LAB Practice #6 Simple Internetwork Test
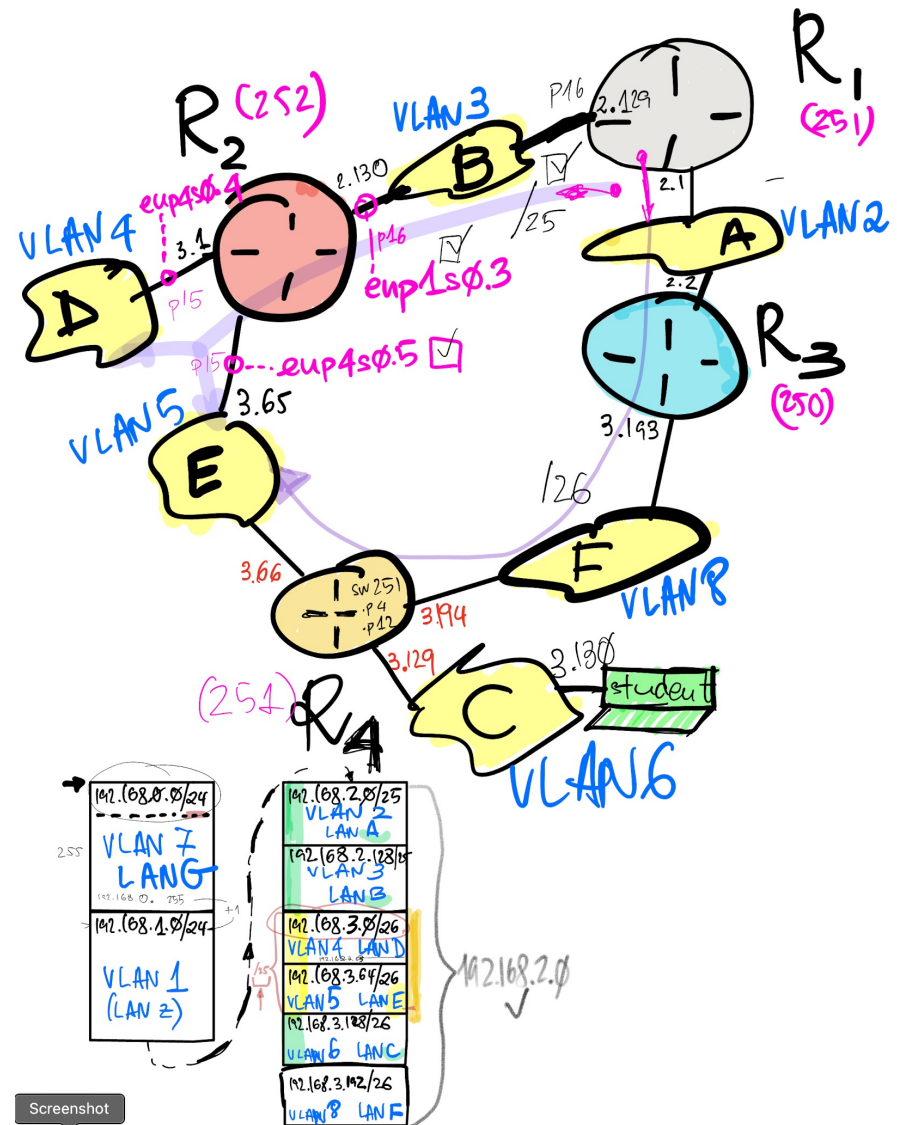
Universidad de León
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Electrical and Systems Engineering Dept.
Course on Computer Networks

LAB Practice #6 Simple Internetwork Implementation on Linux with Cisco VLAN

- Internetwork diagram is drawn on the whiteboard

- IP Numbering also on the white board

- Skim *current lecture* presentation before starting

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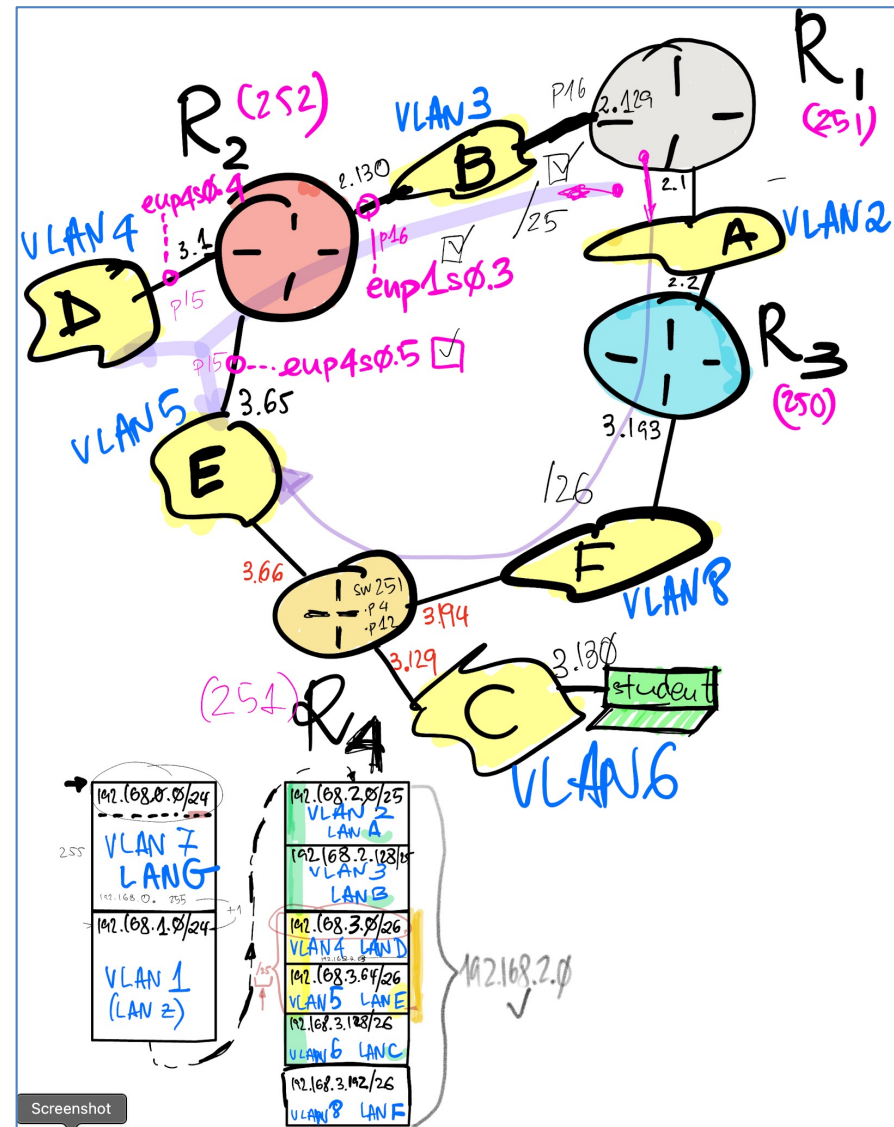
- **Preconditions**

- All Linux routers (R1, R2, R3 and R4) must be forwarding

- Check with sysctl

 # sysctl net.ipv4.ip_forward 1

If the return value is 0, then:

 # sysctl -w net.ipv4.ip_forward=1

Exercise 1. Install NIC stock commands

- A. Login into one of the PCs in Lab B6. Install the following commands **only _if necessary_**

    - Debian Package vlan
    - lshw
    - ethtool
    - ifup, ifdown
- B. Obtain NIC stock listing
    - lshw
    - ifconfig
    - ip link
- What's the NIC that is allowing this host to communicate via the *scaffolding network*
    - NIC IP Prefix 192.168.1.0/24
- Check out extended properties of the ethernet NIC with ethtool

```
# apt install vlan

# apt install lshw

# apt install ethtool

# apt install ifupdown

# lshw –class network

# ethtool <NIC label>

# ifconfig

# ip link
```

Exercise 2. Connect your PC to VLAN 6

- If your PC has more than one NIC physically connected to a switch
  - Identify the NIC label by skimming the lshw listing
  - Connect the NIC to a switch port

- If your PC only has one NIC physically connected to a switch
  - Identify the NIC label by skimming the lshw listing

- Identify the switch:
  - 192.168.1.**250**
  - 192.168.1.**251**
  - 192.168.1.**252**
  - 192.168.1.253

- Identify the switch port number where your PC is connected

Exercise 3. Set switch port in 802.1Q **trunk** mode

- Browse the IP address of your switch, e.g., 192.168.1.251
- logon as labb6 or as cisco
  - Password is published in Lab B6
- Assume port GE15 (Gigabit Ethernet 15)

- VLAN Management
  Interface Settings
  Select GE15 radio button
  Click button Edit …
  Click radio button Trunk
  Apply
- Save switch config

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Exercise 4. Have GE15 trunk accept VLAN 6

- VLAN Management

  Port to VLAN

  VLAN ID equals 6

  Click button Go

- *Set GE15 in **Tagged** mode*

- *Click button Apply*

- *Save switch configs*

- **Check GE15 VLANs**

- VLAN Management

  Port VLAN membership

  ```
  GE15 should appear
  set similar to
  this:
  ```

  GE15 Trunk 1UP, 6T …

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Exercise 5. Configure NIC for VLAN multiplexing (Only VLAN 6)

```
# su (Debian) OR
sudo su (Ubuntu)
```

cd /etc/network

*(**If** interfaces.ori doesn't exist, then, make a copy of it):*

```
# cp interfaces interfaces.ori
```

- VLAN 6 IP Prefix: **192.168.3.128/26**
- **Edit** /etc/network/interfaces to multiplex VLAN 6 over the NIC selected earlier. Use a unique **IP**; an example:

```
auto eno1.6
iface eno1.6 inet static
address 192.168.3.130
netmask 255.255.255.192
up ip route add 192.168.2.0/23 via 192.168.3.129 dev eno1.6
```

```
# ifup eno1.6
```

- Check **ifconfig eno1.6**, which should print out a status similar to this:

```
# ifconfig eno1.6
eno1.6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.3.130  netmask 255.255.255.192  broadcast 192.168.3.191
        inet6 fe80::e2d5:5eff:fed8:86a1  prefixlen 64  scopeid 0x20<link>
        ether e0:d5:5e:d8:86:a1  txqueuelen 1000  (Ethernet)
        RX packets 19  bytes 1684 (1.6 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 111  bytes 14064 (13.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

In case some error occurs, reboot the computer:
 # shutdown –r now

Exercise 6. Check ifconfig and FIB after reboot

```
# ifconfig eno1.6
eno1.6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.3.130  netmask 255.255.255.192  broadcast 192.168.3.191
        inet6 fe80::e2d5:5eff:fed8:86a1  prefixlen 64  scopeid 0x20<link>
        ether e0:d5:5e:d8:86:a1  txqueuelen 1000  (Ethernet)
        RX packets 19  bytes 1684 (1.6 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 111  bytes 14064 (13.7 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0


# route -vn
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.1.1     0.0.0.0         UG    0      0        0 eno1
192.168.1.0     0.0.0.0         255.255.255.0   U     0      0        0 eno1
192.168.1.0     0.0.0.0         255.255.255.0   U     0      0        0 enp1s0
192.168.2.0     192.168.3.129   255.255.254.0   UG    0      0        0 eno1.6
```
The preceding entry's destination prefix is 192.168.2.0/23 which aggregates all of the internetwork prefixes (Observe the Netmask)
```
192.168.3.128   0.0.0.0         255.255.255.192 U     0      0        0 eno1.6
```

Exercise 7. Capture packets crossing router **R1**, for *example*

```
# ping 192.168.3.193
…
```

```
# ssh administrator@192.168.1.81


# tcpdump -i eno1 -ent -XX -vvv icmp
```

Exercise 8. Capture packets crossing other routers, **R2, R3 and R4**. Considering LPM and the FIB, does the observed traffic make sense?

THE END