

# Redes Software - Laboratorio Virtualización

Grupo X

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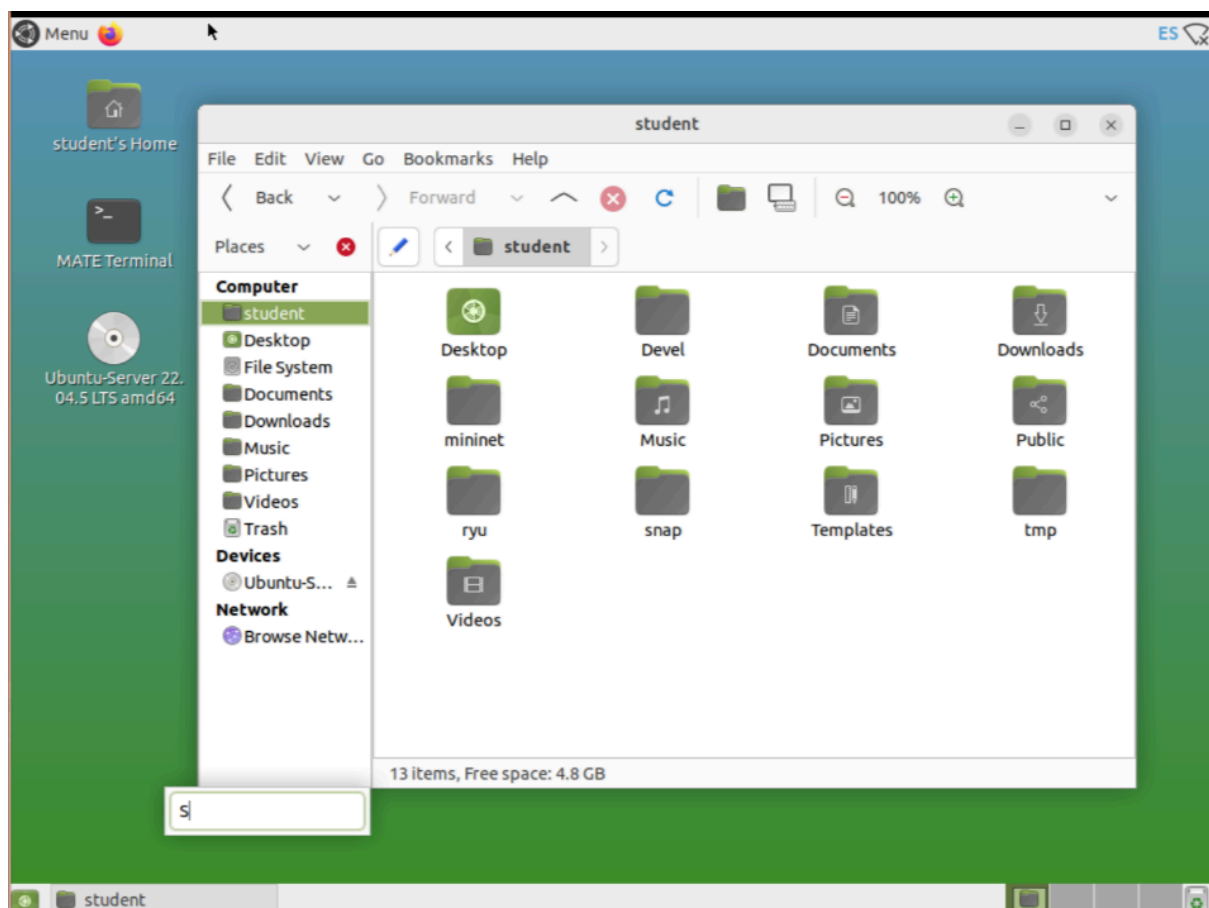
## Introducción

En este documento hay capturas de dos tipos:

- Capturas del entorno gráfico de la máquina virtual
- Capturas de ventanas de la máquina *host* conectada al *guest*.

## Hito 1

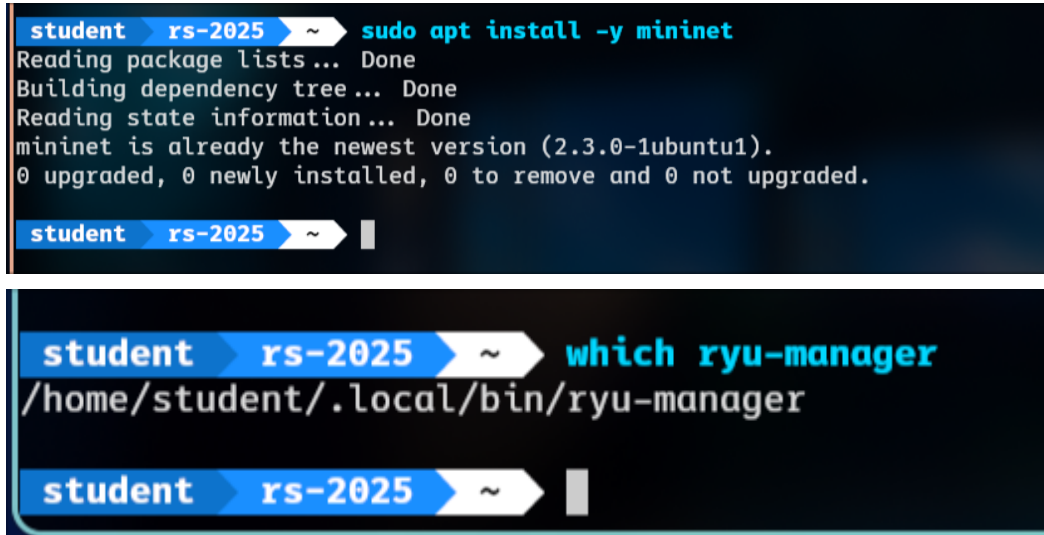
“Se ha creado la VM con el sistema operativo y el entorno gráfico que se va a utilizar en el resto de la práctica, así como en las restantes prácticas del curso.”



## Hito 2

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“Ha creado el entorno completo de emulación de redes OpenFlow que necesita para las restantes prácticas”



```
student rs-2025 ~ sudo apt install -y mininet
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
mininet is already the newest version (2.3.0-1ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.

student rs-2025 ~ █

student rs-2025 ~ which ryu-manager
/home/student/.local/bin/ryu-manager

student rs-2025 ~ █
```

*Capturas de kitty en el host conectado a la máquina virtual por SSH*

## Hito 3

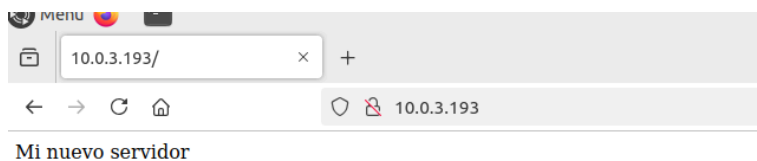
“Refleje las capturas de pantalla del terminal de los pasos 5 a 8 en su documento de laboratorio”

### Paso 5

```
student@rdss-2025:~$ sudo lxc-attach -n alpine
/ #
/ # apk update
fetch https://dl-cdn.alpinelinux.org/alpine/v3.19/main/x86_64/APKINDEX.tar.gz
fetch https://dl-cdn.alpinelinux.org/alpine/v3.19/community/x86_64/APKINDEX.tar.gz
v3.19.6-69-gd2e5ad791ed [https://dl-cdn.alpinelinux.org/alpine/v3.19/main]
v3.19.6-64-g49fb91a3e8f [https://dl-cdn.alpinelinux.org/alpine/v3.19/community]
OK: 23038 distinct packages available
/ # apk upgrade
(1/4) Upgrading musl (1.2.4_git20230717-r4 -> 1.2.4_git20230717-r5)
(2/4) Upgrading alpine-release (3.19.6-r0 -> 3.19.7-r0)
(3/4) Upgrading musl-utils (1.2.4_git20230717-r4 -> 1.2.4_git20230717-r5)
(4/4) Upgrading alpine-base (3.19.6-r0 -> 3.19.7-r0)
Executing busybox-1.36.1-r19.trigger
OK: 10 MiB in 30 packages
/ # apk add lighttpd

(1/10) Installing brotli-libs (1.1.0-r1)
(2/10) Installing libdbi (0.9.0-r4)
(3/10) Installing gdbm (1.23-r1)
(4/10) Installing libsasl (2.1.28-r5)
(5/10) Installing libldap (2.6.6-r1)
(6/10) Installing lua5.4-libs (5.4.6-r1)
(7/10) Installing pcre2 (10.42-r2)
(8/10) Installing zstd-libs (1.5.5-r8)
(9/10) Installing lighttpd (1.4.76-r0)
Executing lighttpd-1.4.76-r0.pre-install
(10/10) Installing lighttpd-openrc (1.4.76-r0)
Executing busybox-1.36.1-r19.trigger
OK: 14 MiB in 40 packages
/ #
/ # rc-service lighttpd start
* Caching service dependencies ... [ ok ]
* Starting lighttpd ... [ ok ]
/ #
```

### Paso 6



## Paso 7

```
student@rdss-2025:~$ sudo lxc-stop -n alpine
student@rdss-2025:~$ sudo lxc-ls -f
NAME      STATE    AUTOSTART GROUPS IPV4 IPV6 UNPRIVILEGED
alpine    STOPPED  0        -    -    -    false
student@rdss-2025:~$
```

## Paso 8

```
student@rdss-2025:~$ sudo lxc-destroy -n alpine
student@rdss-2025:~$ sudo lxc-ls -f
student@rdss-2025:~$
```

## HITO 4

“Ha creado un contenedor Docker con un fichero de especificación y ha instalado arrancado correctamente un servidor Web. Muestre en el documento todos los pasos seguidos mediante capturas de pantalla. Compruebe el espacio de direccionamiento utilizado y compárelo con el espacio de direccionamiento de LXC.”

## Paso 1

```
total 8.0K
-rw-rw-r-- 1 student student 235 Feb 14 10:12 Dockerfile
-rw-rw-r-- 1 student student 54 Feb 14 10:11 index.html

student rs-2025 ~/Devel $ sudo docker build -t webserver:v1 .
[+] Building 5.9s (8/8) FINISHED                                docker:default
=> [internal] load build definition from Dockerfile              0.1s
=> => transferring dockerfile: 274B                             0.0s
=> [internal] load metadata for docker.io/library/alpine:3.14.3 1.2s
=> [internal] load .dockerignore                                0.1s
=> => transferring context: 2B                                    0.0s
=> [1/3] FROM docker.io/library/alpine:3.14.3@sha256:635f0aa53d99017b38d1a0aa5 1.1s
=> => resolve docker.io/library/alpine:3.14.3@sha256:635f0aa53d99017b38d1a0aa5 0.1s
=> => sha256:635f0aa53d99017b38d1a0aa5b2082f7812b03e3cdb299103 1.64kB / 1.64kB 0.0s
=> => sha256:5e604d3358ab7b6b734402ce2e19ddd822a354dc14843f34d36c6 528B / 528B 0.0s
=> => sha256:0a97eee8041e2b6c0e65abb2700b0705d0da5525ca69060b9 1.47kB / 1.47kB 0.0s
=> => sha256:97518928ae5f3d52d4164b314a7e73654eb686ecd8aafa0b7 2.82MB / 2.82MB 0.7s
=> => extracting sha256:97518928ae5f3d52d4164b314a7e73654eb686ecd8aafa0b79acd9 0.1s
=> [internal] load build context                                0.1s
=> => transferring context: 91B                                    0.0s
=> [2/3] RUN apk update && apk upgrade && apk add lighttpd      2.7s
=> [3/3] COPY ./index.html /var/www/localhost/htdocs/          0.1s
=> exporting to image                                           0.3s
=> => exporting layers                                           0.2s
=> => writing image sha256:1f213d76ab26363353f081b801bf7d15fc5ab96c7aff5085d8d 0.0s
=> => naming to docker.io/library/webserver:v1                  0.0s

1 warning found (use docker --debug to expand):
- MaintainerDeprecated: Maintainer instruction is deprecated in favor of using label
(line 2)

student rs-2025 ~/Devel $
```

## Pasos 2 y 3

```
⇒ [internal] load .dockerignore 0.1s
⇒ ⇒ transferring context: 2B 0.0s
⇒ [1/3] FROM docker.io/library/alpine:3.14.3@sha256:635f0aa53d99017b38d1a0aa5 1.1s
⇒ ⇒ resolve docker.io/library/alpine:3.14.3@sha256:635f0aa53d99017b38d1a0aa5 0.1s
⇒ ⇒ sha256:635f0aa53d99017b38d1a0aa5b2082f7812b03e3cdb299103 1.64kB / 1.64kB 0.0s
⇒ ⇒ sha256:5e604d3358ab7b6b734402ce2e19ddd822a354dc14843f34d36c6 528B / 528B 0.0s
⇒ ⇒ sha256:0a97eee8041e2b6c0e65abb2700b0705d0da5525ca69060b9 1.47kB / 1.47kB 0.0s
⇒ ⇒ sha256:97518928ae5f3d52d4164b314a7e73654eb686ecd8aafa0b7 2.82MB / 2.82MB 0.7s
⇒ ⇒ extracting sha256:97518928ae5f3d52d4164b314a7e73654eb686ecd8aafa0b79acd9 0.1s
⇒ [internal] load build context 0.1s
⇒ ⇒ transferring context: 91B 0.0s
⇒ [2/3] RUN apk update && apk upgrade && apk add lighttpd 2.7s
⇒ [3/3] COPY ./index.html /var/www/localhost/htdocs/ 0.1s
⇒ exporting to image 0.3s
⇒ ⇒ exporting layers 0.2s
⇒ ⇒ writing image sha256:1f213d76ab26363353f081b801bf7d15fc5ab96c7aff5085d8d 0.0s
⇒ ⇒ naming to docker.io/library/webserver:v1 0.0s

1 warning found (use docker --debug to expand):
- MaintainerDeprecated: Maintainer instruction is deprecated in favor of using label
(line 2)

student rs-2025 ~/Devel sudo docker run -d -it --name webserver webserver:v1
842cc8ab120b83f7df0ca070edc15ec3c9fca03762f68779bd69e8bea897e2f7

student rs-2025 ~/Devel sudo docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS
PORTS NAMES
842cc8ab120b webserver:v1 "/usr/sbin/lighttpd ..." 6 seconds ago Up 6 seconds
80/tcp webserver

student rs-2025 ~/Devel
```

## Paso 4

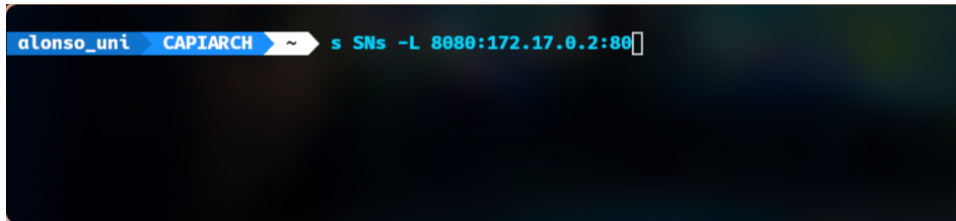
```
"IPv6Gateway": "",
"MacAddress": "02:42:ac:11:00:02",
"Networks": {
  "bridge": {
    "IPAMConfig": null,
    "Links": null,
    "Aliases": null,
    "MacAddress": "02:42:ac:11:00:02",
    "DriverOpts": null,
    "NetworkID": "dd656038470c8ad5e1de30f6d2c77068a1d1dcde3a467512f298
b890c887a03d",
    "EndpointID": "32ab1861af90dc94625d2976feb2fd806cefbaccc4bccb67c9
1cf753390ec42",
    "Gateway": "172.17.0.1",
    "IPAddress": "172.17.0.2",
    "IPPrefixLen": 16,
    "IPv6Gateway": "",
    "GlobalIPv6Address": "",
    "GlobalIPv6PrefixLen": 0,
    "DNSNames": null
  }
}
}
]

student rs-2025 ~/Devel sudo docker inspect webserver | grep IPAddress
"SecondaryIPAddresses": null,
"IPAddress": "172.17.0.2",
"IPAddress": "172.17.0.2",

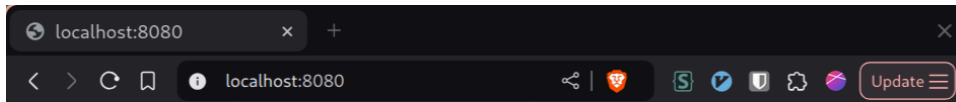
student rs-2025 ~/Devel
```

En este punto, para acceder al servidor desde el navegador en mi máquina local, creo una nueva conexión SSH con un túnel: del puerto 8080 del *cliente* SSH (sistema anfitrión) al

contenedor en el *servidor SSH* (que está escuchando en el puerto **80** en el contenedor en el sistema huésped)

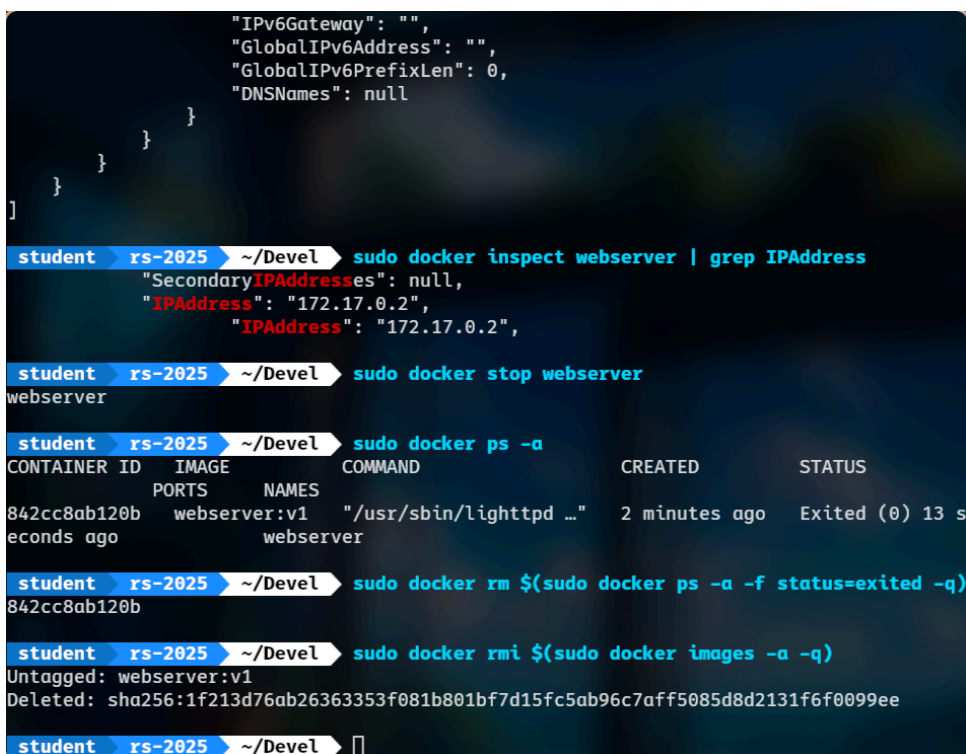


Así se puede acceder desde un navegador en la máquina *host*.



Copiado con el Dockerfile

## Paso 5



## Comparación de espacios de direccionamiento

El contenedor creado con LXC estaba en la IP **10.0.3.193**, mientras que el creado con Docker estaba en **172.17.0.2**. Claramente se colocaron espacios de direccionamiento distintos.