

VLANs

Se van a añadir diferentes VLAN en nuestra red con el fin de segmentarla para organizarla lógicamente de una manera diferente a como se encuentra físicamente.

En la primera tabla se encuentran las distintas VLAN con sus respectivas redes y su función. En la segunda podemos encontrar el direccionamiento asociado a lo anterior.

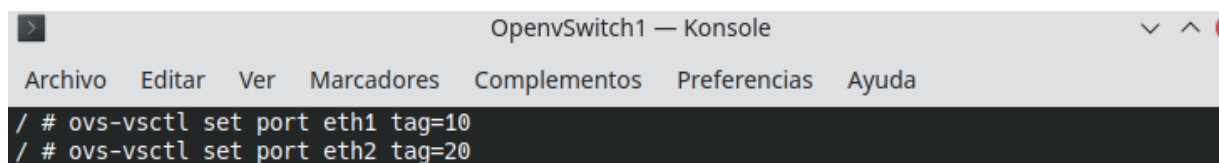
VLAN	Nombre	Dirección de red	Descripción
10	Centrales	192.168.5.0/24	Personal de servicios centrales
20	Oficina	192.168.6.0/24	Personal de oficinas
30	CPD	192.168.7.0/24	Equipamiento en CPD

Red	Equipo	VLAN	Dirección IP	Descripción
Usuarios	PC-2	10	192.168.5.10	Equipo en OpenvSwitch1 de servicios centrales
	PC-3	20	192.168.6.11	Equipo en OpenvSwitch1 de oficinas
	PC-4	20	192.168.6.12	Equipo en OpenvSwitch2 de oficinas
	PC-5	30	192.168.7.13	Equipo en OpenvSwitch2 del CPD

Configuración de los conmutadores

Para comenzar se han de configurar los conmutadores diciendo
Set the add port to access port, vlan id 10:

```
ovs-vsctl set port eth1 tag=10
```



```
OpenvSwitch1 — Konsole
Archivo  Editar  Ver  Marcadores  Complementos  Preferencias  Ayuda
/ # ovs-vsctl set port eth1 tag=10
/ # ovs-vsctl set port eth2 tag=20
```

Para setear un puerto trunk es importante que este no exista anteriormente, por lo que realizamos lo siguiente:

```
ovs-vsctl del-port br0 eth3
ovs-vsctl add-port br0 eth3 trunk=10,20,30
```

vSW1

```
OpenvSwitch1 — Konsole
Archivo  Editar  Ver  Marcadores  Complementos  Preferencias  Ayuda
/ # ovs-vsctl del-port br0 eth3
/ # ovs-vsctl add-port br0 eth3 trunk=10,20,30
```

```
OpenvSwitch1 — Konsole
Archivo  Editar  Ver  Marcadores  Complementos  Preferencias  Ayuda
/ # ovs-vsctl show
fb147dbb-747f-4e11-8bb7-17dee461795c
  Bridge "br0"
    Controller "tcp:192.168.0.2:6633"
      is_connected: true
    fail_mode: secure
    Port "br0"
      Interface "br0"
        type: internal
    Port "eth2"
      tag: 20
      Interface "eth2"
    Port "eth3"
      trunks: [10, 20, 30]
      Interface "eth3"
    Port "eth1"
      tag: 10
      Interface "eth1"
/ #
```

```
OpenvSwitch1 — Konsole <2>
File  Edit  View  Bookmarks  Plugins  Settings  Help
/ # ovs-vsctl add-port br0 vlan20 tag=20 -- set interface vlan20 type=internal
/ # ovs-vsctl add-port br0 vlan10 tag=10 -- set interface vlan10 type=internal
/ # ip addr add 192.168.3.10 dev vlan10
/ # ip addr add 192.168.4.11 dev vlan20
/ # ip link set vlan10 up
/ # ip link set vlan20 up
```

```
OpenvSwitch1 — Konsole
File  Edit  View  Bookmarks  Plugins  Settings  Help
/ # ovs-vsctl set port eth1 vlan_mode=native-tagged
/ # ovs-vsctl set port eth2 vlan_mode=native-tagged
/ # ovs-vsctl set port eth3 vlan_mode=native-tagged
```

```
OpenvSwitch1 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

vSW2

```
OpenvSwitch2 — Konsole
Archivo Editar Ver Marcadores Complementos Preferencias Ayuda
/ # ovs-vsctl set port eth1 tag=20
/ # ovs-vsctl set port eth2 tag=30
/ # ovs-vsctl set port eth3 trunk=10,20,30
/ # ovs-vsctl show
ea2beba3-c97b-44c8-98f5-b781e0ac3455
  Bridge "br0"
    Controller "tcp:192.168.0.2:6633"
      is_connected: true
    fail_mode: secure
    Port "eth2"
      tag: 30
      Interface "eth2"
    Port "eth3"
      trunks: [10, 20, 30]
      Interface "eth3"
    Port "eth1"
      tag: 20
      Interface "eth1"
    Port "br0"
      Interface "br0"
      type: internal
```

No estoy segura de esta siguiente

```
OpenvSwitch2 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl add-port br0 vlan20 tag=20 -- set interface vlan20 type=internal
/ # ovs-vsctl add-port br0 vlan30 tag=30 -- set interface vlan30 type=internal
/ # ip addr add 192.168.4.12 dev vlan20
/ # ip addr add 192.168.5.13 dev vlan30
/ # ip link set vlan20 up
/ # ip link set vlan30 up
```

esto parece super util

```
OpenvSwitch2 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl set port eth1 vlan_mode=native-tagged
/ # ovs-vsctl set port eth2 vlan_mode=native-tagged
/ # ovs-vsctl set port eth3 vlan_mode=native-tagged
```

```
OpenvSwitch2 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

Para configurar el switch 3, tendrá el puerto eth1, eth2 y eth3 como trunk.

```
OpenvSwitch3 — Konsole
Archivo Editar Ver Marcadores Complementos Preferencias Ayuda
/ # ovs-vsctl set port eth1 trunk=10,20,30
/ # ovs-vsctl set port eth2 trunk=10,20,30
/ # ovs-vsctl set port eth3 trunk=10,20,30
/ # ovs-vsctl show
d4b8305b-b1df-4709-809b-e70271f56f5e
Bridge "br0"
  Controller "tcp:192.168.0.2:6633"
    is_connected: true
  fail_mode: secure
  Port "eth1"
    trunks: [10, 20, 30]
    Interface "eth1"
  Port "eth3"
    trunks: [10, 20, 30]
    Interface "eth3"
  Port "eth2"
    trunks: [10, 20, 30]
    Interface "eth2"
  Port "br0"
    Interface "br0"
    type: internal
```

```
OpenvSwitch3 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl set port eth1 vlan_mode=native-tagged
/ # ovs-vsctl set port eth2 vlan_mode=native-tagged
/ # ovs-vsctl set port eth3 vlan_mode=native-tagged
```

```
OpenvSwitch3 — Konsole
File Edit View Bookmarks Plugins Settings Help
/ # ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

ONOS

Comandos

OpenVSwitch 1

puertos de acceso

```
ovs-vsctl set port eth1 tag=10
```

```
ovs-vsctl set port eth2 tag=20
```

puertos trunk

```
ovs-vsctl set port eth3 trunk=10,20,30
```

```
ovs-vsctl add-port br0 vlan10 tag=10 -- set interface vlan10 type=internal
```

```
ovs-vsctl add-port br0 vlan20 tag=20 -- set interface vlan20 type=internal
```

```
ip addr add 192.168.3.10 dev vlan10
```

```
ip addr add 192.168.4.11 dev vlan20
```

```
ip link set vlan10 up
```

```
ip link set vlan20 up
```

```
ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

```
vlan_mode=native-tagged
```

OpenVSwitch 2

puertos de acceso

```
ovs-vsctl set port eth1 vlan_mode=access tag=20
```

```
ovs-vsctl set port eth2 vlan_mode=access tag=30
```

puertos trunk

```
ovs-vsctl set port eth3 vlan_mode=trunk trunk=10,20,30
```

```
ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

```
ovs-vsctl add-port br0 vlan20 tag=20 -- set interface vlan20 type=internal
```

```
ovs-vsctl add-port br0 vlan30 tag=30 -- set interface vlan30 type=internal
```

```
ip addr add 192.168.4.12 dev vlan20
```

```
ip addr add 192.168.5.13 dev vlan30
```

```
ip link set vlan20 up
```

```
ip link set vlan30 up
```

OpenVSwitch 3

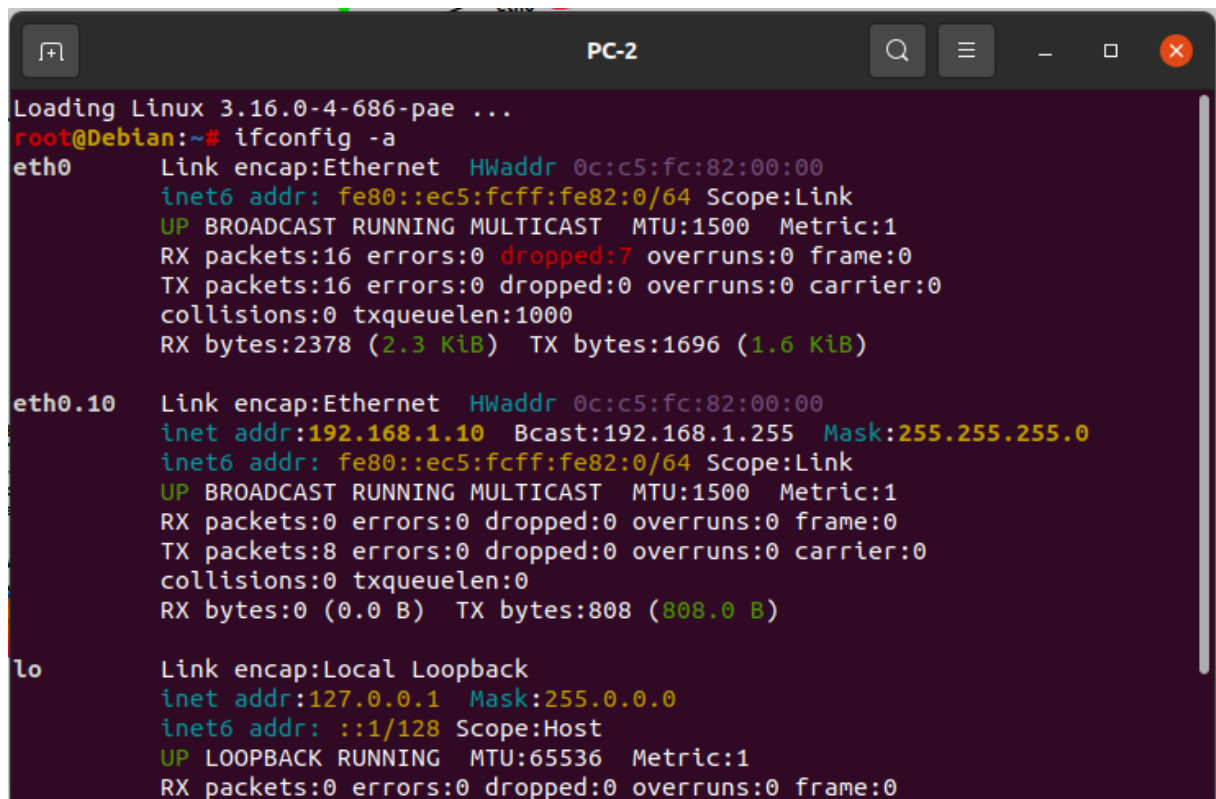
```
ovs-vsctl set port eth1 trunk=10,20,30
```

```
ovs-vsctl set port eth2 vlan_mode=trunk trunk=10,20,30
```

```
ovs-vsctl set port eth3 vlan_mode=trunk trunk=10,20,30
```

```
ovs-vsctl set-controller br0 tcp:192.168.0.2:6653
```

Haciendo que los hosts manden paquetes etiquetados:



```
PC-2
Loading Linux 3.16.0-4-686-pae ...
root@Debian:~# ifconfig -a
eth0      Link encap:Ethernet  HWaddr 0c:c5:fc:82:00:00
          inet6 addr: fe80::ec5:fcff:fe82:0/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:16 errors:0 dropped:7 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2378 (2.3 KiB)  TX bytes:1696 (1.6 KiB)

eth0.10    Link encap:Ethernet  HWaddr 0c:c5:fc:82:00:00
          inet addr:192.168.1.10  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::ec5:fcff:fe82:0/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:808 (808.0 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
```

creamos la interfaz nueva para mandar el tráfico taggeado:

```
vconfig add [INTERFAZ] [VLAN]
```

Comprobamos que el driver 8021q está cargado para poder trabajar con VLAN's

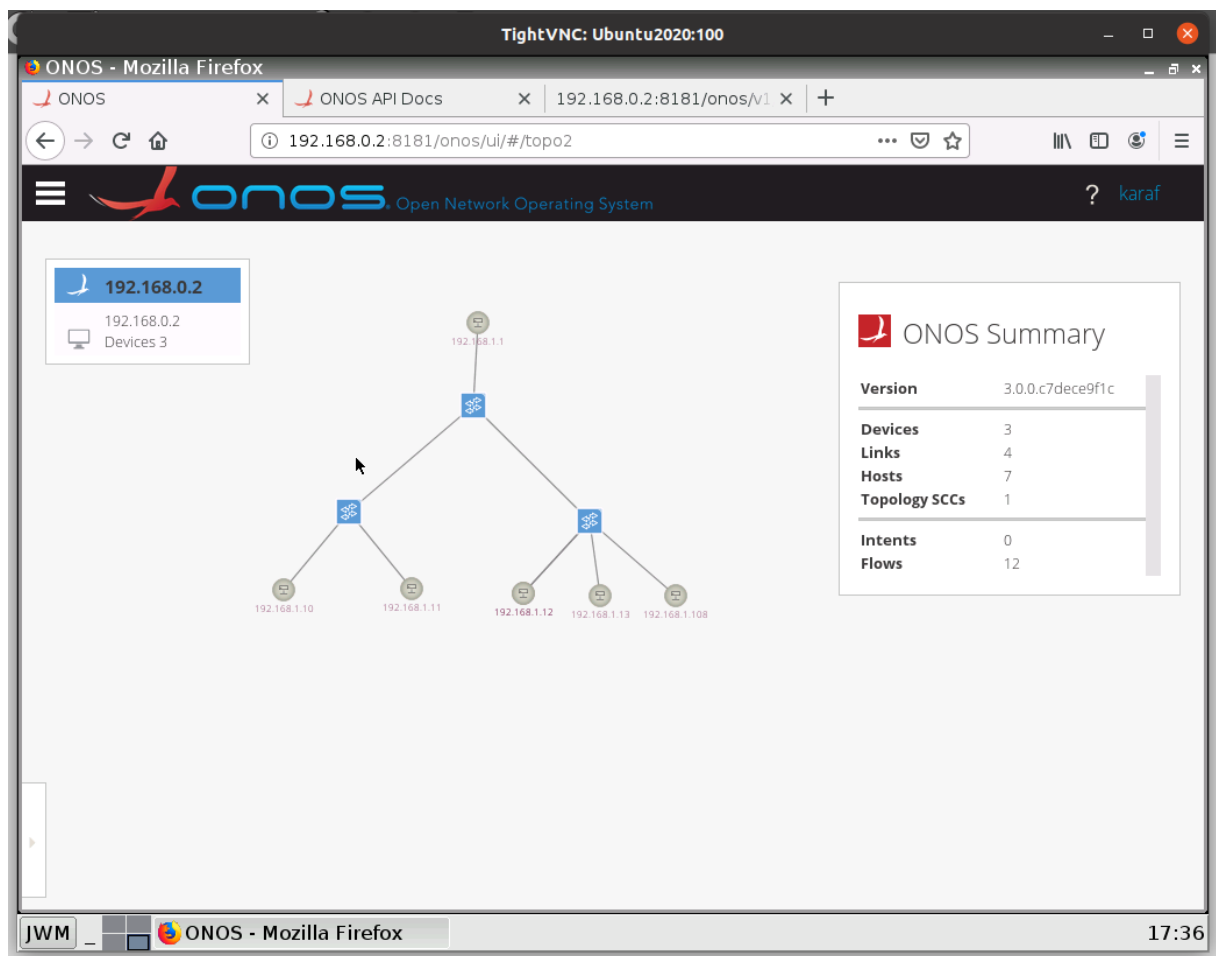
```
lsmod | grep 8021q
```

en /etc/network/interfaces agregamos las siguientes líneas. por ejemplo para el PC2

```
auto eth0.10
iface eth0.10 inet static
    address 192.168.1.10
    netmask 255.255.255.0
    vlan-raw-device eth0
```

ping de PC3 a PC4 y de PC3 a PC2:

```
PC-3
root@Debian:~# ping 192.168.1.12
PING 192.168.1.12 (192.168.1.12) 56(84) bytes of data.
64 bytes from 192.168.1.12: icmp_seq=1 ttl=64 time=18.9 ms
64 bytes from 192.168.1.12: icmp_seq=2 ttl=64 time=1.35 ms
64 bytes from 192.168.1.12: icmp_seq=3 ttl=64 time=1.50 ms
64 bytes from 192.168.1.12: icmp_seq=4 ttl=64 time=1.09 ms
^C
--- 192.168.1.12 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 1.096/5.737/18.992/7.654 ms
root@Debian:~# ping 192.168.1.10
PING 192.168.1.10 (192.168.1.10) 56(84) bytes of data.
From 192.168.1.11 icmp_seq=1 Destination Host Unreachable
From 192.168.1.11 icmp_seq=2 Destination Host Unreachable
From 192.168.1.11 icmp_seq=3 Destination Host Unreachable
^C
--- 192.168.1.10 ping statistics ---
6 packets transmitted, 0 received, +3 errors, 100% packet loss, time 5019ms
pipe 3
```



pfSense

Primero se crean las interfaces virtuales.

Interfaces / VLANs

Interface Assignments

Interface Groups

Wireless

VLANs

QinQs







PPPs

GREs

GIFs

Bridges

LAGGs

VLAN Interfaces				
Interface	VLAN tag	Priority	Description	Actions
em1 (lan)	10		Contains PC2	 
em1 (lan)	20		Contains PC3 and PC4	 
em1 (lan)	30		Contains PC5	 

+

 Add

Interfaces / VLANs / Edit

VLAN Configuration

Parent Interface

em1 (0c:0c:5d:e0:00:01) - lan

Only VLAN capable interfaces will be shown.

VLAN Tag

10

802.1Q VLAN tag (between 1 and 4094).

VLAN Priority

0

802.1Q VLAN Priority (between 0 and 7).

Description

Contains PC2

A group description may be entered here for administrative reference (not parsed).

Interfaces configuradas

Interfaces / Interface Assignments

Interface Assignments

Interface Groups

Wireless

VLANs

QinQs







PPPs

GREs

GIFs

Bridges

LAGGs

Interface	Network port
WAN	em0 (0c:0c:5d:e0:00:00)
LAN	em1 (0c:0c:5d:e0:00:01) 
MGMT	em2 (0c:0c:5d:e0:00:02) 
DMZ	em3 (0c:0c:5d:e0:00:03) 
VLAN10	VLAN 10 on em1 - lan (Contains PC2) 
VLAN20	VLAN 20 on em1 - lan (Contains PC3 and PC4) 
VLAN30	VLAN 30 on em1 - lan (Contains PC5) 

Interfaces

VLAN10 static IPv4 192.168.3.1

VLAN20 static IPv4 192.168.4.1

VLAN30 static IPv4 192.168.5.1

Rules VLAN10, VLAN20, VLAN30

The screenshot displays the Mikrotik WinBox interface. At the top, navigation tabs include Floating, WAN, LAN, MGMT, DMZ, VLAN10 (selected), VLAN20, and VLAN30. Below these is the 'Rules (Drag to Change Order)' section, which contains a table with one rule:

	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	0/0 B	IPv4*	*	*	*	*	none			

Below the table are buttons for 'Add' (up and down arrows), 'Delete' (trash), 'Save' (floppy), and 'Separator' (+).

The bottom section is a terminal window titled 'PC-5 — Konsole'. It shows the results of three ping commands:

```
root@Debian:~# ping 192.168.3.10
PING 192.168.3.10 (192.168.3.10) 56(84) bytes of data.
64 bytes from 192.168.3.10: icmp_seq=1 ttl=63 time=12.4 ms
64 bytes from 192.168.3.10: icmp_seq=2 ttl=63 time=5.28 ms
64 bytes from 192.168.3.10: icmp_seq=3 ttl=63 time=4.20 ms
^C
--- 192.168.3.10 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 4.204/7.300/12.415/3.643 ms
root@Debian:~# ping 192.168.4.11
PING 192.168.4.11 (192.168.4.11) 56(84) bytes of data.
64 bytes from 192.168.4.11: icmp_seq=1 ttl=63 time=5.29 ms
64 bytes from 192.168.4.11: icmp_seq=2 ttl=63 time=4.42 ms
64 bytes from 192.168.4.11: icmp_seq=3 ttl=63 time=4.13 ms
^C
--- 192.168.4.11 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 4.138/4.620/5.297/0.492 ms
root@Debian:~# ping 192.168.4.12
PING 192.168.4.12 (192.168.4.12) 56(84) bytes of data.
64 bytes from 192.168.4.12: icmp_seq=1 ttl=63 time=8.08 ms
64 bytes from 192.168.4.12: icmp_seq=2 ttl=63 time=4.11 ms
64 bytes from 192.168.4.12: icmp_seq=3 ttl=63 time=2.45 ms
^C
--- 192.168.4.12 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 2.450/4.883/8.082/2.363 ms
```

Sin reglas en el firewall activadas

```
PC-4 — Konsole
Archivo  Editar  Ver  Marcadores  Complementos  Preferencias  Ayuda

root@Debian:~# ping 192.168.3.10
^CPING 192.168.3.10 (192.168.3.10) 56(84) bytes of data.

--- 192.168.3.10 ping statistics ---
5 packets transmitted, 0 received, 100% packet loss, time 4032ms

root@Debian:~# ping 192.168.4.11
PING 192.168.4.11 (192.168.4.11) 56(84) bytes of data.
64 bytes from 192.168.4.11: icmp_seq=1 ttl=64 time=6.29 ms
64 bytes from 192.168.4.11: icmp_seq=2 ttl=64 time=3.82 ms
64 bytes from 192.168.4.11: icmp_seq=3 ttl=64 time=2.35 ms
^C
--- 192.168.4.11 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 2.351/4.156/6.294/1.627 ms
```

References

<https://docs.openvswitch.org/en/latest/faq/vlan/>
[Introduction to the ONOS Web UI](#)

https://oa.upm.es/52004/1/PFC_JAVIER_CONDE_DIAZ_2018.pdf

<https://docs.openvswitch.org/en/latest/faq/vlan/> //IMPORTANTE

<https://docs.openvswitch.org/en/latest/tutorials/ovs-advanced/#implementing-table-1-vlan-input-processing> // más importante

<https://wiki.onosproject.org/display/ONOS/Interfaces+configuration>

<https://manpages.ubuntu.com/manpages/xenial/man8/ovs-vsctl.8.html> //mirar bien

<https://docs.netgate.com/pfsense/en/latest/vlan/configuration.html>

hosts mandan paquetes etiquetados:

<https://stackoverflow.com/questions/33342146/how-to-tag-outgoing-traffic-with-vlan-id>

modulo de kernel: software que controla hardware... ??? fuente: miami me lo confirmó

<https://linuxize.com/post/lsm-command-in-linux/>