

Cheatsheet

- **Come posso effettuare un clone per una VM?** Attraverso `setting_up_vm.sh` è possibile creare n VMs e settare per ognuno di essi le relative interfacce. Lo script si basa su:
 - Creazione di uno Snapshot della macchina principale (i.e. `main`)
 - `VBoxManage snapshot $main take Snapshot # Creating snapshot of main VM`
 - Inizializzazione di un for loop (da `1` ad `n`) in cui per ogni ciclo viene effettuato il setup della macchina i -esima. Il tutto secondo (i) clonazione e (ii) set-up delle sue interfacce.
 - `VBoxManage clonevm $main --snapshot Snapshot --name $name --options link --register`
 - `VBoxManage modifyvm $name --nic$j intnet --intnet$j $lan`

Come impostare un VM come Router?

- IPv4: `VBoxManage guestcontrol <VM-NAME> run --exe /usr/sbin/sysctl --username root --password root --wait-stdout -- sysctl/ -w net.ipv4.ip_forward=1`
- IPv6: `VBoxManage guestcontrol <VM-NAME> run --exe /usr/sbin/sysctl --username root --password root --wait-stdout -- sysctl/ -w net.ipv6.conf.all.forwarding=1`

Create VM

```
#!/bin/bash

# Number of hosts
printf "Enter the number of hosts: \n"
read n
# Name of main VM
printf "Enter the name of the main VM: \n"
read main

# Creating snapshot of main VM
VBoxManage snapshot $main take Snapshot
# Creating hosts
for (( i=1; i<=$n; i++ ))
do
```

```

printf "Creating host $i \n"
# printf "Crezione dell'host" $i
printf "Insert the name for the host (e.g. A): \n"
read name

VBoxManage clonevm $main --snapshot Snapshot --name $name --options link --
register
# Network settings
# N.B. Set "Internal Network" by default
printf "Setting up network for host $name \n"
# Number of interfaces per host
printf "Insert number of interfaces per host... \n"
read m

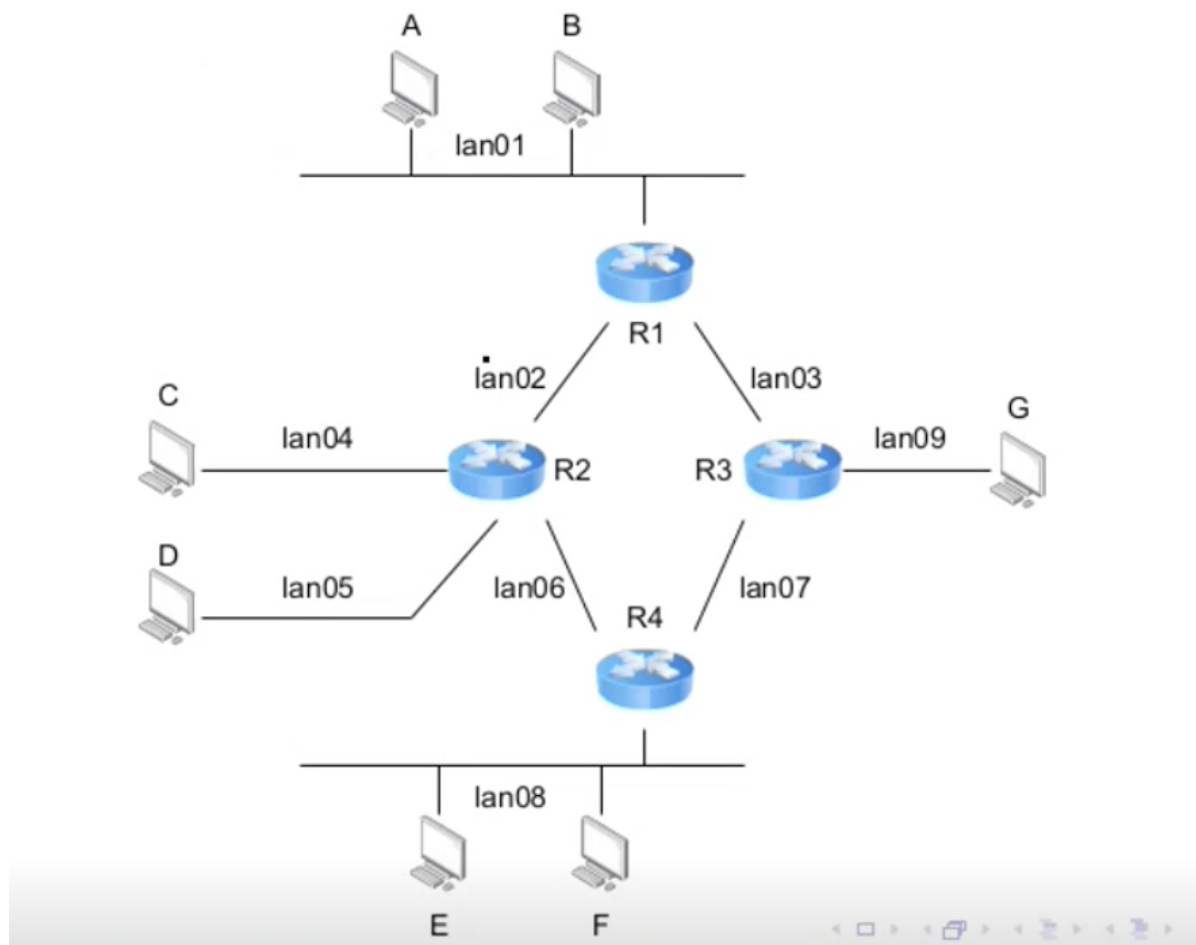
for (( j=1; j<=$m; j++ ))
do
printf "Insert name for LAN (e.g. lan01)... \n"
read lan
VBoxManage modifyvm $name --nic$j intnet --intnet$j $lan
done

VBoxManage startvm $name --type headless

done

```

Subnetting 3C IPv4



A partire dall'indirizzo 10.128.0.0/9, suddividere la rete secondo le seguenti LAN.

1. Creo la tabella per il subnetting. Al suo interno inserisco le LAN in ordine decrescente.

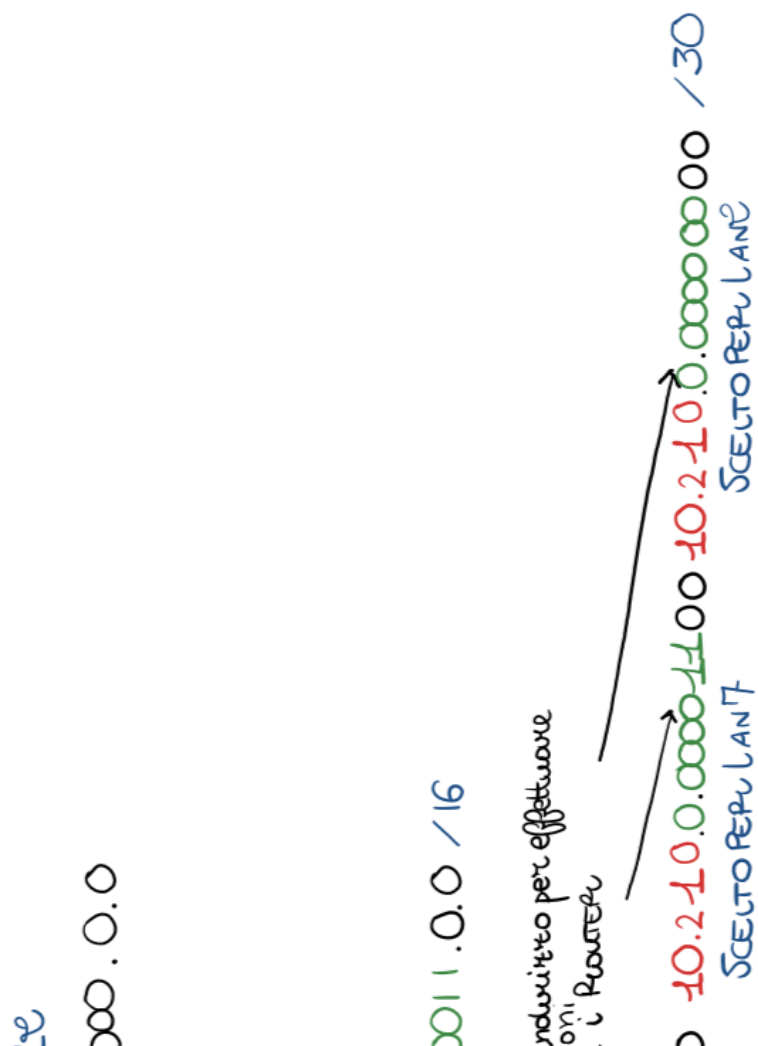
Nome rete	Numero di host	Bit host	Subnet mask	Rete	Broadcast
LAN1	2 000 000				
LAN8	2 000 000				
LAN9	1 040 000				
LAN4	65 000				
LAN5	65 000				
LAN2	2				
LAN3	2				
LAN6	2				
LAN7	2				

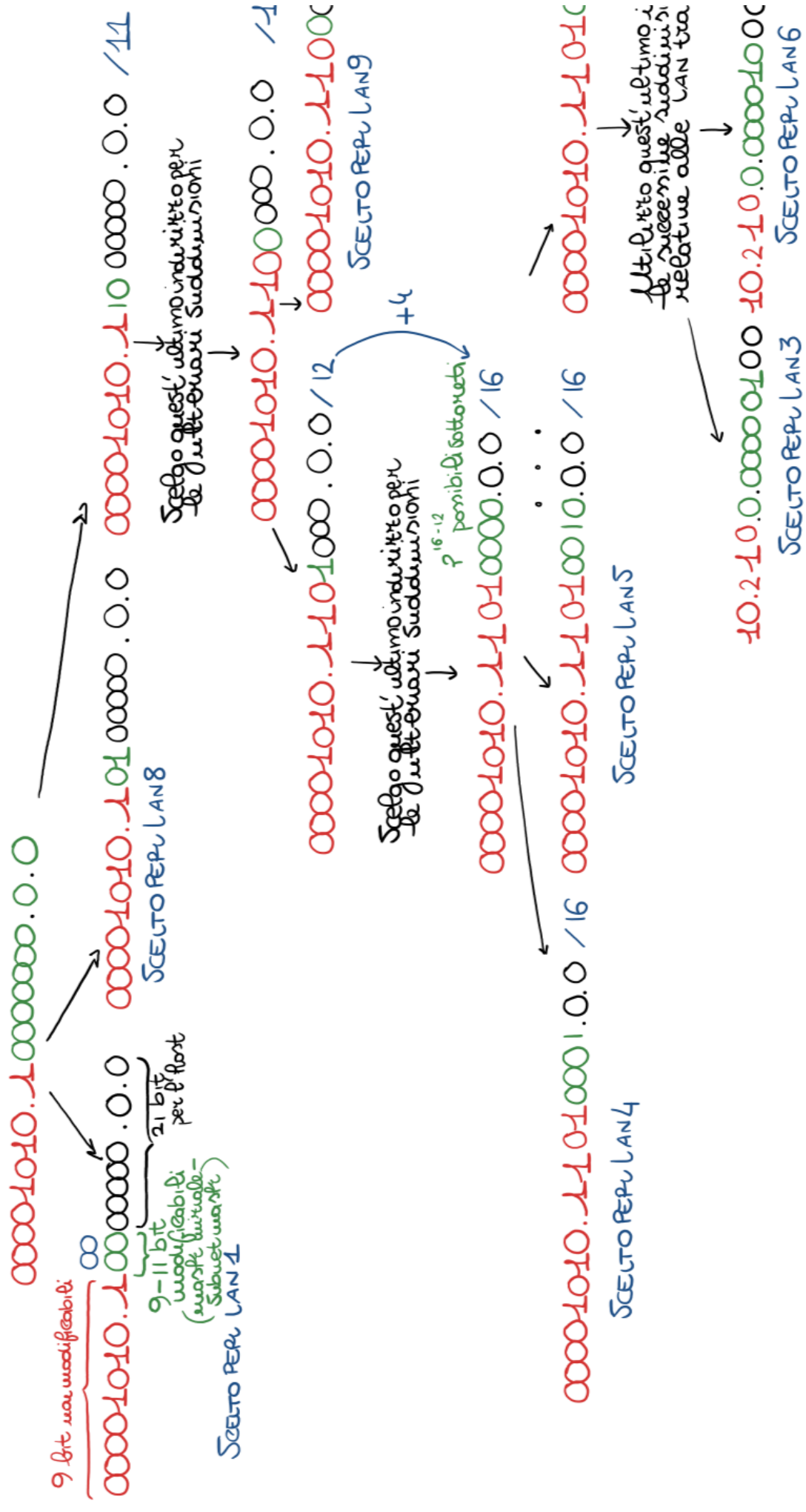
E' importante notare che le LAN tra i router (i.e. 2, 3, 6, 7) necessitano di soli 2 indirizzi (per la coppia di interfacce). Per questo motivo, inserisco un numero di host pari a 2.

2. Calcolo il numero di bit necessari alla parte di host. Successivamente, calcolo la *subnet-mask* per ogni LAN.

Nome rete	Numero di host	Bit host	Subnet mask	Rete	Broad
LAN1	2 000 000	$p : (2^p - 2) \geq n. hosts \rightarrow p = 21$	$32 - 21 = 11$		
LAN8	2 000 000	$p : (2^p - 2) \geq n. hosts \rightarrow p = 21$	$32 - 21 = 11$		
LAN9	1 040 000	$p : (2^p - 2) \geq n. hosts \rightarrow p = 20$	$32 - 20 = 12$		
LAN4	65 000	$p : (2^p - 2) \geq n. hosts \rightarrow p = 16$	$32 - 16 = 16$		
LAN5	65 000	$p : (2^p - 2) \geq n. hosts \rightarrow p = 16$	$32 - 16 = 16$		
LAN2	2	$p : (2^p - 2) \geq n. hosts \rightarrow p = 2$	$32 - 30 = 2$		
LAN3	2	$p : (2^p - 2) \geq n. hosts \rightarrow p = 2$	$32 - 30 = 2$		
LAN6	2	$p : (2^p - 2) \geq n. hosts \rightarrow p = 2$	$32 - 30 = 2$		
LAN7	2	$p : (2^p - 2) \geq n. hosts \rightarrow p = 2$	$32 - 30 = 2$		

3. Svolgo graficamente il lavoro di subnetting.





4. Inserisco indirizzo di rete e broadcast, rispettivamente primo ed ultimo all'interno dello spazio di indirizzamento per la determinata LAN.

Nome rete	Numero di host	Bit host	Subnet mask	Rete	Broadcast
LAN1	2 000 000	21	11	10.128.0.0	10.128.7.255
LAN8	2 000 000	21	11	10.160.0.0	10.160.7.255
LAN9	1 040 000	20	12	10.192.0.0	10.192.15.255
LAN4	65 000	16	16	10.209.0.0	10.209.255.255
LAN5	65 000	16	16	10.210.0.0	10.210.255.255
LAN2	2	2	2	10.210.0.0	10.210.0.3
LAN3	2	2	2	10.210.0.4	10.210.0.7
LAN6	2	2	2	10.210.0.8	10.210.0.11
LAN7	2	2	2	10.210.0.12	10.210.0.15

```
echo "Configurazione nodo A"
# Login
VBoxManage guestcontrol A run --exe /usr/bin/hostname --username root --password root --wait-stdout -- hostname/ A

# Set up address
VBoxManage guestcontrol A run --exe /sbin/ip --username root --password root --wait-stdout -- ip/ addr add 10.128.0.1/11 dev enp0s3

# Set up routing
VBoxManage guestcontrol A run --exe /sbin/ip --username root --password root --wait-stdout -- ip/ route add default via 10.128.7.254

echo "Configurazione nodo B"
# Login
VBoxManage guestcontrol B run --exe /usr/bin/hostname --username root --password root --wait-stdout -- hostname/ B

# Set up address
VBoxManage guestcontrol B run --exe /sbin/ip --username root --password root --wait-stdout -- ip/ addr add 10.128.0.2/11 dev enp0s3

# Set up routing
VBoxManage guestcontrol B run --exe /sbin/ip --username root --password root --wait-stdout -- ip/ route add default via 10.128.7.254
```

```
echo "Configurazione nodo C"
# Login
VBoxManage guestcontrol C run --exe /usr/bin/hostname --username root --password
root --wait-stdout -- hostname/ C

# Set up address
VBoxManage guestcontrol C run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.209.0.1/16 dev enp0s3

# Set up routing
VBoxManage guestcontrol C run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add default via 10.209.255.254

echo "Configurazione nodo D"
# Login
VBoxManage guestcontrol D run --exe /usr/bin/hostname --username root --password
root --wait-stdout -- hostname/ D

# Set up address
VBoxManage guestcontrol D run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.1/16 dev enp0s3

# Set up routing
VBoxManage guestcontrol D run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add default via 10.210.255.254

echo "Configurazione nodo E"
# Login
VBoxManage guestcontrol E run --exe /usr/bin/hostname --username root --password
root --wait-stdout -- hostname/ E

# Set up address
VBoxManage guestcontrol E run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.160.0.1/11 dev enp0s3

# Set up routing
VBoxManage guestcontrol E run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add default via 10.160.7.254

echo "Configurazione nodo F"
# Login
VBoxManage guestcontrol F run --exe /usr/bin/hostname --username root --password
root --wait-stdout -- hostname/ F

# Set up address
VBoxManage guestcontrol F run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.160.0.2/11 dev enp0s3

# Set up routing
```

```
VBoxManage guestcontrol F run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add default via 10.160.7.254

echo "Configurazione nodo G"
# Login
VBoxManage guestcontrol G run --exe /usr/bin/hostname --username root --password
root --wait-stdout -- hostname/ G

# Set up address
VBoxManage guestcontrol G run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.192.0.1/12 dev enp0s3

# Set up routing
VBoxManage guestcontrol G run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add default via 10.192.15.254

echo "Configurazione nodo R1"
# Login
VBoxManage guestcontrol R1 run --exe /usr/bin/hostname --username root --
password root --wait-stdout -- hostname/ R1

# Set up interfaces (> enp0s3)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s8 up

VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s9 up

# Set up address

VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.128.7.254/11 dev enp0s3

VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.1/30 dev enp0s8

VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.5/30 dev enp0s9

# Set up routing

# Se riceve un pacchetto per LAN04, allora inoltra verso R2 (LAN02)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.209.0.0/16 via 10.210.0.2

# Se riceve un pacchetto per LAN05, allora inoltra verso R2 (LAN02)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.210.0.0/16 via 10.210.0.2
```



```
# Se riceve un pacchetto per LAN08, allora inoltra verso R2 (LAN02)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.160.0.0/11 via 10.210.0.2

# Se riceve un pacchetto per LAN08, allora inoltra verso R3 (LAN03)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.160.0.0/11 via 10.210.0.6

# Se riceve un pacchetto per LAN09, allora inoltra verso R3 (LAN02)
VBoxManage guestcontrol R1 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.192.0.0/12 via 10.210.0.6

# Set up packet-forwarding
VBoxManage guestcontrol R1 run --exe /usr/sbin/sysctl --username root --password
root --wait-stdout -- sysctl/ -w net.ipv4.ip_forward=1

echo "Configurazione nodo R2"
# Login
VBoxManage guestcontrol R2 run --exe /usr/bin/hostname --username root --
password root --wait-stdout -- hostname/ R2

# Set up interfaces (> enp0s3)
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s8 up

VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s9 up

VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s10 up

# Set up address
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.2/30 dev enp0s3

VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.209.255.254/16 dev enp0s8

VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.255.254/16 dev enp0s9

VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.9/30 dev enp0s10

# Set up routing
# Se riceve un pacchetto per LAN01, allora inoltra verso R1 (LAN02)
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.128.0.0/11 via 10.210.0.1
```

```
# Se riceve un pacchetto per LAN08, allora inoltra verso R4 (LAN06)
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.160.0.0/11 via 10.210.0.10

# Se riceve un pacchetto per LAN09, allora inoltra verso R4 (LAN06)
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.192.0.0/12 via 10.210.0.10

# Se riceve un pacchetto per LAN09, allora inoltra verso R1 (LAN02)
VBoxManage guestcontrol R2 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.192.0.0/12 via 10.210.0.1

# Set up packet-forwarding
VBoxManage guestcontrol R2 run --exe /usr/sbin/sysctl --username root --password
root --wait-stdout -- sysctl/ -w net.ipv4.ip_forward=1

echo "Configurazione nodo R3"
# Login
VBoxManage guestcontrol R3 run --exe /usr/bin/hostname --username root --
password root --wait-stdout -- hostname/ R3

# Set up interfaces (> enp0s3)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s8 up

VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s9 up

# Set up address
# LAN03
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.6/30 dev enp0s3

# LAN09
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.192.15.254/12 dev enp0s8

# LAN07
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.13/30 dev enp0s9

# Set up routing
# Se riceve un pacchetto per LAN01, allora inoltra verso R1 (LAN03)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.128.0.0/11 via 10.210.0.5

# Se riceve un pacchetto per LAN04, allora inoltra verso R1 (LAN03)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.209.0.0/16 via 10.210.0.5
```

```
# Se riceve un pacchetto per LAN05, allora inoltra verso R1 (LAN03)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.210.0.0/16 via 10.210.0.5

# Se riceve un pacchetto per LAN04, allora inoltra verso R4 (LAN07)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.209.0.0/16 via 10.210.0.14

# Se riceve un pacchetto per LAN05, allora inoltra verso R4 (LAN07)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.210.0.0/16 via 10.210.0.14

# Se riceve un pacchetto per LAN08, allora inoltra verso R4 (LAN07)
VBoxManage guestcontrol R3 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.160.0.0/11 via 10.210.0.14

# Set up packet-forwarding
VBoxManage guestcontrol R3 run --exe /usr/sbin/sysctl --username root --password
root --wait-stdout -- sysctl/ -w net.ipv4.ip_forward=1

echo "Configurazione nodo R4"
# Login
VBoxManage guestcontrol R4 run --exe /usr/bin/hostname --username root --
password root --wait-stdout -- hostname/ R4

# Set up interfaces (> enp0s3)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s8 up
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ link set enp0s9 up

# Set up address
# LAN06
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.10/30 dev enp0s3

# LAN08
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.160.7.254/11 dev enp0s8

# LAN07
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ addr add 10.210.0.14/30 dev enp0s9

# Set up routing
# Se riceve un pacchetto per LAN01, allora inoltra verso R2 (LAN06)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.128.0.0/11 via 10.210.0.9
```

```
# Se riceve un pacchetto per LAN01, allora inoltra verso R3 (LAN07)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.128.0.0/11 via 10.210.0.13

# Se riceve un pacchetto per LAN09, allora inoltra verso R3 (LAN07)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.192.0.0/12 via 10.210.0.13

# Se riceve un pacchetto per LAN04, allora inoltra verso R2 (LAN06)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.209.0.0/16 via 10.210.0.9

# Se riceve un pacchetto per LAN05, allora inoltra verso R2 (LAN06)
VBoxManage guestcontrol R4 run --exe /sbin/ip --username root --password root --
wait-stdout -- ip/ route add 10.210.0.0/16 via 10.210.0.9

# Set up packet-forwarding
VBoxManage guestcontrol R4 run --exe /usr/sbin/sysctl --username root --password
root --wait-stdout -- sysctl/ -w net.ipv4.ip_forward=1
```