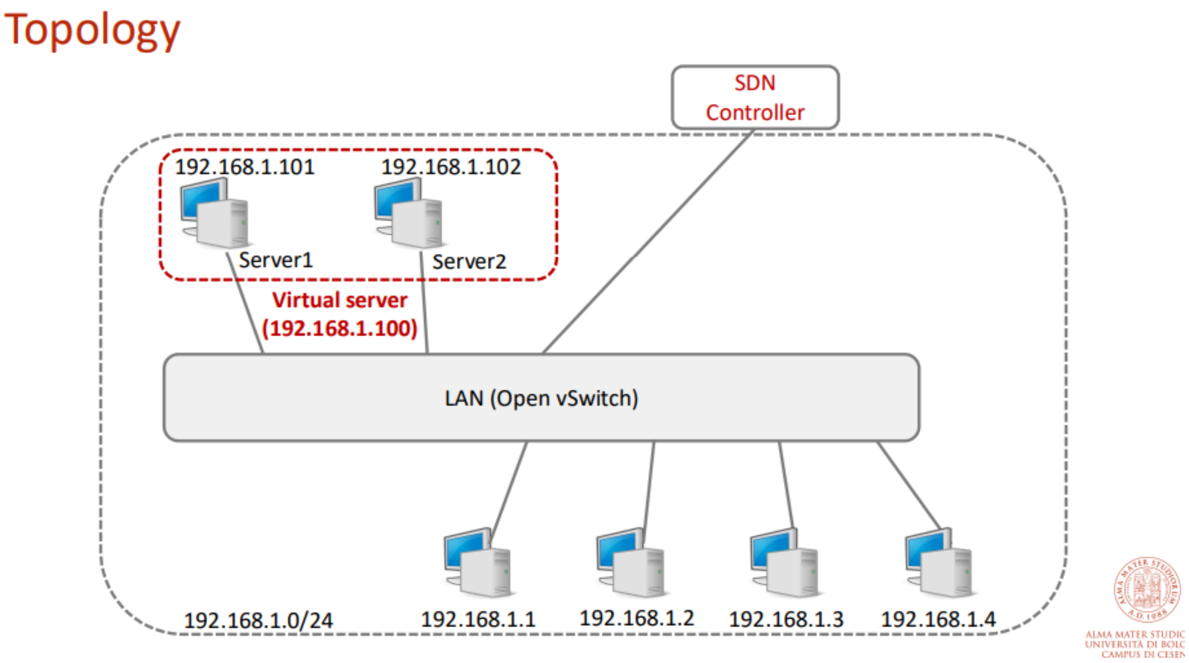
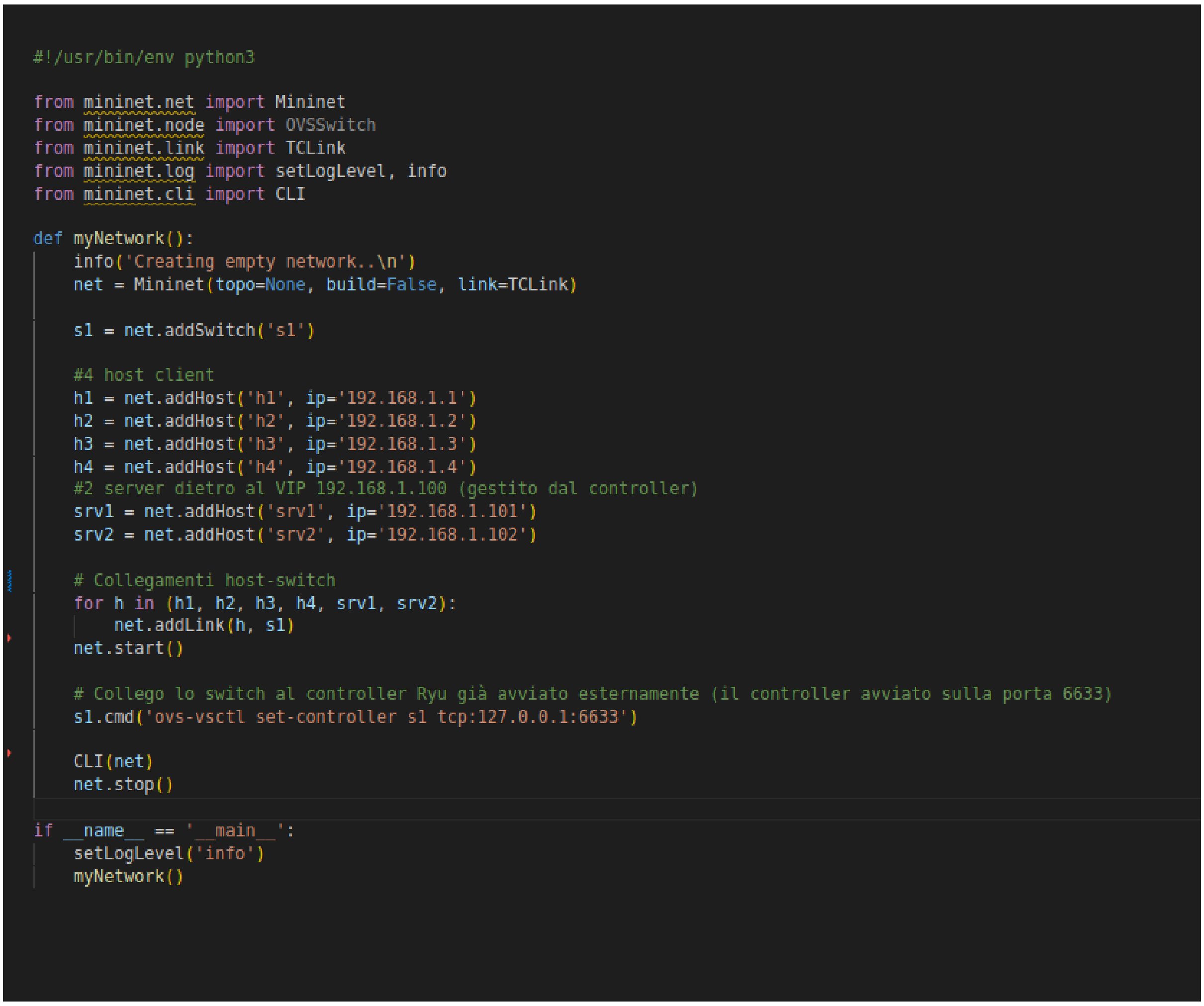
LOAD BALANCER HOMEWORK



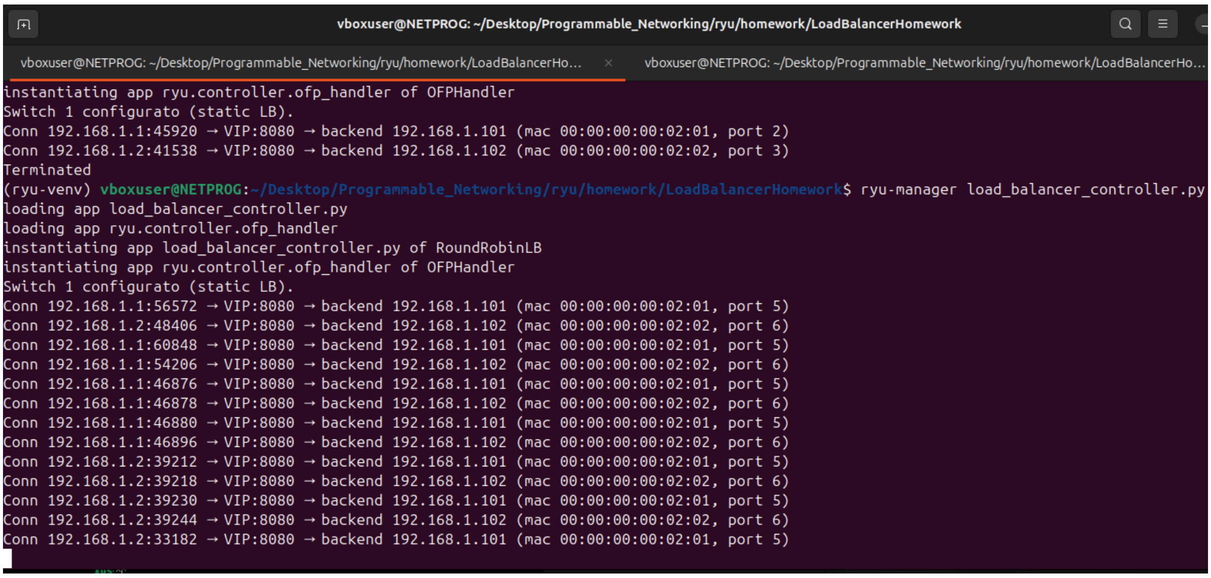
1) CREAZIONE DELLA TOPOLOGIA

La topologia è stata creata con Mininet.



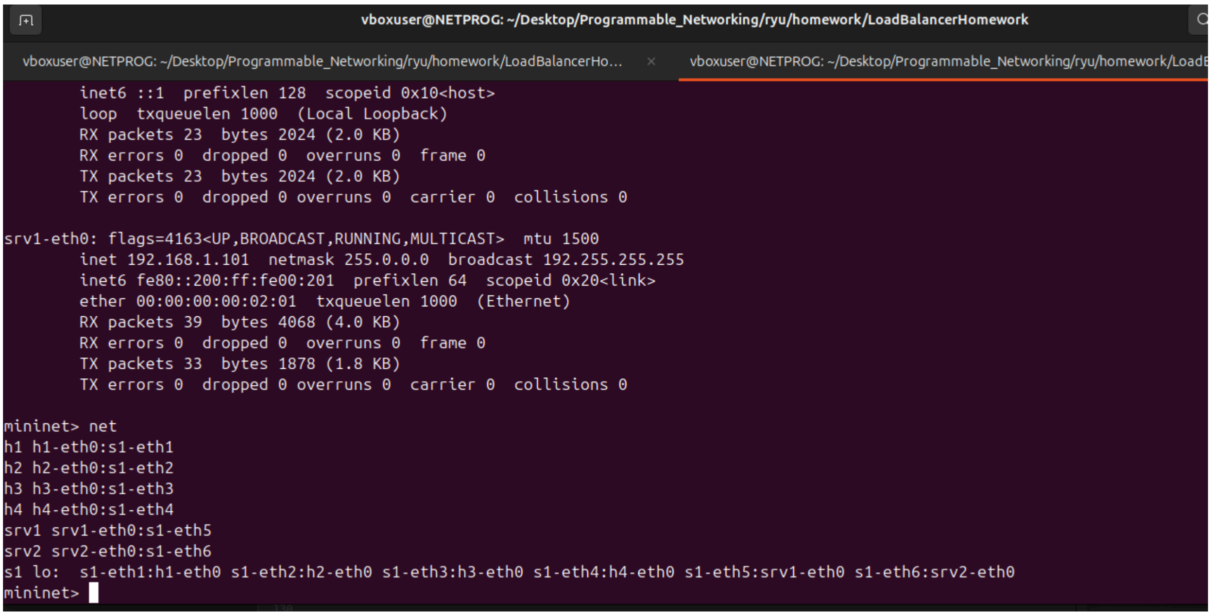
```
#!/usr/bin/env python3

from mininet.net import Mininet
from mininet.node import OVSSwitch
from mininet.link import TCLink
from mininet.log import setLogLevel, info
from mininet.cli import CLI

def myNetwork():
    info('Creating empty network..\n')
    net = Mininet(topo=None, build=False, link=TCLink)

    s1 = net.addSwitch('s1')

    #4 host client
    h1 = net.addHost('h1', ip='192.168.1.1')
    h2 = net.addHost('h2', ip='192.168.1.2')
    h3 = net.addHost('h3', ip='192.168.1.3')
    h4 = net.addHost('h4', ip='192.168.1.4')
    #2 server dietro al VIP 192.168.1.100 (gestito dal controller)
    srv1 = net.addHost('srv1', ip='192.168.1.101')
    srv2 = net.addHost('srv2', ip='192.168.1.102')

    # Collegamenti host-switch
    for h in (h1, h2, h3, h4, srv1, srv2):
        net.addLink(h, s1)
    net.start()

    # Collego lo switch al controller Ryu già avviato esternamente (il controller avviato sulla porta 6633)
    s1.cmd('ovs-vsctl set-controller s1 tcp:127.0.0.1:6633')

    CLI(net)
    net.stop()

if __name__ == '__main__':
    setLogLevel('info')
    myNetwork()
```

2) CREAZIONE DEL CONTROLLER CON RYU.

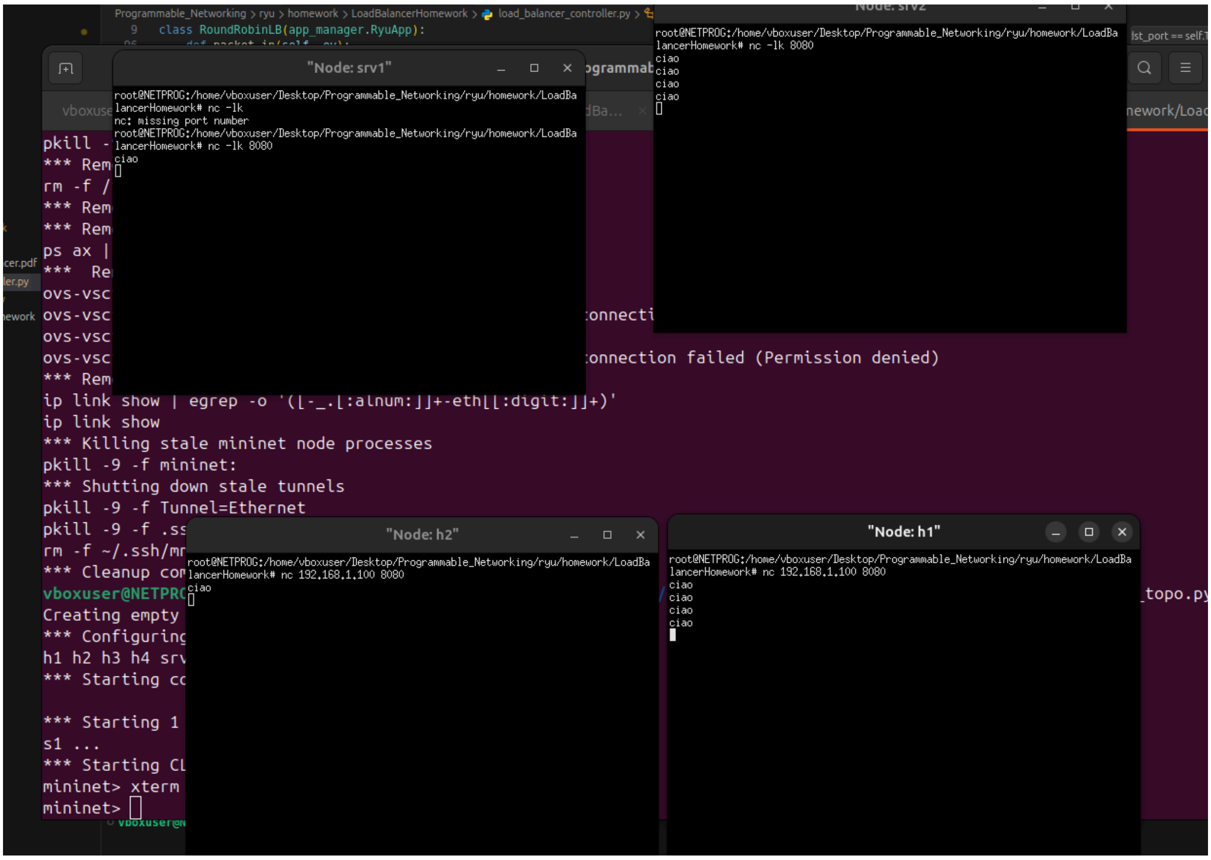

vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHomework
vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHo...
vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHo...

```
instantiating app ryu.controller.ofp_handler of OFPHandler
Switch 1 configurato (static LB).
Conn 192.168.1.1:45920 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 2)
Conn 192.168.1.2:41538 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 3)
Terminated
(ryu-venv) vboxuser@NETPROG:~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHomework$ ryu-manager load_balancer_controller.py
loading app load_balancer_controller.py
loading app ryu.controller.ofp_handler
instantiating app load_balancer_controller.py of RoundRobinLB
instantiating app ryu.controller.ofp_handler of OFPHandler
Switch 1 configurato (static LB).
Conn 192.168.1.1:56572 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.2:48406 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.1:60848 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.1:54206 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.1:46876 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.1:46878 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.1:46880 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.1:46896 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.2:39212 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.2:39218 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.2:39230 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
Conn 192.168.1.2:39244 → VIP:8080 → backend 192.168.1.102 (mac 00:00:00:00:02:02, port 6)
Conn 192.168.1.2:33182 → VIP:8080 → backend 192.168.1.101 (mac 00:00:00:00:02:01, port 5)
```

Ogni nuova connessione il controller le reindirizza sul backend alterrnando le connessioni come previsto da round robin.


vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHomework
vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadBalancerHo...
vboxuser@NETPROG: ~/Desktop/Programmable_Networking/ryu/homework/LoadB

```
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 23  bytes 2024 (2.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 23  bytes 2024 (2.0 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

srv1-eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.101  netmask 255.0.0.0  broadcast 192.255.255.255
        inet6 fe80::200:ff:fe00:201  prefixlen 64  scopeid 0x20<link>
        ether 00:00:00:00:02:01  txqueuelen 1000  (Ethernet)
        RX packets 39  bytes 4068 (4.0 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 33  bytes 1878 (1.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

mininet> net
h1 h1-eth0:s1-eth1
h2 h2-eth0:s1-eth2
h3 h3-eth0:s1-eth3
h4 h4-eth0:s1-eth4
srv1 srv1-eth0:s1-eth5
srv2 srv2-eth0:s1-eth6
s1 lo:  s1-eth1:h1-eth0 s1-eth2:h2-eth0 s1-eth3:h3-eth0 s1-eth4:h4-eth0 s1-eth5:srv1-eth0 s1-eth6:srv2-eth0
mininet> 
```



Programmable_Networking > ryu > homework > LoadBalancerHomework > load_balancer_controller.py >

```
class RoundRobinLB(app_manager.RyuApp):
```

"Node: srv1"

```
root@NETPROG:/home/vboxuser/Desktop/Programmable_Networking/ryu/homework/LoadBa
lancerHomework# nc -lk
nc: missing port number
root@NETPROG:/home/vboxuser/Desktop/Programmable_Networking/ryu/homework/LoadBa
lancerHomework# nc -lk 8080
ciao
```

"Node: srv2"

```
root@NETPROG:/home/vboxuser/Desktop/Programmable_Networking/ryu/homework/LoadBa
lancerHomework# nc -lk 8080
ciao
ciao
ciao
ciao
```

```
pkill -
*** Rem
rm -f /
*** Rem
*** Rem
ps ax |
***  Re
ovs-vsc
ovs-vsc                                                onnecti
ovs-vsc
ovs-vsc                                                onnection failed (Permission denied)
*** Rem
ip link show | egrep -o '([-_.[:alnum:]]+-eth[[:digit:]]+)'
ip link show
*** Killing stale mininet node processes
pkill -9 -f mininet:
*** Shutting down stale tunnels
pkill -9 -f Tunnel=Ethernet
pkill -9 -f .ss
rm -f ~/.ssh/mr
*** Cleanup com
vboxuser@NETPRO
Creating empty
*** Configuring
h1 h2 h3 h4 srv
*** Starting co

*** Starting 1
s1 ...
*** Starting CL
mininet> xterm
mininet> 
```

"Node: h2"

```
root@NETPROG:/home/vboxuser/Desktop/Programmable_Networking/ryu/homework/LoadBa
lancerHomework# nc 192.168.1.100 8080
ciao
```

"Node: h1"

```
root@NETPROG:/home/vboxuser/Desktop/Programmable_Networking/ryu/homework/LoadBa
lancerHomework# nc 192.168.1.100 8080
ciao
ciao
ciao
ciao
```