede:

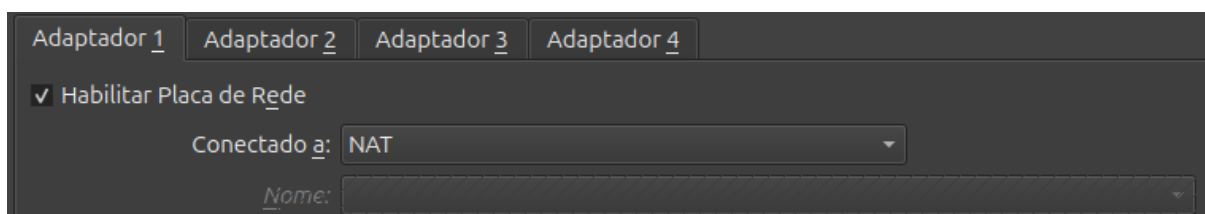


1.4 - No Debian 1 procure pela aba **Rede** e habilite **apenas** o adaptador 1 e altere as seguintes opções:

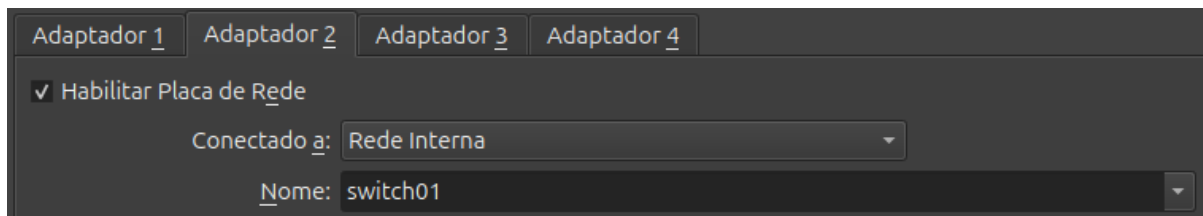


No Debian 2 habilite **3 adaptadores**, com as seguintes configurações:

Adaptador 1:



Adaptador 2:



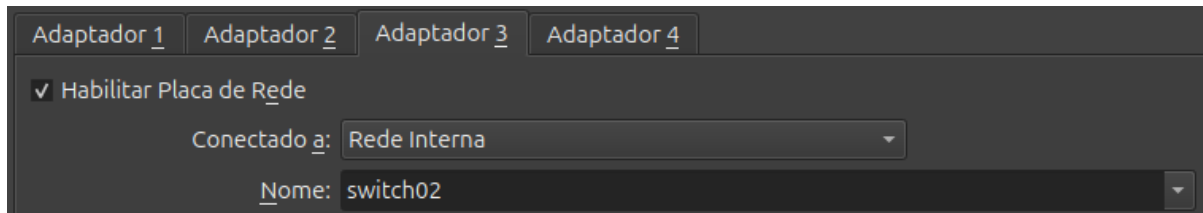
Adaptador 1 Adaptador 2 Adaptador 3 Adaptador 4

☒ Habilitar Placa de Rede

Conectado a: Rede Interna

Nome: switch01

Adaptador 3:



Adaptador 1 Adaptador 2 Adaptador 3 Adaptador 4

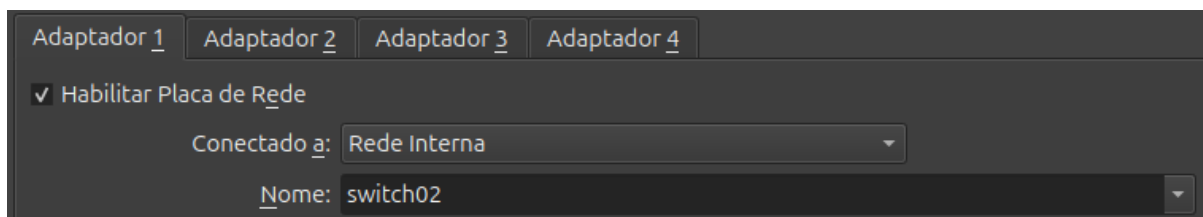
☒ Habilitar Placa de Rede

Conectado a: Rede Interna

Nome: switch02

No Debian 3, você deve habilitar **2 adaptadores** da seguinte forma:

Adaptador 1:



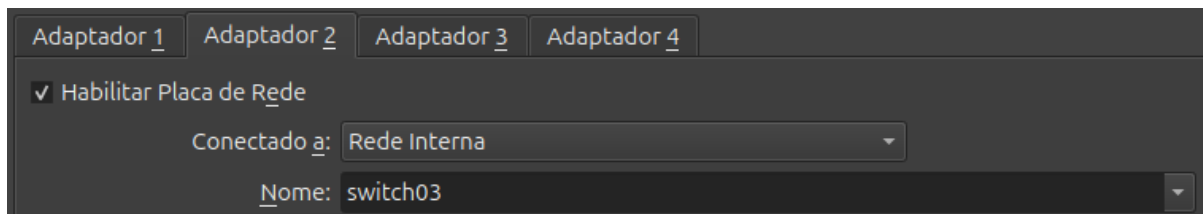
Adaptador 1 Adaptador 2 Adaptador 3 Adaptador 4

☒ Habilitar Placa de Rede

Conectado a: Rede Interna

Nome: switch02

Adaptador 2:



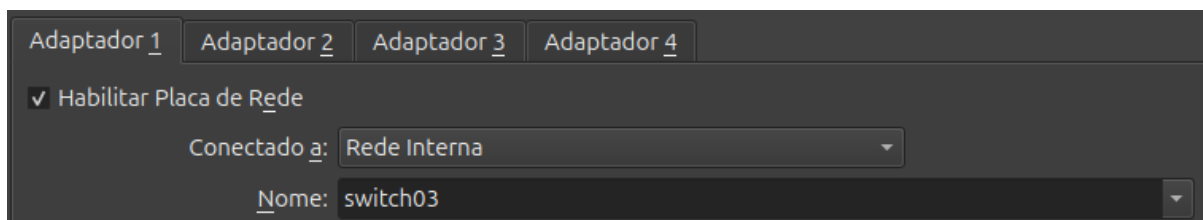
Adaptador 1 Adaptador 2 Adaptador 3 Adaptador 4

☒ Habilitar Placa de Rede

Conectado a: Rede Interna

Nome: switch03

Já no Windows XP habilite **apenas 1** adaptador, com a seguinte configuração:



Adaptador 1 Adaptador 2 Adaptador 3 Adaptador 4

☒ Habilitar Placa de Rede

Conectado a: Rede Interna

Nome: switch03

Configuração dentro das máquinas


```

root@debian1:~# ip a s && ip r s
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: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:97:31:e0 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.2/24 brd 10.0.0.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe97:31e0/64 scope link
        valid_lft forever preferred_lft forever
default via 10.0.0.1 dev eth0
10.0.0.0/24 dev eth0 proto kernel scope link src 10.0.0.2
root@debian1:~#

```

Agora inicialize o Debian 2

Execute o comando **ip a s** e verifique quais adaptadores estão disponíveis:

```

root@debian2:~# ip a s
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: eth0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:58:cd:62 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:1e:31:1b brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:df:1f:18 brd ff:ff:ff:ff:ff:ff
root@debian2:~#

```

Neste caso temos 3 adaptadores

Abra o arquivo **/etc/network/interfaces** e acrescente as seguintes linhas de comando

```

1 auto eth0
2 iface eth0 inet dhcp
3
4 auto eth1
5 iface eth1 inet static
6 address 10.0.0.1
7 netmask 255.255.255.0
8
9 auto eth2
10 iface eth2 inet static
11 address 172.16.0.1
12 netmask 255.255.255.0
~
~
~
~
~
~
~
~
~
~
-- INSCRIÇÃO --
12.1
Tudo

```

Reinicie o serviço de rede pelo comando **/etc/init.d/networking restart**

```
root@debian2:~# /etc/init.d/networking restart
[ ok ] Restarting networking (via systemctl): networking.service.
root@debian2:~#
```

E verifique se as configurações foram aplicadas através do comando **ip a s**

```
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:58:cd:62 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fd00::a00:27ff:fe58:cd62/64 scope global mngtmpaddr dynamic
        valid_lft 86374sec preferred_lft 14374sec
    inet6 fe80::a00:27ff:fe58:cd62/64 scope link
        valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:1e:31:1b brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.1/24 brd 10.0.0.255 scope global eth1
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe1e:311b/64 scope link
        valid_lft forever preferred_lft forever
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:df:1f:18 brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.1/24 brd 172.16.0.255 scope global eth2
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fedf:1f18/64 scope link
        valid_lft forever preferred_lft forever
root@debian2:~#
```

Inicialize o Debian 3 e verifique quais os adaptadores disponíveis

```
root@debian3:~# ip a s
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: eth0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:3f:ba:7f brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:bb:e5:b6 brd ff:ff:ff:ff:ff:ff
root@debian3:~#
```

Abra o arquivo de edição e inclua as seguintes linhas

```
1 auto eth0
2 iface eth0 inet static
3 address 172.16.0.2
4 netmask 255.255.255.0
5 gateway 172.16.0.1
6
7 auto eth1
8 iface eth1 inet static
9 address 192.168.0.1
10 netmask 255.255.255.0
~
~
~
~
~
~
~
~
~
~
-- INSCRIÇÃO -- 10.22 Tudo
```

Salve as edições e reinicie o serviço de rede para verificar se as configurações foram aplicadas

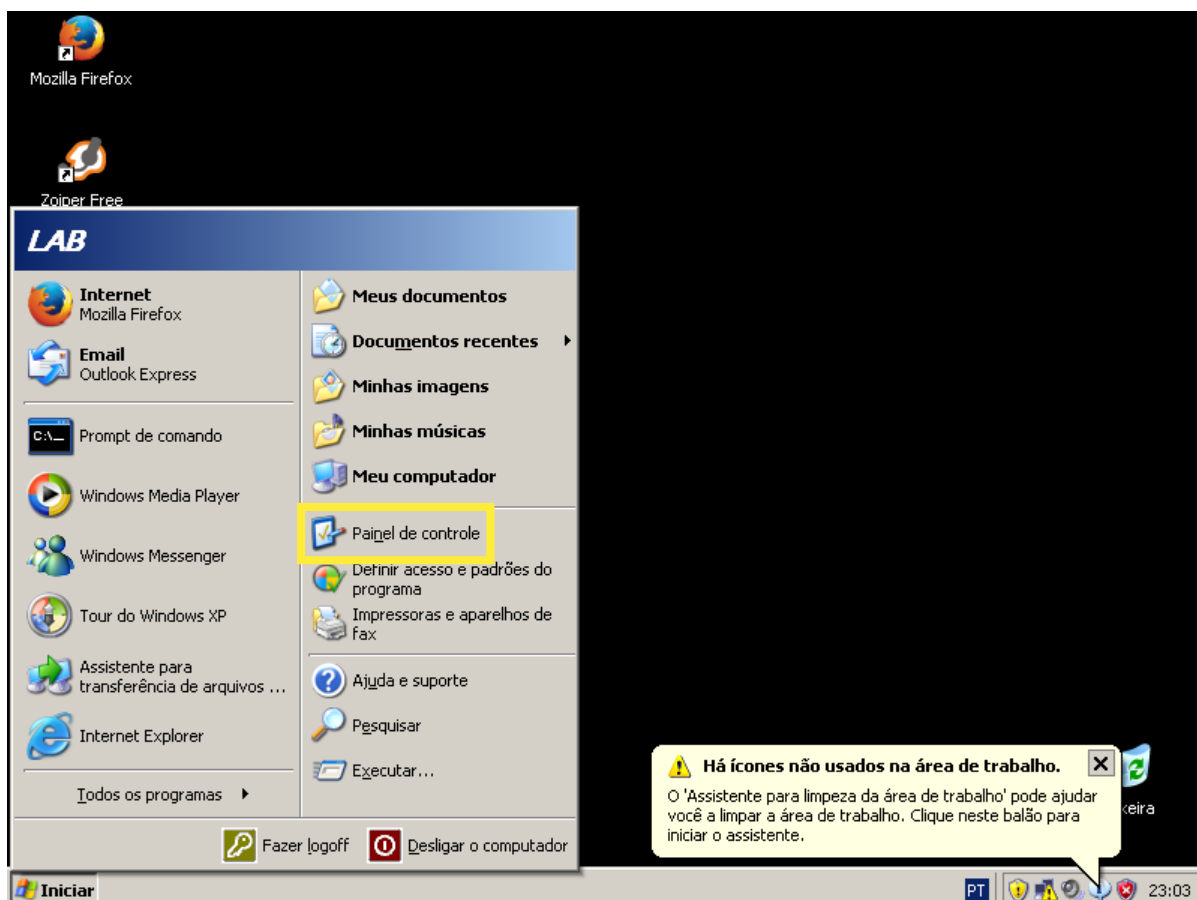

```

root@debian3:~# /etc/init.d/networking restart
[ ok ] Restarting networking (via systemctl): networking.service.
root@debian3:~# ip a s
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: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:3f:ba:7f brd ff:ff:ff:ff:ff:ff
    inet 172.16.0.2/24 brd 172.16.0.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe3f:ba7f/64 scope link
        valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:bb:e5:b6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.1/24 brd 192.168.0.255 scope global eth1
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:febb:e5b6/64 scope link
        valid_lft forever preferred_lft forever
root@debian3:~#

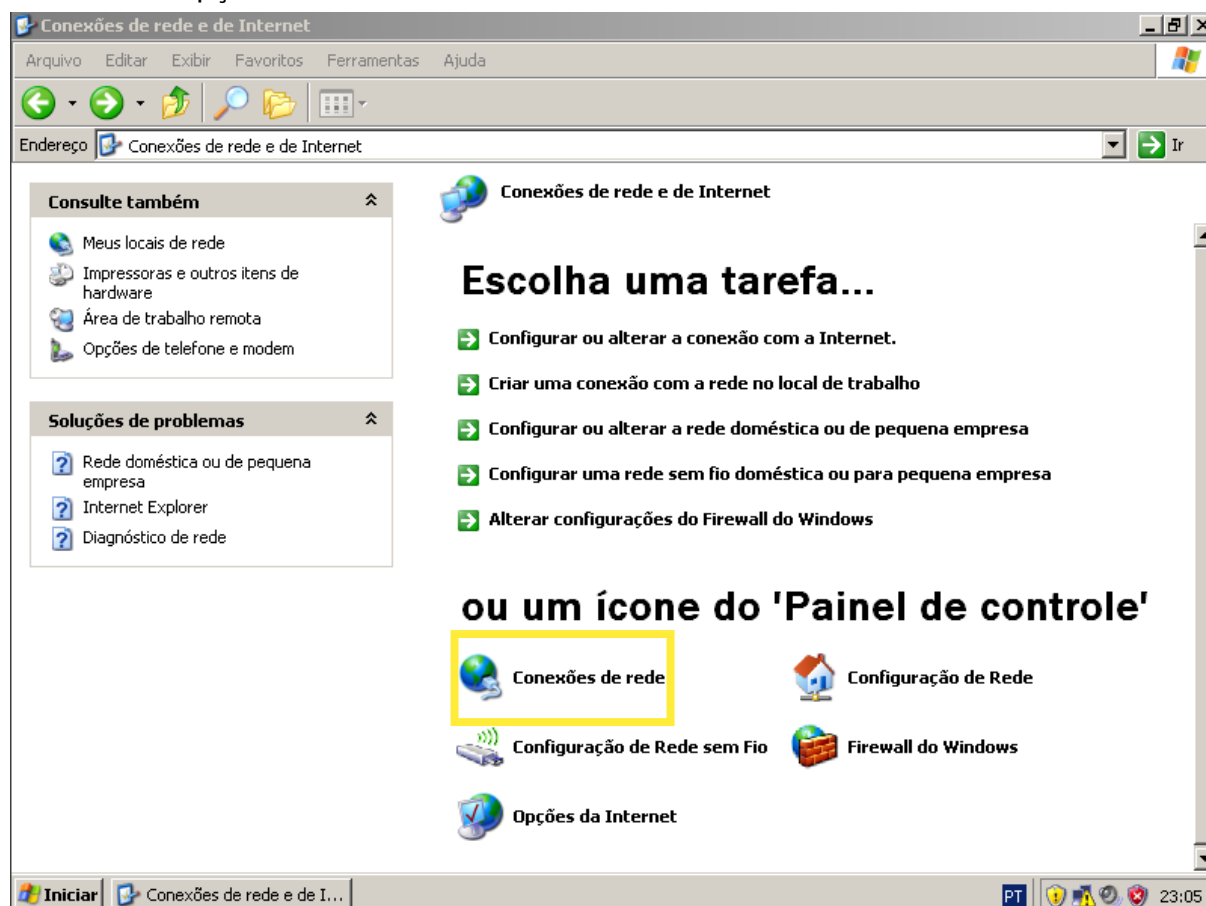
```

Inicialize o Windows XP

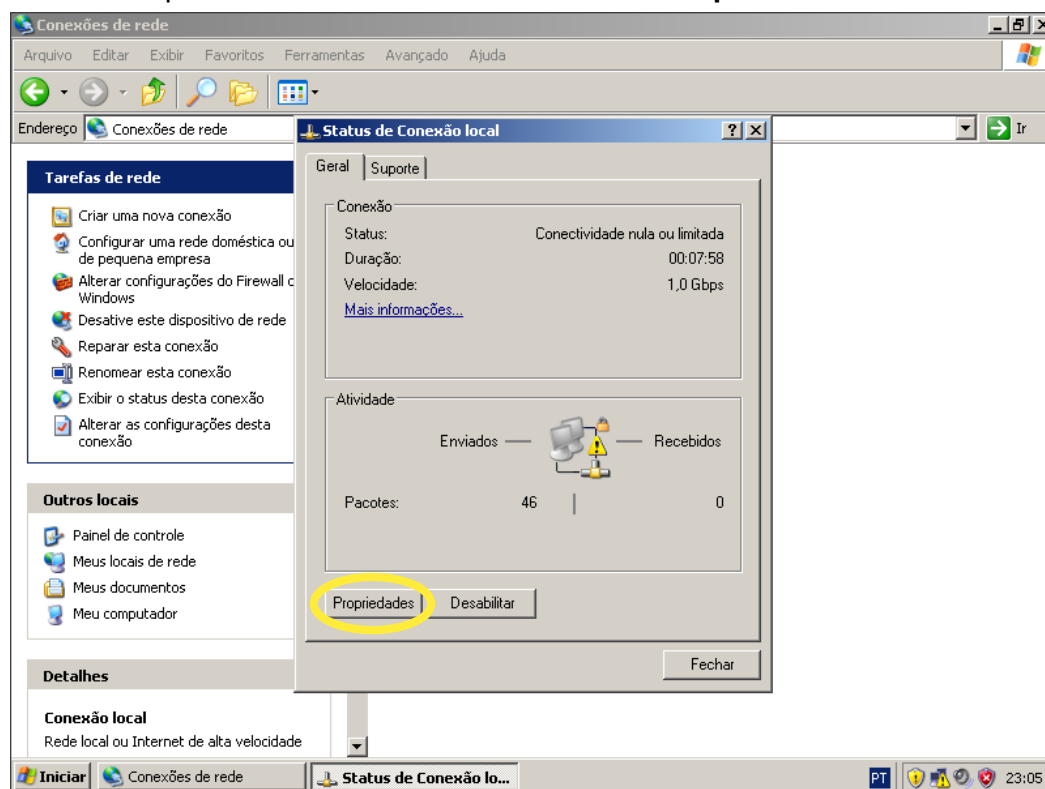
Na área de trabalho, clique em **iniciar** e **painel de controle**



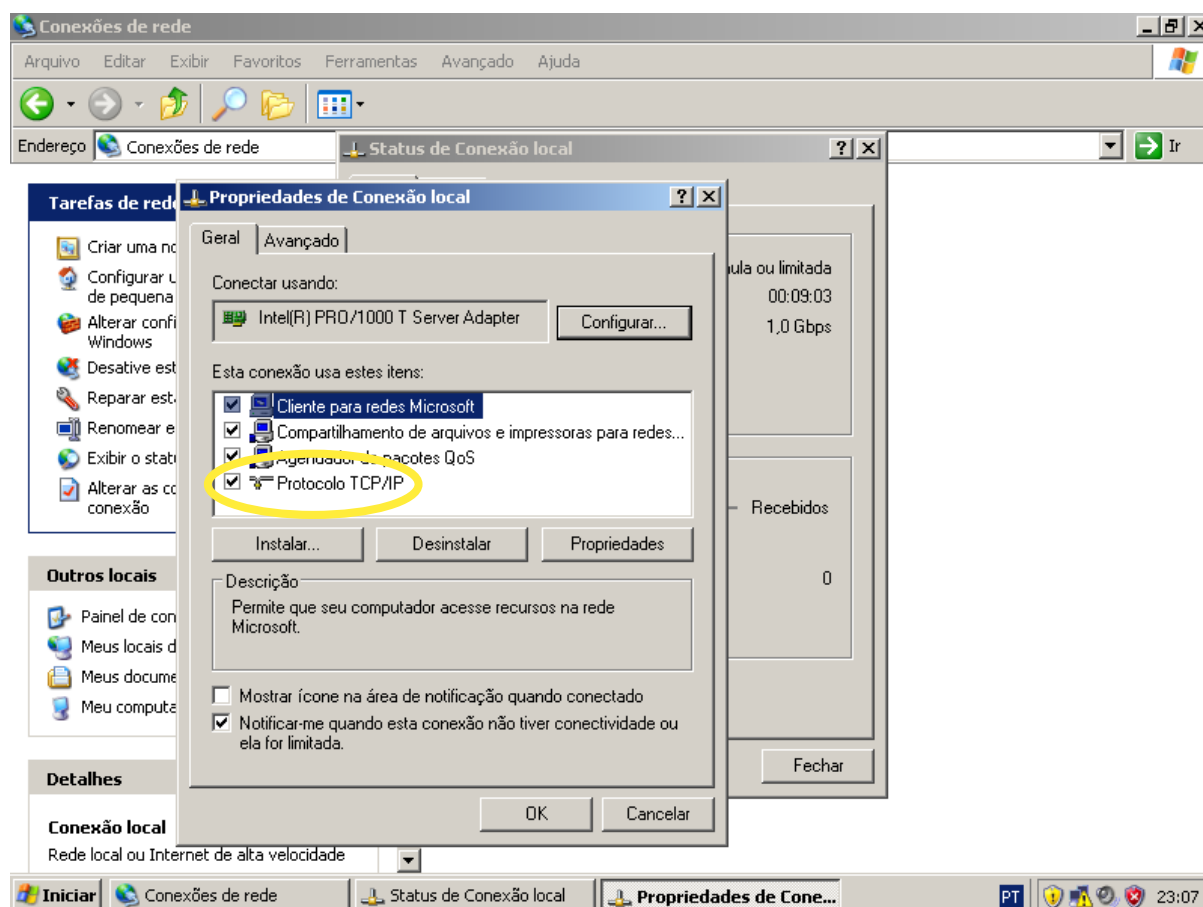
Selecione a opção **Conexões de rede e de internet** e **Conexões de rede**



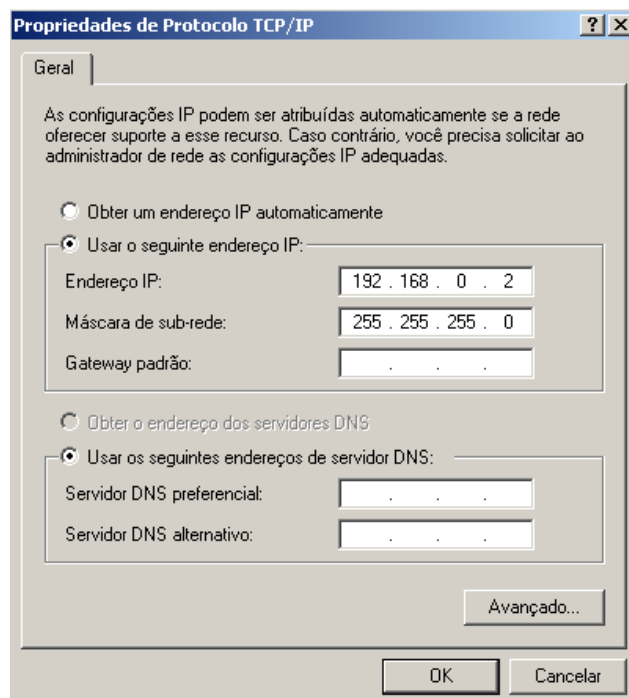
De dois cliques na **Conexão local** e abra a aba **Propriedades**



Novamente, de dois cliques no **Protocolo TCP/IP**



Selecione a opção **Usar o seguinte endereço IP** e coloque as seguintes configurações:



Fase de testes

1.6 - Volte para o Debian 2 e faça um ping para 10.0.0.2 (Adaptador de rede do Debian) utilizando o comando: **ping 10.0.0.2**

```
root@debian2:~# ping 10.0.0.2
PING 10.0.0.2 (10.0.0.2): 56(84) bytes of data:
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=0.257 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=0.276 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=0.238 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=0.212 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=0.252 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=0.315 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=0.214 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=0.225 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=0.222 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=0.249 ms
64 bytes from 10.0.0.2: icmp_seq=11 ttl=64 time=0.203 ms
64 bytes from 10.0.0.2: icmp_seq=12 ttl=64 time=0.227 ms
```

Enquanto o Debian 2 estiver pingando o endereço 10.0.0.2, abra o Debian 1 e execute o seguinte comando: **tcpdump -i eth0 -nN**

```
root@debian1:~# tcpdump -i eth0 -nN
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
23:17:53.926018 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 1747, seq 16, length 64
23:17:53.926032 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 1747, seq 16, length 64
23:17:54.925929 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 1747, seq 17, length 64
23:17:54.925943 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 1747, seq 17, length 64
23:17:55.925897 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 1747, seq 18, length 64
23:17:55.925911 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 1747, seq 18, length 64
23:17:56.926078 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 1747, seq 19, length 64
23:17:56.926092 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 1747, seq 19, length 64
^C
8 packets captured
10 packets received by filter
0 packets dropped by kernel
root@debian1:~#
```

Caso as máquinas consigam se comunicar entre si, no Debian 2, irão surgir escritas como as que estão circuladas e no Debian 1, as linhas também circuladas

Agora verifique se o Debian 2 consegue se comunicar com um dos adaptadores de rede do Debian 3 (eth0)

Debian 2: ping 172.16.0.2

```
root@debian2:~# ping 172.16.0.2
PING 172.16.0.2 (172.16.0.2) 56(84) bytes of data.
64 bytes from 172.16.0.2: icmp_seq=1 ttl=64 time=0.160 ms
64 bytes from 172.16.0.2: icmp_seq=2 ttl=64 time=0.187 ms
64 bytes from 172.16.0.2: icmp_seq=3 ttl=64 time=0.165 ms
64 bytes from 172.16.0.2: icmp_seq=4 ttl=64 time=0.169 ms
64 bytes from 172.16.0.2: icmp_seq=5 ttl=64 time=0.165 ms
64 bytes from 172.16.0.2: icmp_seq=6 ttl=64 time=0.173 ms
64 bytes from 172.16.0.2: icmp_seq=7 ttl=64 time=0.177 ms
64 bytes from 172.16.0.2: icmp_seq=8 ttl=64 time=0.174 ms
64 bytes from 172.16.0.2: icmp_seq=9 ttl=64 time=0.148 ms
^C
--- 172.16.0.2 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 7999ms
rtt min/avg/max/mdev = 0.148/0.168/0.187/0.018 ms
root@debian2:~#
```

Enquanto o ping rola, no Debian 3 execute: **tcpdump -i eth0 -nN**

```
root@debian3:~# tcpdump -i eth0 -nN
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
23:38:41.967193 IP 172.16.0.1 > 172.16.0.2: ICMP echo request, id 1755, seq 5, length 64
23:38:41.967211 IP 172.16.0.2 > 172.16.0.1: ICMP echo reply, id 1755, seq 5, length 64
23:38:42.967222 IP 172.16.0.1 > 172.16.0.2: ICMP echo request, id 1755, seq 6, length 64
23:38:42.967239 IP 172.16.0.2 > 172.16.0.1: ICMP echo reply, id 1755, seq 6, length 64
23:38:42.974532 ARP, Request who-has 172.16.0.1 tell 172.16.0.2, length 28
23:38:42.974626 ARP, Reply 172.16.0.1 is-at 08:00:27:df:1f:18, length 46
23:38:43.966479 IP 172.16.0.1 > 172.16.0.2: ICMP echo request, id 1755, seq 7, length 64
23:38:43.966495 IP 172.16.0.2 > 172.16.0.1: ICMP echo reply, id 1755, seq 7, length 64
^C
8 packets captured
10 packets received by filter
0 packets dropped by kernel
root@debian3:~#
```

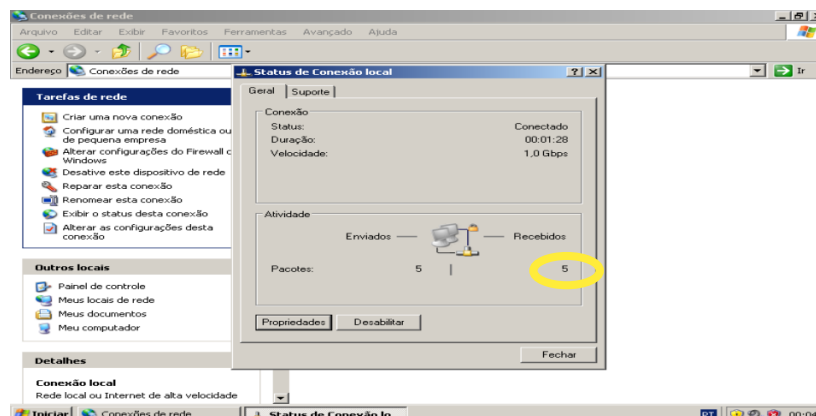
Caso as respostas sejam iguais ao caso da comunicação entre o Debian 1 – Debian 2, a configuração funcionou

Por fim, teste a comunicação entre o Debian 3 e o Windows XP

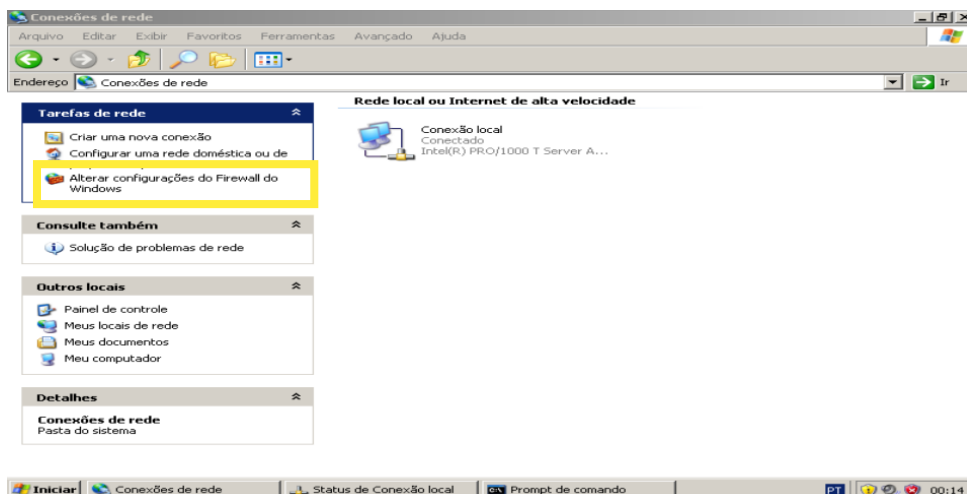
Debian 3: ping 192.168.0.2

```
root@debian3:~# ping 192.168.0.2
PING 192.168.0.2 (192.168.0.2) 56(84) bytes of data.
^C
--- 192.168.0.2 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4033ms
root@debian3:~#
```

Neste caso, o windows recebe os pacotes, mas o debian não obtém uma resposta



Para fazer com que essa comunicação funcione, vamos desabilitar o firewall do windows



Agora o ping irá funcionar

1.7 - No próximo passo, vamos ativar o roteamento de pacotes (IP Forwarding) para permitir a comunicação entre redes diferentes. Para isso, execute o arquivo **/etc/sysctl.conf**

Dentro desse arquivo na linha 28, tire o # e salve

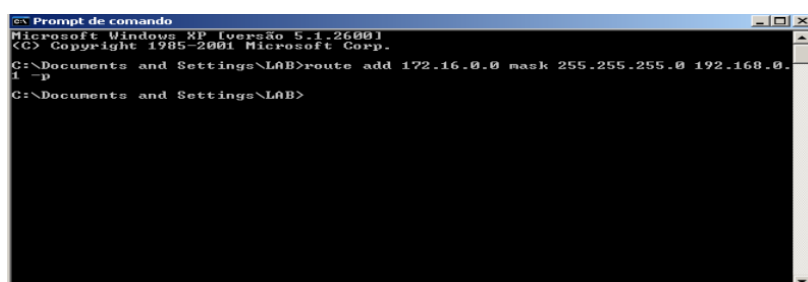
Para aplicar as alterações do sysctl, execute o comando **sysctl -p**

```
root@debian3:~# sysctl -p
net.ipv4.ip_forward = 1
root@debian3:~# _
```

Como o Debian 2 funciona como um intermediador entre a rede A, B e a internet, ele precisa saber para onde encaminhar os pacotes destinados à rede C (windows)

No Debian 2, execute o comando **ip r a 192.168.0.0/24 via 172.16.0.2**

Após isso, para que o windows saiba como retornar pacotes para o Debian 3, é necessário adicionar uma rota pelo CMD: **route add 172.16.0.0 mask 255.255.255.0 192.168.0.1 -p**



Para fazer com que o Debian 1 se comunique com o Debian 3, precisamos alterar o arquivo **/etc/sysctl.conf** no Debian 2

Execute **vim /etc/sysctl.conf** e tire o **#** da linha **28**

Salve o arquivo e execute o comando **sysctl -p**

```
root@debian2:~# sysctl -p
net.ipv4.ip_forward = 1
root@debian2:~#
```

Para teste da comunicação, no Debian 1, execute ping 172.16.0.2

Caso a configuração no debian 2 esteja correta, os pacotes enviados terão resposta no Debian 1

```
root@debian1:~# ping 172.16.0.2
PING 172.16.0.2 (172.16.0.2) 56(84) bytes of data.
64 bytes from 172.16.0.2: icmp_seq=1 ttl=63 time=0.366 ms
64 bytes from 172.16.0.2: icmp_seq=2 ttl=63 time=0.331 ms
64 bytes from 172.16.0.2: icmp_seq=3 ttl=63 time=0.283 ms
64 bytes from 172.16.0.2: icmp_seq=4 ttl=63 time=0.300 ms
64 bytes from 172.16.0.2: icmp_seq=5 ttl=63 time=0.304 ms
64 bytes from 172.16.0.2: icmp_seq=6 ttl=63 time=0.303 ms
64 bytes from 172.16.0.2: icmp_seq=7 ttl=63 time=0.285 ms
64 bytes from 172.16.0.2: icmp_seq=8 ttl=63 time=0.298 ms
64 bytes from 172.16.0.2: icmp_seq=9 ttl=63 time=0.305 ms
64 bytes from 172.16.0.2: icmp_seq=10 ttl=63 time=0.297 ms
^C
--- 172.16.0.2 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 8997ms
rtt min/avg/max/mdev = 0.283/0.307/0.366/0.025 ms
root@debian1:~#
```

1.8 - Por fim, para estabelecer uma conexão com a internet, no Debian 2 e no Debian 3 execute **iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE**

Dessa forma, todas as máquinas conseguem se comunicar entre si e também estabelecer uma conexão com a internet:

