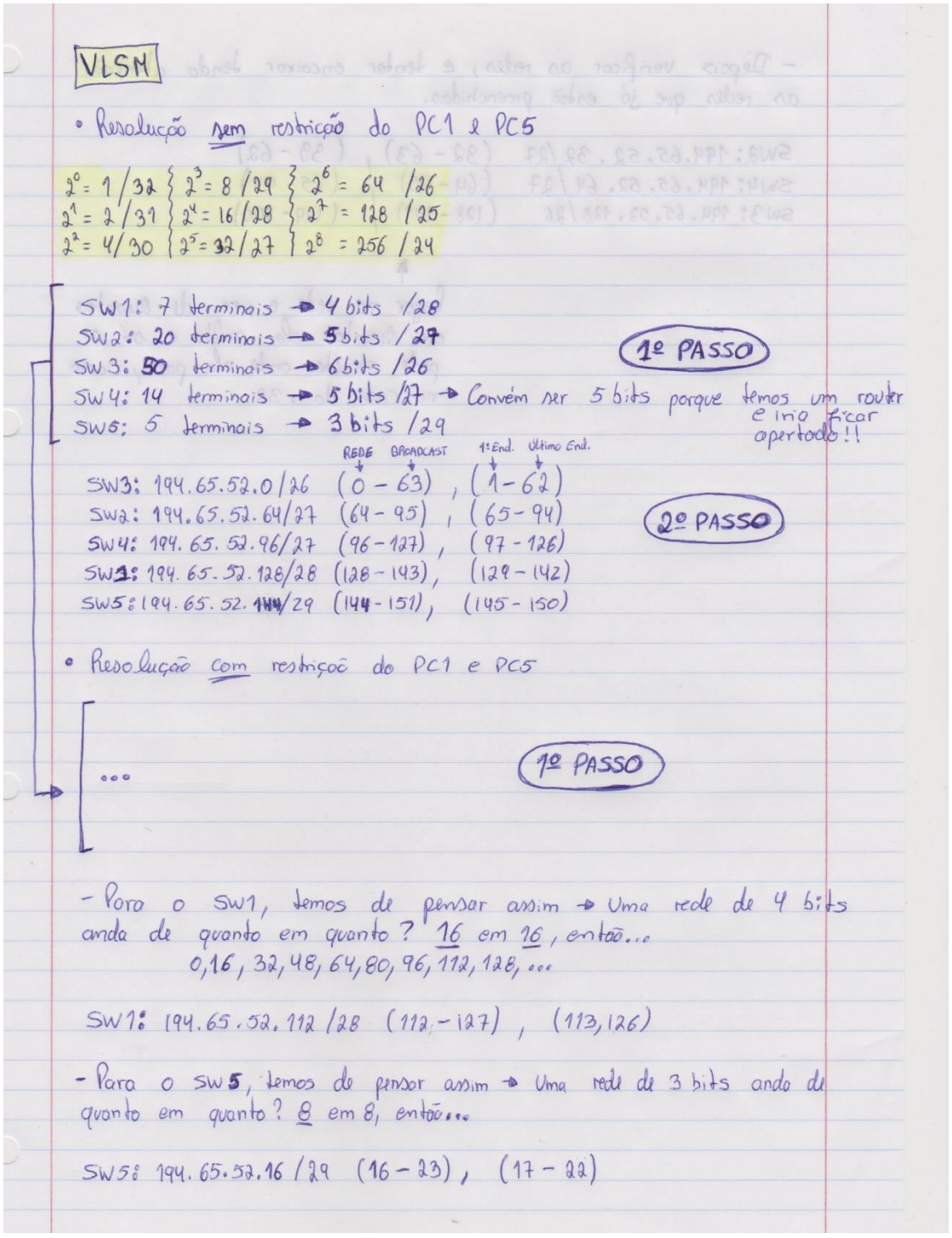
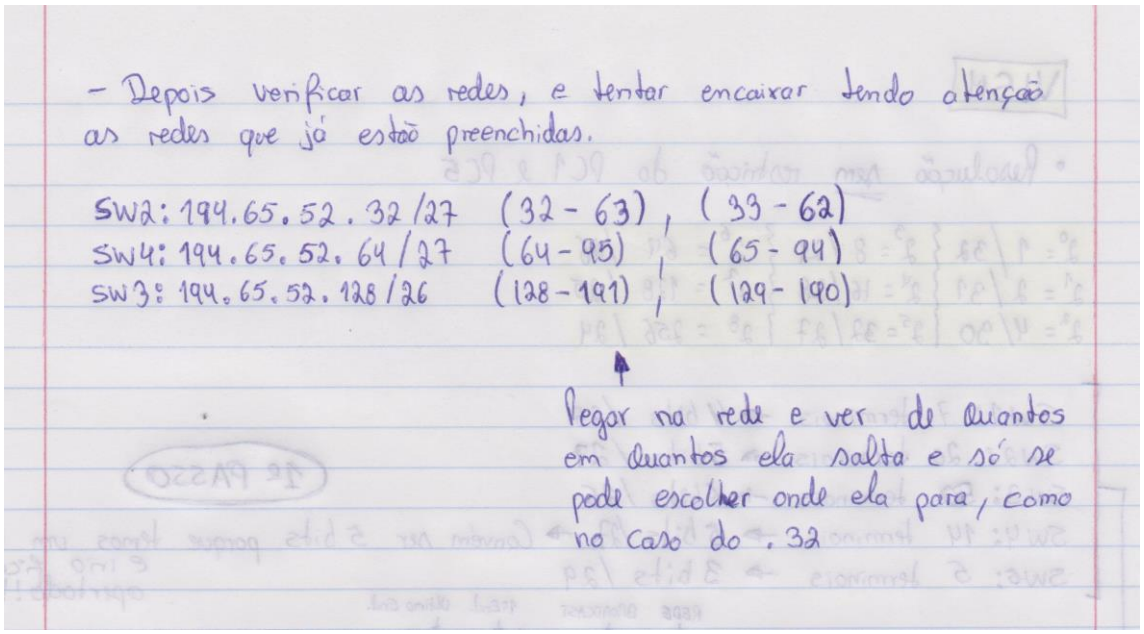
Topologia VLSM & Static





PC5

```
set pcname PC5
save
ip 194.65.52.17 /29 194.65.52.22
save
```

PC4

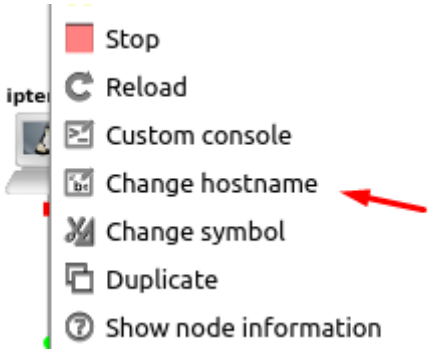
```
set pcname PC4
ip 194.65.52.65 /27 194.65.52.94
save
```

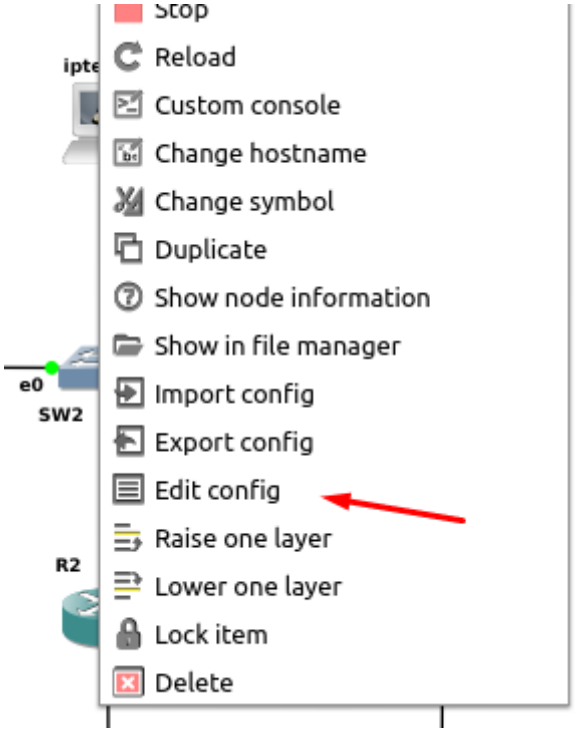
PC3

```
set pcname PC3
ip 194.65.52.129 /26 194.65.52.190
save
```

PC2 -> ipterm OFF

hostname: PC2





```
# Static config for eth0
auto eth0
iface eth0 inet static
        address 194.65.52.33
        netmask 255.255.255.224
        gateway 194.65.52.62
#       up echo nameserver 192.168.0.1 > /etc/resolv.conf

# DHCP config for eth0
# auto eth0
# iface eth0 inet dhcp
```

- Última linha é DNS, para já não vale a pena!!

VERIFICAR:

ipterm ON

```
ipterm-1
root@ipterm-1:~#
root@ipterm-1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 3a:a3:4f:d5:fc:0e
          inet addr:194.65.52.33  Bcast:0.0.0.0  Mask:255.255.255.224
          inet6 addr: fe80::38a3:4fff:fed5:fc0e/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:9 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:726 (726.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@ipterm-1:~#
```

PC1

set pcname PC1

ip 194.65.52.113 /28 194.65.52.126

save

Enterprise public address space: 194.65.52.0/24
Enterprise output interface: 10.10.20.1/30
R4 <-> R3: 10.10.10.0/30

!! Saída da empresa (output) é no router R1!!

R1

conf t

int s2/0

ip add 10.10.20.1 255.255.255.252

no shut

end

copy run start OU wr

RISP

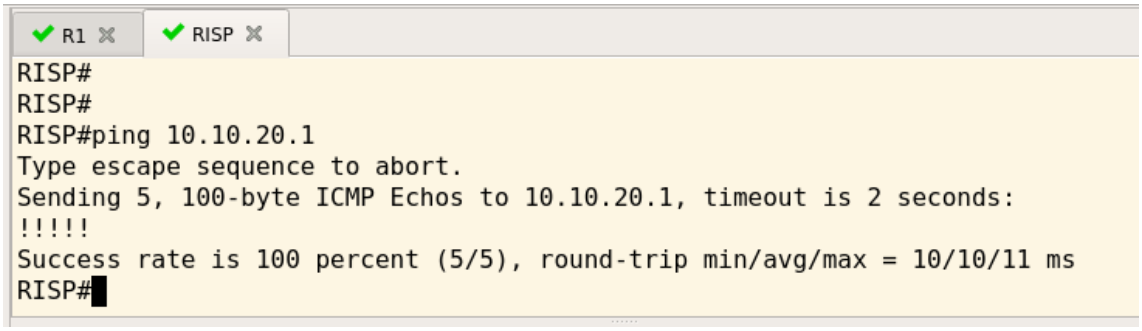
conf t

int s2/0

ip add 10.10.20.2 255.255.255.252

no shut

wr



Existe conectividade entre RISP e R1!!

R4 <-> R3

R4

```
conf t
int s2/0
ip add 10.10.10.1 255.255.255.252
no shut
end
wr
```

R3

```
conf t
int s2/0
ip add 10.10.10.2 255.255.255.252
no shut
end
wr
```

LOOPBACK

Para que quero a loopback no RISP? Convém sempre ter uma interface no RISP que sirva de teste a conectividade!!

São interfaces que não estão ligadas a nada, são virtuais!!

RISP

```
conf t
int loopback0
ip add 1.1.1.1 255.255.255.255
no shut
end
wr
```

No RISP pinga a loopbak?

RISP

```
RISP#
RISP#ping 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/5 ms
RISP#
```

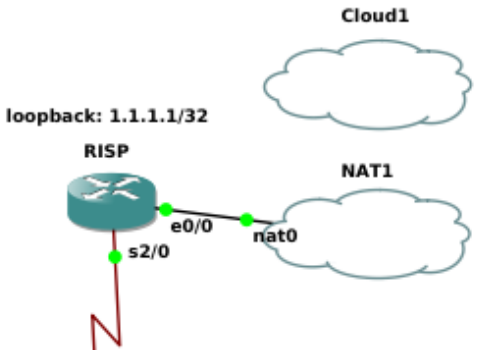
Em R1 pinga a loopback?

RISP | R1

```
R1#
R1#ping 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
R1#
```

Em R1 temos de colocar todo o tráfego que vai para fora da empresa tem de ser enfiado na serial2/0!

Mas primeiro vamos colocar o RISP com uma ligação ao exterior!



RISP - NAT

conf t

int e0/0

ip add dhcp

end

wr

```
RISP  R1
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/5 ms
RISP#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
RISP(config)#int e0/0
RISP(config-if)#ip add dhcp
RISP(config-if)#no shut
RISP(config-if)#
*Mar 23 01:30:24.296: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
*Mar 23 01:30:25.301: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0
, changed state to up
RISP(config-if)#
*Mar 23 01:30:37.810: %DHCP-6-ADDRESS_ASSIGN: Interface Ethernet0/0 assigned DHCP
 address 192.168.122.153, mask 255.255.255.0, hostname RISP

RISP(config-if)#
```

->Ganhou o ip 192.168.122.153, da rede 122!!

De onde vem esta rede?

```
gns3@gns3-vm: ~
File  Edit  View  Search  Terminal  Help

virbr0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:a3:59:f5  txqueuelen 1000  (Ethernet)
        RX packets 15  bytes 3520 (3.5 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 9  bytes 998 (998.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

gns3@gns3-vm:~$
```

É uma interface virtual (virbr0) que quem a criou foi quem instalou o GNS.

Neste momento estamos ligados ao exterior!

```
RISP  R1
RISP#
RISP#ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 21/21/23 ms
RISP#
```

Na NAT1 quem está a atribuir ip's para dentro do RISP?

É a interface virtual. Só que neste momento a rede 122 está dentro da máquina virtual!!!

RISP | R1

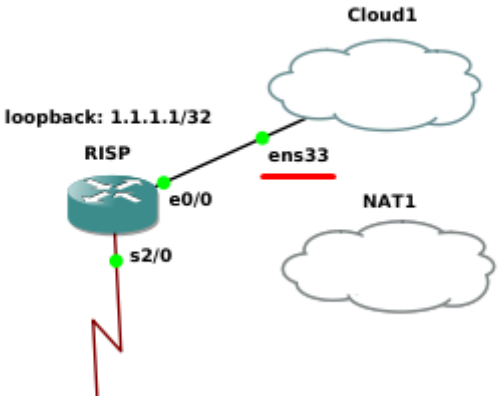
```
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 21/21/23 ms
RISP#tracerou
RISP#traceroute 9.9.9.9 num
RISP#traceroute 9.9.9.9 numeric ttl 0 5
Type escape sequence to abort.
Tracing the route to 9.9.9.9
VRF info: (vrf in name/id, vrf out name/id)
  0 192.168.122.1 1 msec 0 msec 0 msec
  1 192.168.122.1 1 msec 0 msec 0 msec
  2 192.168.79.2 2 msec 1 msec 0 msec
  3  *  *  *
  4  *  *  *
  5  *  *  *
RISP#
```

-> .122 esta onde? Máquina Virtual

-> .79? é a saída(ens33) da máquina virtual para a máquina host!

```
gns3@gns3-vm:~$ ifconfig
docker0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 172.17.0.1  netmask 255.255.0.0  broadcast 172.17.255.255
        ether 02:42:75:14:48:13  txqueuelen 0  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.79.128  netmask 255.255.255.0  broadcast 192.168.79.255
        inet6 fe80::248a:5784:b693:7b82  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:ca:95:ba  txqueuelen 1000  (Ethernet)
        RX packets 3583  bytes 4785672 (4.7 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1869  bytes 142628 (142.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

E agora, havia possibilidade em vez de ligar o GNS primeiro a rede .122 e depois para a .79, será que não havia forma de ligar a .79 sem ligar a .122?



Ligando diretamente o RISP a Cloud1, neste momento o RISP vai diretamente a rede .79 sem passar pela .122!

RISP | R1

```
Enter configuration commands, one per line.  End with CNTL/Z.
RISP(config)#int e0/0
RISP(config-if)#shut
RISP(config-if)#
*Mar 23 01:56:05.667: %LINK-5-CHANGED: Interface Ethernet0/0, changed state to ad
ministratively down
*Mar 23 01:56:06.675: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0
, changed state to down
RISP(config-if)#no shut
RISP(config-if)#
*Mar 23 01:56:11.351: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
*Mar 23 01:56:12.356: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0
, changed state to up
RISP(config-if)#
*Mar 23 01:56:14.431: %DHCP-6-ADDRESS_ASSIGN: Interface Ethernet0/0 assigned DHCP
 address 192.168.79.131, mask 255.255.255.0, hostname RISP
```

RISP | R1

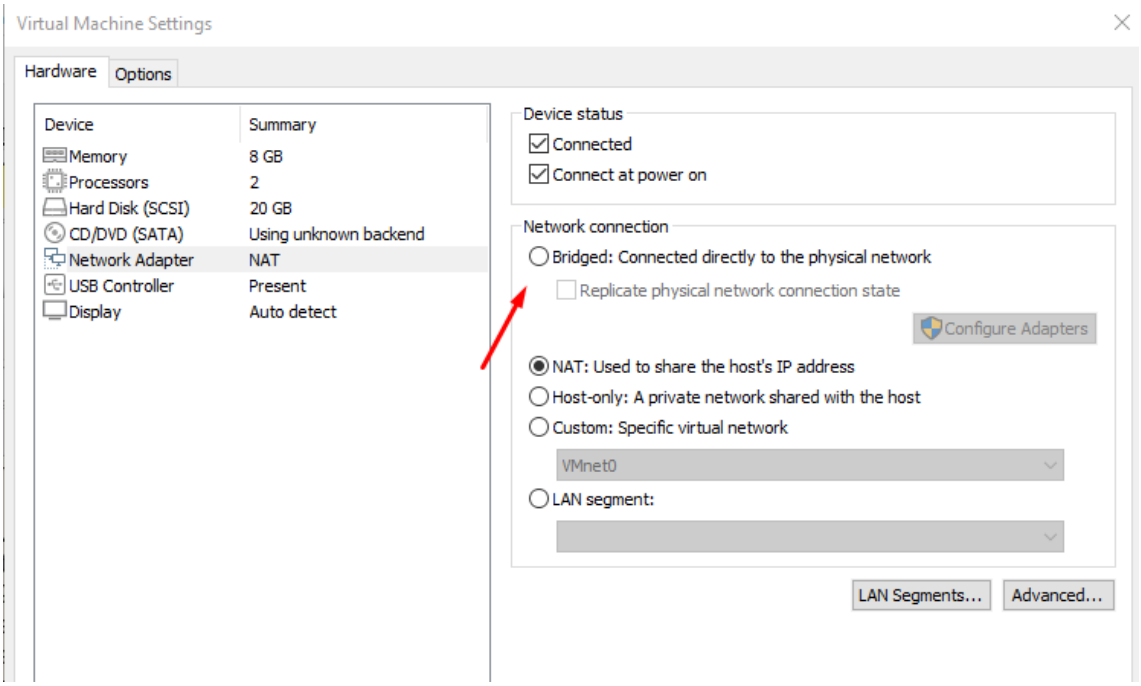
```
Building configuration...
[OK]
RISP#traceroute 9.9.9.9 numeric ttl 0 5
Type escape sequence to abort.
Tracing the route to 9.9.9.9
VRF info: (vrf in name/id, vrf out name/id)
  0 192.168.79.2 1 msec 5 msec 6 msec
  1 192.168.79.2 5 msec 1 msec 5 msec
  2  *  *  *
  3  *  *  *
  4  *  *  *
  5  *  *  *
RISP#
```

Agora, não há forma de ligar diretamente o RISP a rede .1 (rede onde esta a máquina Host)?

Linha de comandos

```
C:\Users\rafaa>ipconfig

Windows IP Configuration


Unknown adapter OpenVPN Wintun:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . : Home
   IPv6 Address. . . . . . . . . . . : 2001:8a0:d703:900:24f8:a94e:2ff6:6c7
   Temporary IPv6 Address. . . . . . : 2001:8a0:d703:900:d0d6:87e4:28dc:f5d6
   Link-local IPv6 Address . . . . . : fe80::24f8:a94e:2ff6:6c7%5
   IPv4 Address. . . . . . . . . . . : 192.168.1.65
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::206:91ff:fea7:c49f%5
                                       192.168.1.254
```

Nas propriedades no VMWare colocamos em Bridge:



RISP | R1

```
RISP#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
RISP(config)#int e0/0
RISP(config-if)#shut
RISP(config-if)#no shut
RISP(config-if)#
*Mar 23 02:06:39.821: %DHCP-6-ADDRESS_ASSIGN: Interface Ethernet0/0 assigned DHCP
 address 192.168.1.101, mask 255.255.255.0, hostname RISP

RISP(config-if)#
```

Descobrir qual o MACADDRESS da interface e0/0?

sh interfaces e0/0

RISP R1

```
RISP#
RISP#
*Mar 23 02:10:40.537: %SYS-5-CONFIG_I: Configured from console by console
RISP#sh inter
RISP#sh interfaces e0/0
Ethernet0/0 is up, line protocol is up
  Hardware is AmdP2, address is aabb.cc00.0500 (bia aabb.cc00.0500)
  Internet address is 192.168.79.131/24
  MTU 1500 bytes, BW 10000 Kbit/sec, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:01:01, output 00:00:06, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
```

USAR NAT NO TRABALHO!!

STATIC

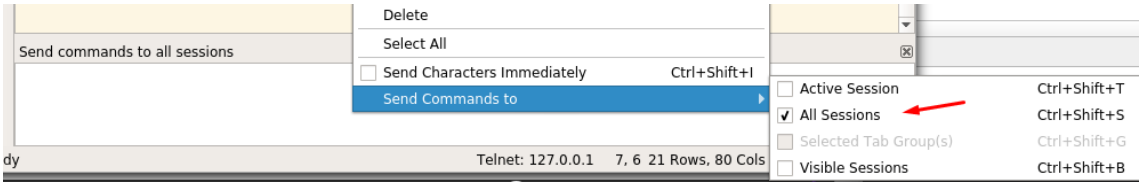
- Encaminhamento Estático

VLSM
Empresa: 194.65.52.0/24 (1-255)
SW1: 4 term. =3 bits, 194.65.52.0/29 (0-7)
SW3: 5 term. =3 bits, 194.65.52.8/29 (8-15)
SW5: 12 term.=4 bits, 194.65.52.16/28 (16-31)
SW4: 20 term.=5 bits, 194.65.52.32/27 (32-63)
SW2: 50 term.=6 bits, 194.65.52.64/26 (64-127)
livre: 194.65.52.128/25 (128-255)

Enterprise public address space: 194.65.52.0/25
Enterprise output interface: 10.10.20.1/30
R4 <-> R3: 10.10.10.0/30
SW1: 4 terminals
SW2: 50 terminals
SW3: 5 terminals
SW4: 20 terminals
SW5: 12 terminals
PC1: 194.65.52.1

- Configuração Base:

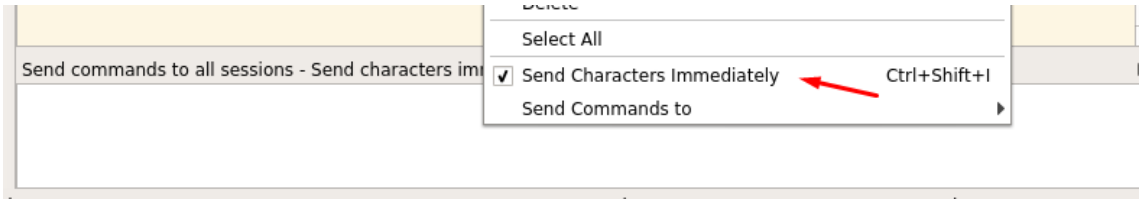
RISP – R1 – R2 – R3 – R4



enable

conf t

hostname



hostname RISP R1 R2 R3 R4 ->INDIVIDUALMENTE

line console 0

exec-timeout 0 -> SESSÃO NÃO TERMINA!

Logging synchronous

privilege level 15 -> ENTRA EM PRIVILÉGIO MÁXIMO (ENTRA DIRETAMENTE NO *CONF T*)!

end

wr

conf t

enable secret cisco

no ip domain-lookup

banner motd # Este é o router RISP #

```
end
wr
```

RISP

```
conf t
int loopback0
ip add 1.1.1.1 255.255.255.255
exit
int s2/0
ip add 10.10.20.2 255.255.255.252
no shut
end
wr
```

R1

s2/0

```
conf t
int s2/0
ip add 10.10.20.1 255.255.255.252
no shut
end
wr
```

e0/1

```
conf t
int e0/1
ip add 194.65.52.6 255.255.255.248
no shut
end
wr
```

e0/0

```
conf t
int e0/0
ip add 194.65.52.126 255.255.255.192
no shut
end
wr
```

PC1

```
set pcname PC1
ip 194.65.52.1 /29 194.65.52.6
save
```

PC1 já pinga a DG!

R2

```
conf t
int e0/1
ip add 194.65.52.14 255.255.255.248
no shut
end
wr
conf t
int e0/0
ip add 194.65.52.125 255.255.255.192
no shut
```

PC3

```
set pcname PC3
ip 194.65.52.9 /29 194.65.52.14
save
```

PC1 já pinga a DG!

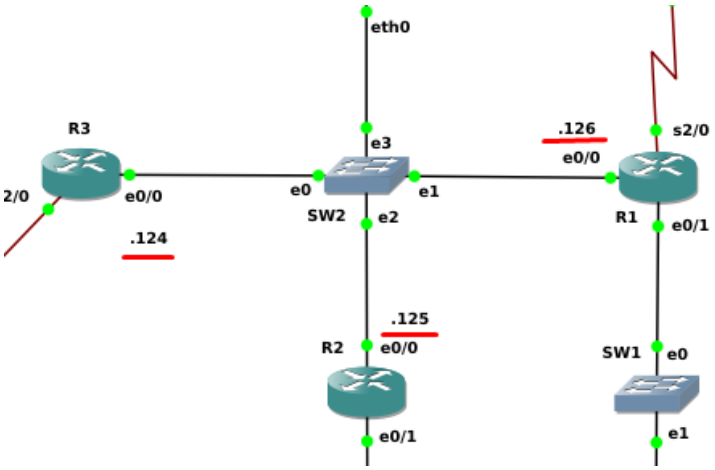
PC2

set pcname PC2

ip 194.65.52.65 255.255.255.192 DG R3 e0/0

ip 194.65.52.65 255.255.255.192 194.65.52.124

save



R2 já pinga PC2!

R3

conf t

int e0/0

ip add 194.65.52.124 255.255.255.192

no shut

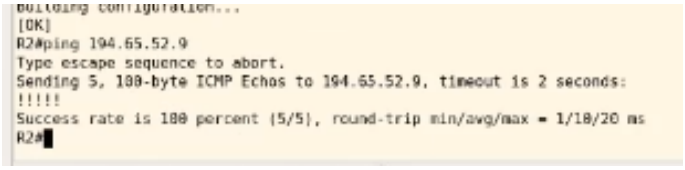
end

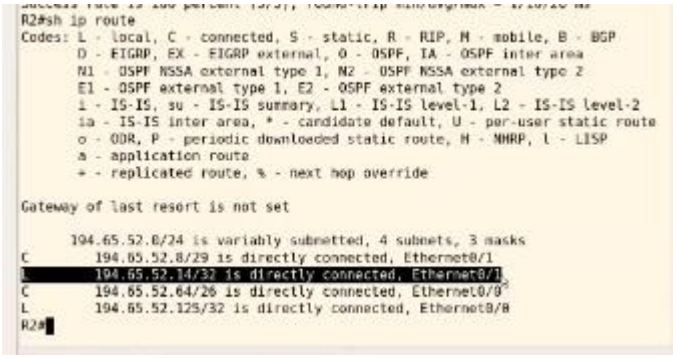
wr

✓ VLSM
Static Routes
Discard Routes
Default Route
ICMP
  Echo request/reply
  Destination unreachable
  Time Exceeded
  Record Route

- Static Routes

Se no R2 quiser pingar PC3 funciona? SIM!





Como o R2 tem 2 portas (e0/0 e e0/1) existem 2 ligações (redes ou sub-redes), dai existir na tabela de encaminhamento 2 redes *connected C*!!

O R3 consegue pingar o PC3 porque esta diretamente ligado a sub-rede do PC3.

ENTÃO:

R2 consegue pingar o PC1? NÃO! – Não esta na tabela de encaminhamento

MAS o R2 consegue pingar R1 e0/0! Porque essa interface faz parte da sub-rede do SW2!!

R2

conf t

ip route 194.65.52.0 255.255.255.248 194.65.52.126

DESTINO MASK VIZINHO (porta) Destino

Agora o R2 pinga o PC1? SIM!

```
R2#ping 194.65.52.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 194.65.52.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/5 ms
R2#
```

PC3 o que consegue pingar?

Default gateway! (.14)

```
PC3> ping 194.65.52.14

84 bytes from 194.65.52.14 icmp_seq=1 ttl=255 time=0.629 ms
84 bytes from 194.65.52.14 icmp_seq=2 ttl=255 time=1.258 ms
84 bytes from 194.65.52.14 icmp_seq=3 ttl=255 time=1.266 ms
^C
PC3>
```

R1 e0/0 (.126)? NÃO!

```
PC3> ping 194.65.52.126

194.65.52.126 icmp_seq=1 timeout
194.65.52.126 icmp_seq=2 timeout
194.65.52.126 icmp_seq=3 timeout
194.65.52.126 icmp_seq=4 timeout
194.65.52.126 icmp_seq=5 timeout

PC3>
```

O R1 não tem rota para a sub-rede SW3!!

R1

conf t

ip route 194.65.52.8 255.255.255.248 194.65.52.125

R2 e0/0

Agora:

```
PC3> ping 194.65.52.126

84 bytes from 194.65.52.126 icmp_seq=1 ttl=254 time=10.614 ms
84 bytes from 194.65.52.126 icmp_seq=2 ttl=254 time=0.817 ms
84 bytes from 194.65.52.126 icmp_seq=3 ttl=254 time=16.388 ms
84 bytes from 194.65.52.126 icmp_seq=4 ttl=254 time=8.314 ms
84 bytes from 194.65.52.126 icmp_seq=5 ttl=254 time=5.778 ms

PC3>
```

PC3 – PC1? SIM!

```
PC3> ping 194.65.52.1

84 bytes from 194.65.52.1 icmp_seq=1 ttl=62 time=3.241 ms
84 bytes from 194.65.52.1 icmp_seq=2 ttl=62 time=1.081 ms
84 bytes from 194.65.52.1 icmp_seq=3 ttl=62 time=1.939 ms
84 bytes from 194.65.52.1 icmp_seq=4 ttl=62 time=19.081 ms
84 bytes from 194.65.52.1 icmp_seq=5 ttl=62 time=6.517 ms

PC3>
```

PC1 – PC3? SIM!

PC2 o que consegue pingar?

Default gateway! (.124)

```
PC2> ping 194.65.52.124

84 bytes from 194.65.52.124 icmp_seq=1 ttl=255 time=2.419 ms
84 bytes from 194.65.52.124 icmp_seq=2 ttl=255 time=2.182 ms
^C
```

R2 e0/0 (.125)? SIM!

```
PC2> ping 194.65.52.125

84 bytes from 194.65.52.125 icmp_seq=1 ttl=255 time=8.713 ms
^C
```

R1 e0/0 (.126)? SIM!

```
PC2> ping 194.65.52.126

84 bytes from 194.65.52.126 icmp_seq=1 ttl=255 time=1.658 ms
84 bytes from 194.65.52.126 icmp_seq=2 ttl=255 time=0.917 ms
84 bytes from 194.65.52.126 icmp_seq=3 ttl=255 time=0.958 ms
^C
PC2>
```

PC1?

```
PC2> ping 194.65.52.1

*194.65.52.124 icmp_seq=1 ttl=255 time=39.065 ms (ICMP type:3, code:1, Destinati
on host unreachable)
*194.65.52.124 icmp_seq=2 ttl=255 time=1.247 ms (ICMP type:3, code:1, Destinatio
n host unreachable)
^[[6~*194.65.52.124 icmp_seq=3 ttl=255 time=0.391 ms (ICMP type:3, code:1, Desti
nation host unreachable)
^H^H^H*194.65.52.124 icmp_seq=4 ttl=255 time=14.511 ms (ICMP type:3, code:1, Des
tination host unreachable)
^H^C
PC2>
PC2>
```

O PC2 tem a DG no R3, e quando lhe chega um pacote para o ip .1 não conhece! *"Destination host unreachable"*

R3 não tem a rota!

```
R3#sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is not set

      194.65.52.0/24 is variably subnetted, 2 subnets, 2 masks
C        194.65.52.64/26 is directly connected, Ethernet0/0
L        194.65.52.124/32 is directly connected, Ethernet0/0
R3#
```

R3

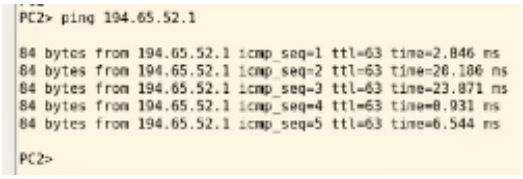
conf t

ip route 194.65.52.0 255.255.255.248 194.65.52.126

OU

ip route 194.65.52.0 255.255.255.248 e0/0 194.65.52.126 – MELHOR

Agora PC2 pinga o PC1!



Default Route

R1

conf t

ip route 0.0.0.0 0.0.0.0 s2/0