ARQUITECTURA EN LA NUBE - ADMINISTRACIÓN REMOTA DE SERVIDORES WEB EN AWS A TRAVÉS DE SSH

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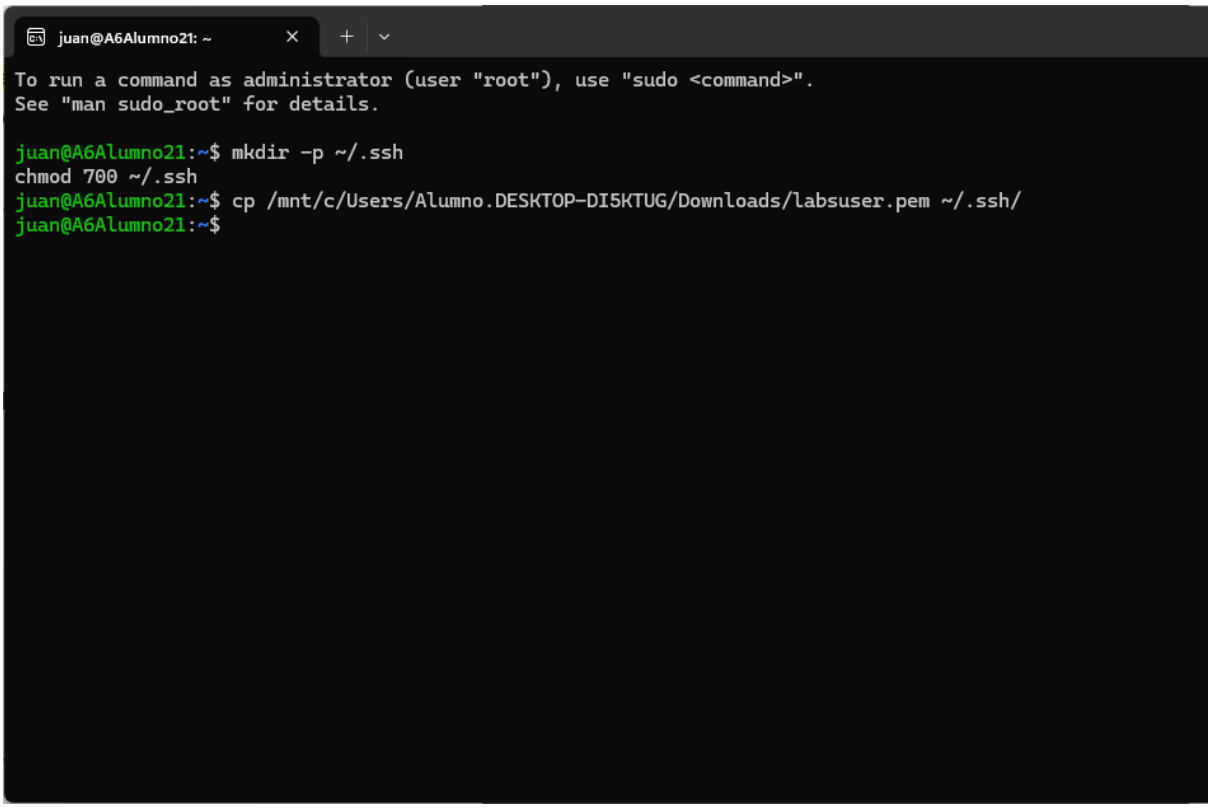
INDICE

SECCIÓN 1 — PREPARACIÓN DEL ENTORNO Y CONEXIÓN REMOTA (WSL + SSH + AWS)

La administración remota de servidores en la nube requiere disponer de un entorno Linux funcional. Para ello se utilizó **Windows Subsystem for Linux (WSL2)**, que permite ejecutar herramientas de administración como SSH, curl y los comandos necesarios para la interacción con la instancia EC2.

1.1 Verificación y preparación de WSL

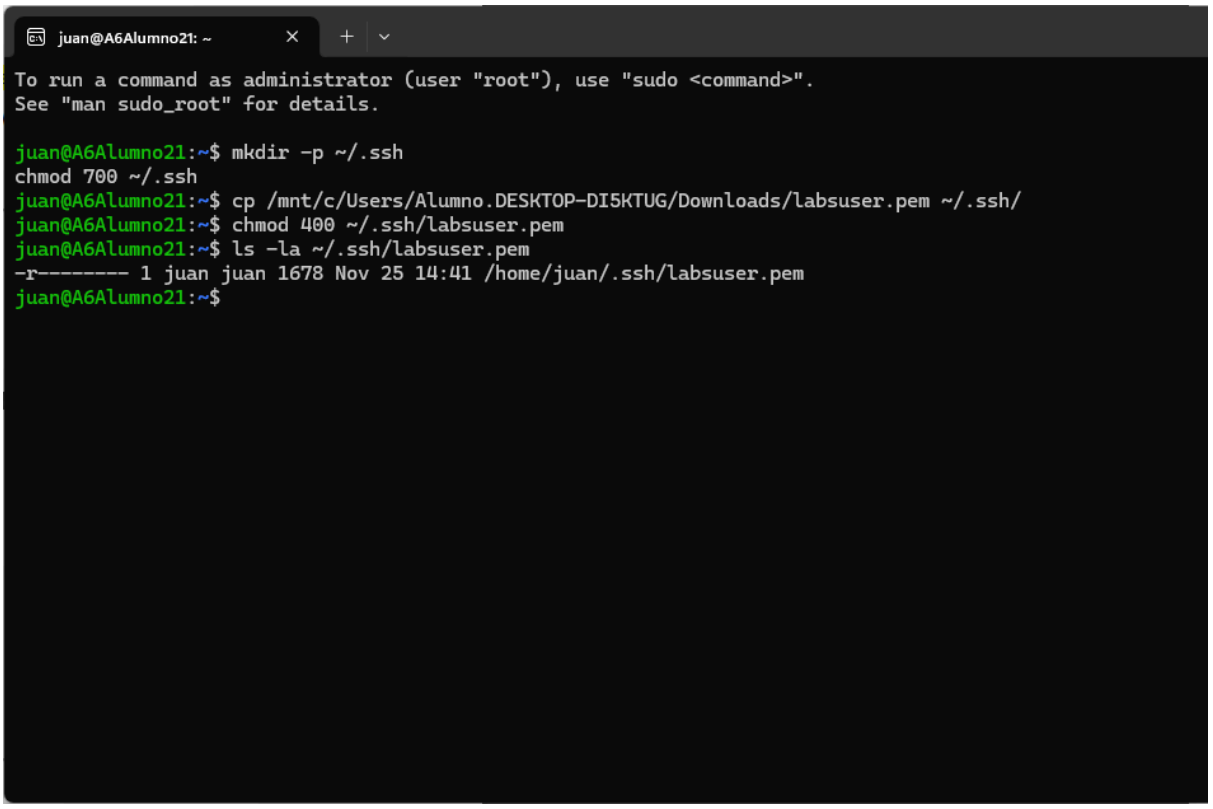
Se comprobó el estado de WSL, su versión instalada y la correcta inicialización del entorno. Se creó el directorio ~/.ssh con permisos adecuados para almacenar claves privadas de acceso seguro.



1.2 Descarga y preparación de la clave PEM

AWS requiere una clave privada PEM para realizar autenticación SSH.
Se descargó la clave desde AWS, se movió al directorio ~/.ssh/ y se aseguraron permisos restrictivos con:

chmod 400 ~/.ssh/clave.pem



1.3 Creación de la instancia EC2

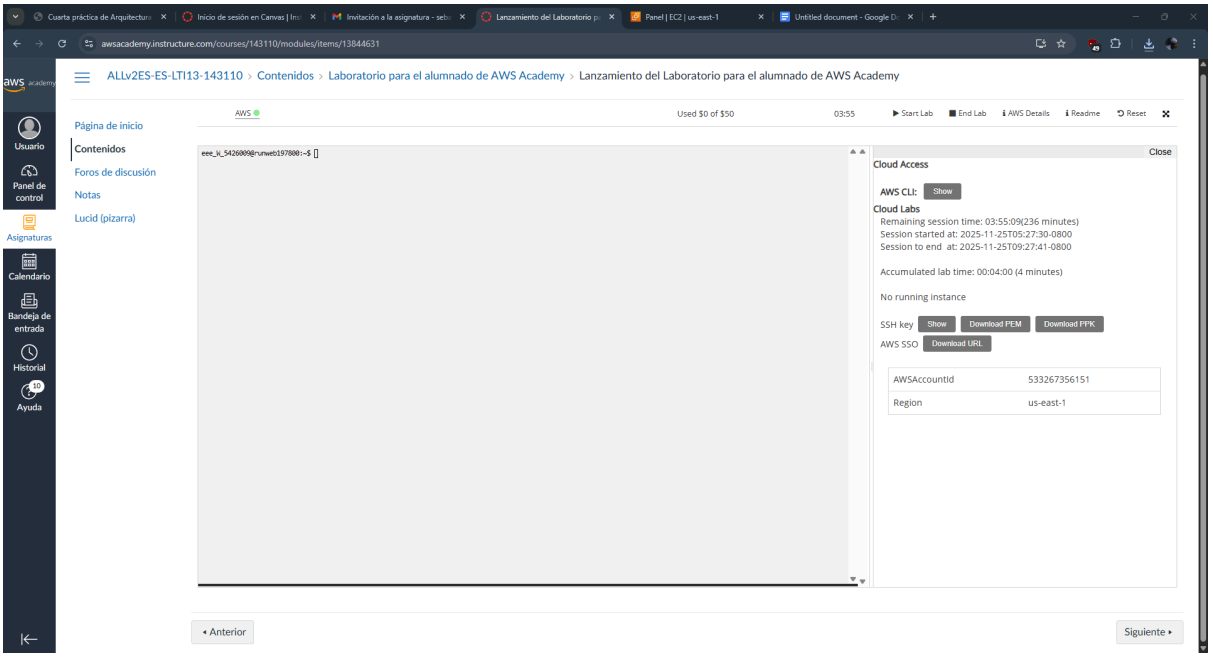
En la consola de AWS se lanzó una instancia EC2 basada en Ubuntu 22.04 con tipo t2.micro.
Se configuró un Security Group permitiendo los puertos:

- **22** → SSH
- **8080** → Apache HTTP
- **8081** → Nginx

- **8082** → Caddy
- **8443** → Apache HTTPS

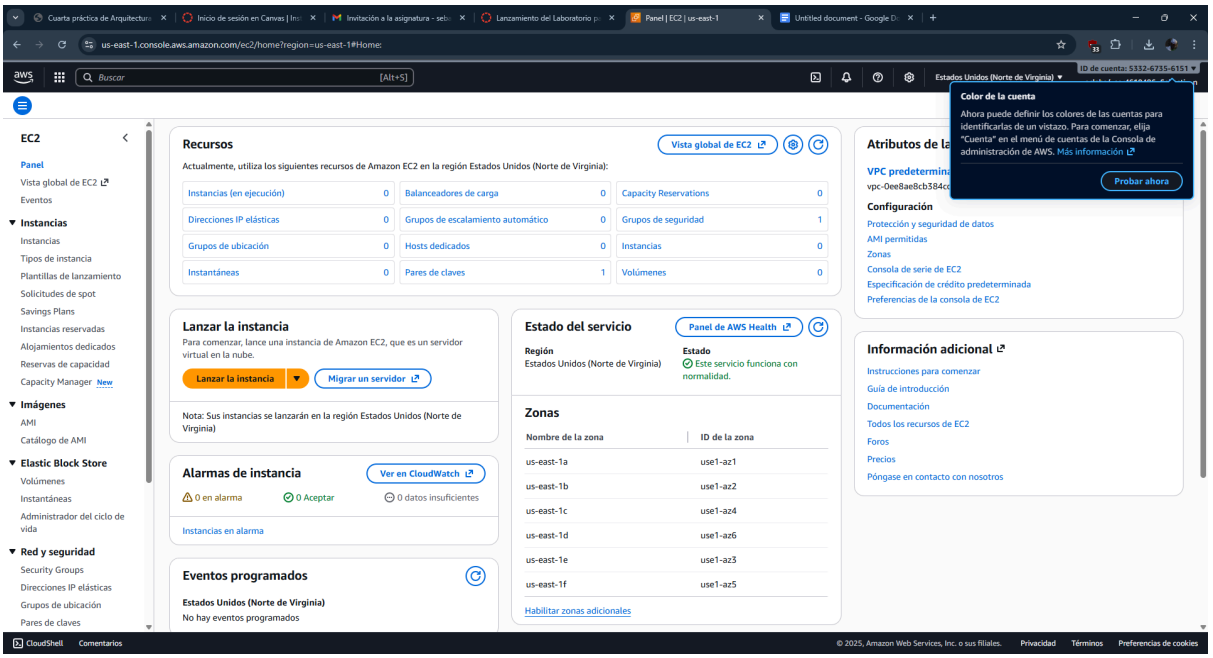
1.4 Selección de la AMI (Imagen del Sistema Operativo)

En este paso se selecciona la AMI (Amazon Machine Image) que define el sistema operativo base de la instancia EC2.



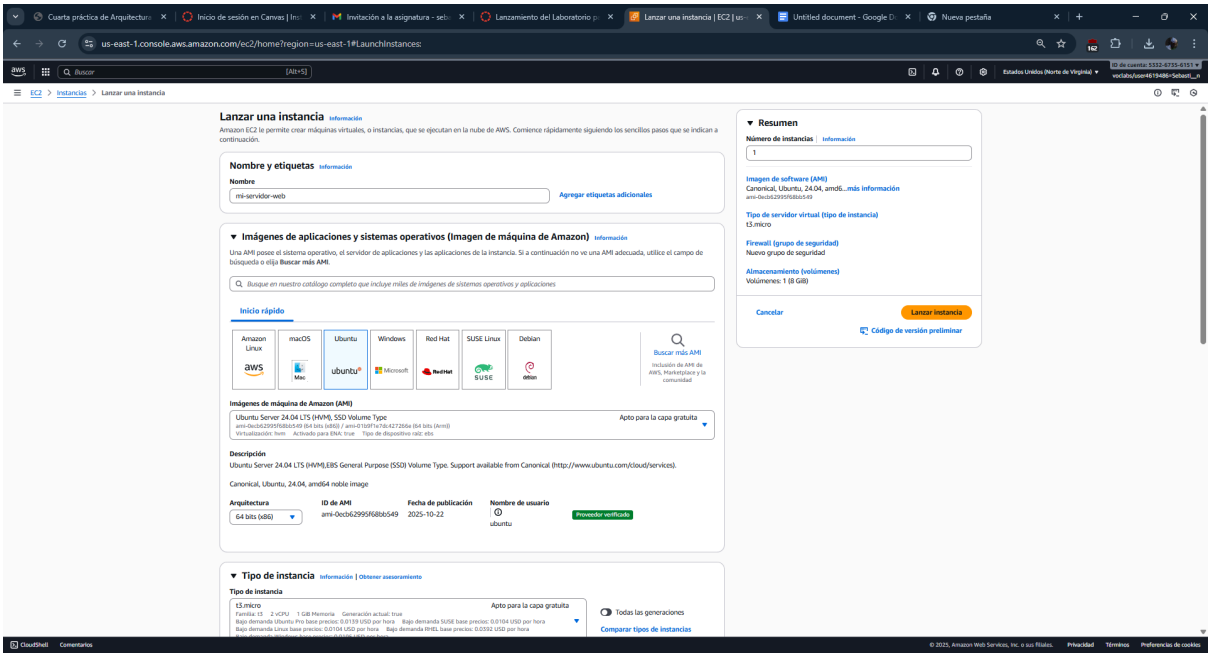
1.5 Selección del tipo de instancia

Aquí se selecciona el tipo de instancia (en este caso t2.micro), adecuado para prácticas y dentro del nivel gratuito.



1.6 Configuración de red y almacenamiento

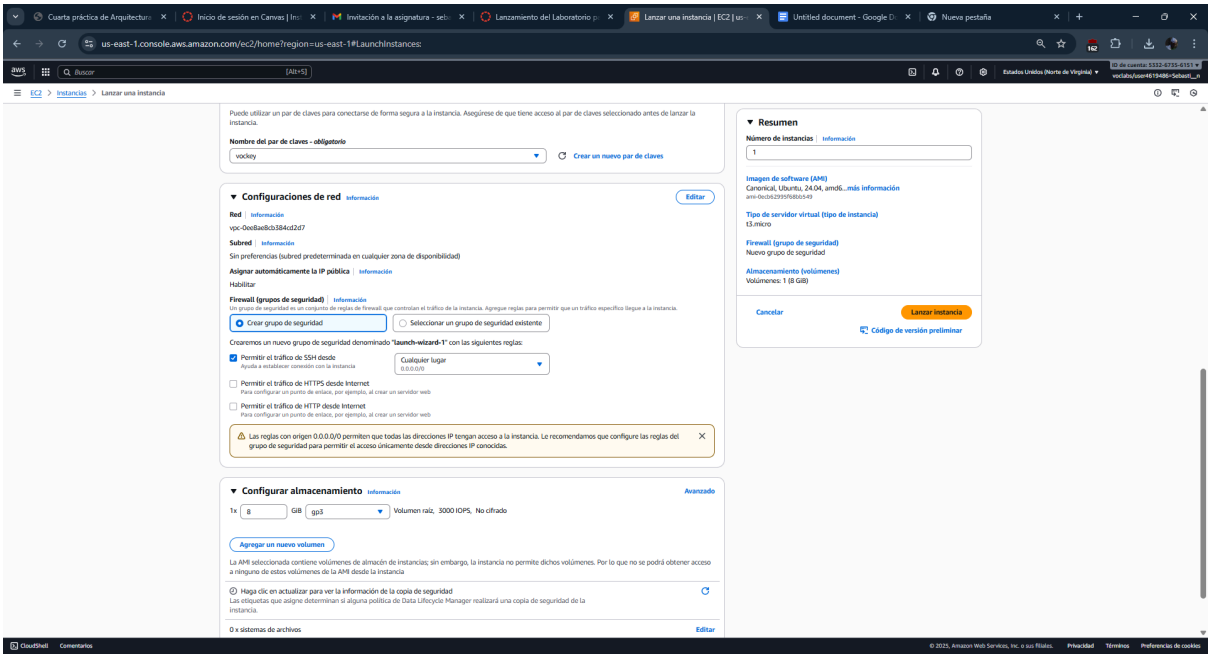
Se configura la red donde estará la instancia, asignación de IP pública y tamaño del volumen EBS.



1.7 Configuración del Grupo de Seguridad (Security Group)

1.7.1 Reglas iniciales del Security Group

El asistente crea inicialmente un grupo de seguridad que permite acceso SSH para administración remota.

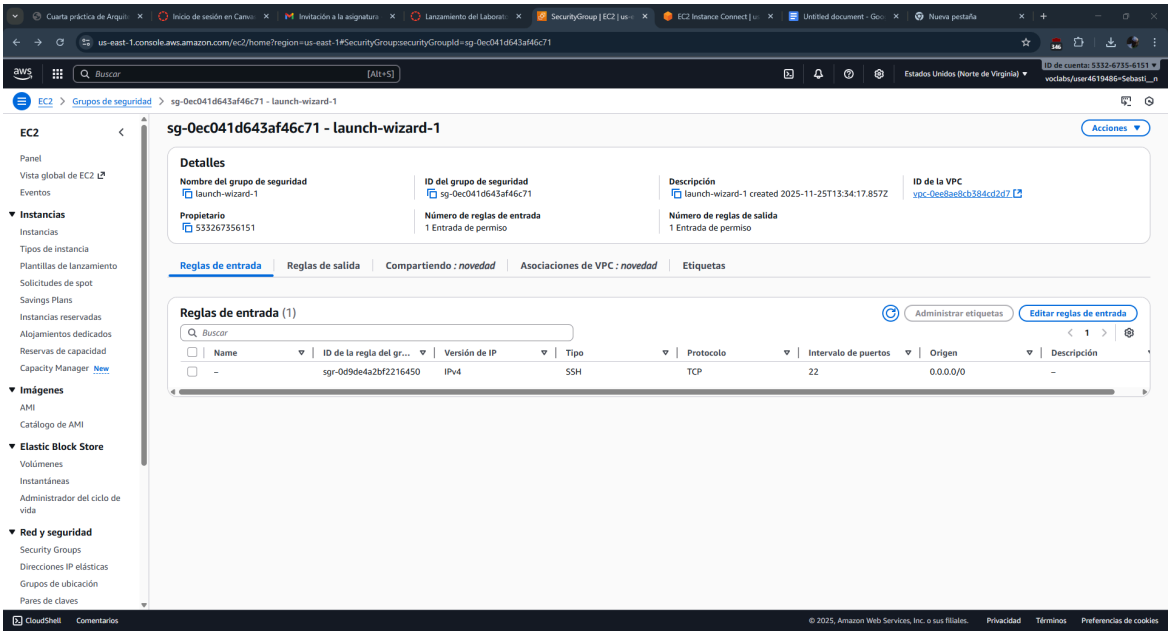


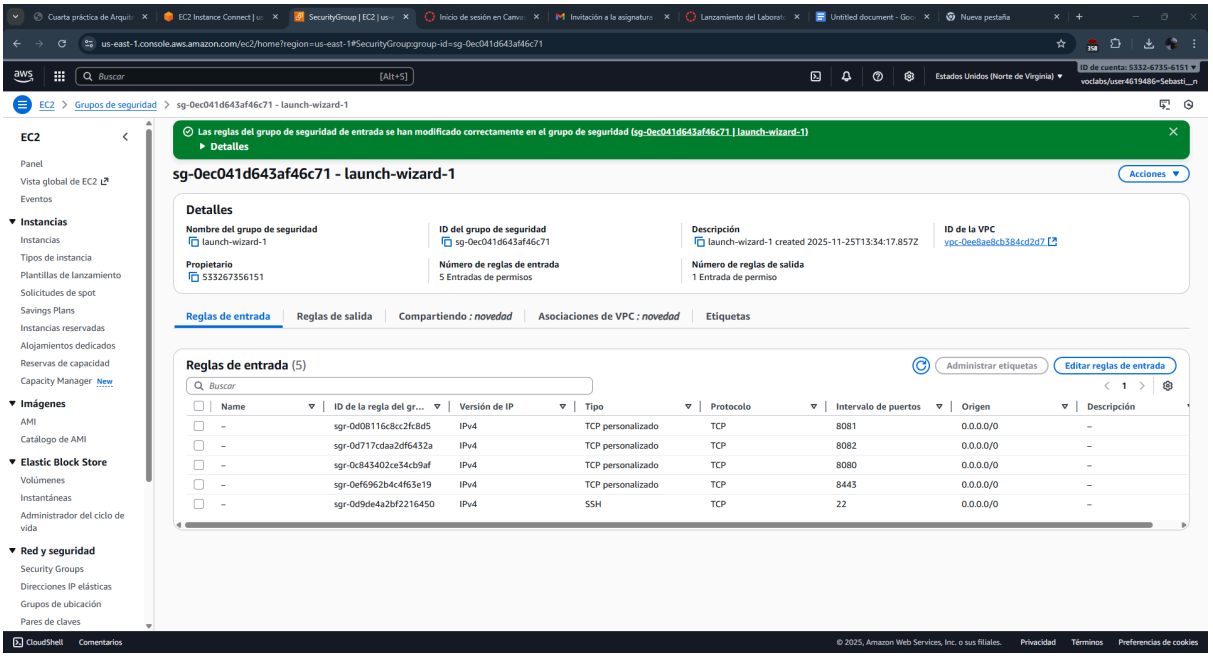
1.7.2 Añadir reglas para servidores web

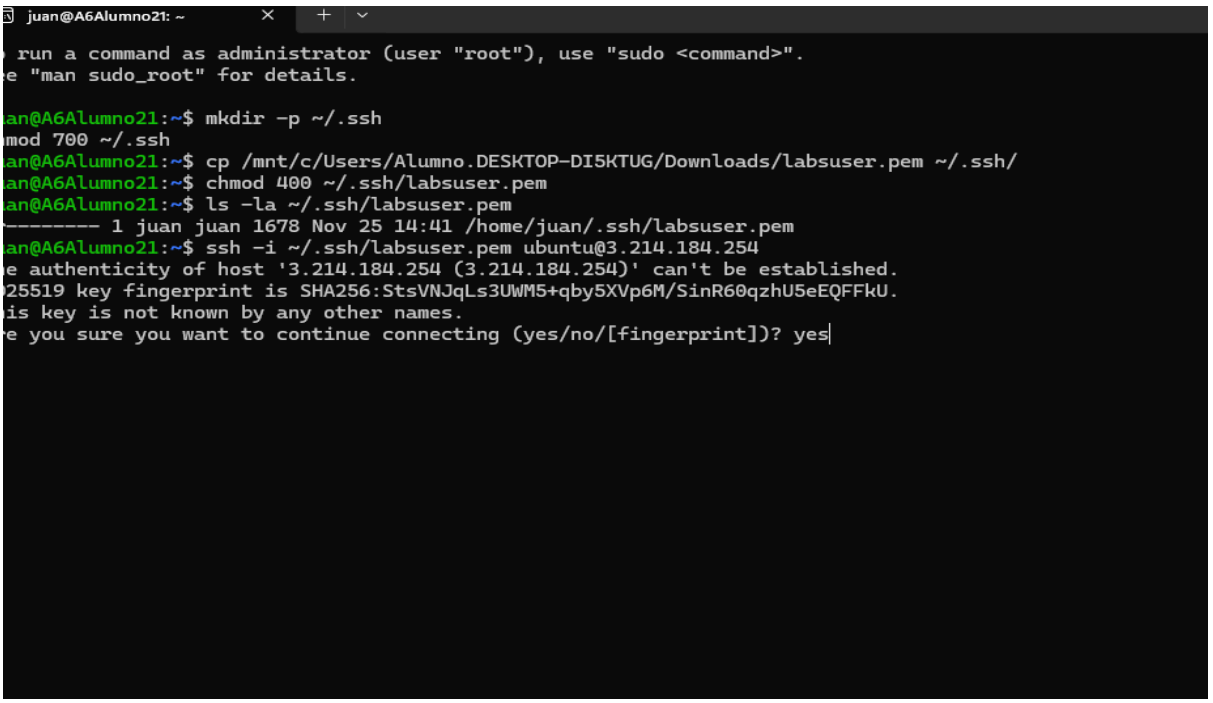
Se añaden las reglas necesarias para la práctica:

- 8080 → Caddy primer servicio
- 8081 → Nginx
- 8082 → Caddy segundo servicio
- 8443 → Apache con SSL

Este paso es crítico para permitir acceso externo a los servidores web configurados posteriormente.


us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#SecurityGroup:securityGroupId=sg-0ec041d643af46c71
EC2 > Grupos de seguridad > sg-0ec041d643af46c71 - launch-wizard-1
sg-0ec041d643af46c71 - launch-wizard-1
Acciones
Detalles
Nombre del grupo de seguridad
launch-wizard-1
ID del grupo de seguridad
sg-0ec041d643af46c71
Descripción
launch-wizard-1 created 2025-11-25T13:34:17.857Z
ID de la VPC
vpc-0ee8ae8cb384cd2d7
Propietario
533267356151
Número de reglas de entrada
1 Entrada de permiso
Número de reglas de salida
1 Entrada de permiso
Reglas de entrada
Reglas de salida
Compartiendo : novedad
Asociaciones de VPC : novedad
Etiquetas
Reglas de entrada (1)
Administrar etiquetas
Editar reglas de entrada
Name
ID de la regla del gr...
Versión de IP
Tipo
Protocolo
Intervalo de puertos
Origen
Descripción
sgr-0d9de4a2bf2216450
IPv4
SSH
TCP
22
0.0.0.0/0


us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#SecurityGroup:group-id=sg-0ec041d643af46c71
EC2 > Grupos de seguridad > sg-0ec041d643af46c71 - launch-wizard-1
Las reglas del grupo de seguridad de entrada se han modificado correctamente en el grupo de seguridad (sg-0ec041d643af46c71 | launch-wizard-1)
Detalles
sg-0ec041d643af46c71 - launch-wizard-1
Acciones
Detalles
Nombre del grupo de seguridad
launch-wizard-1
ID del grupo de seguridad
sg-0ec041d643af46c71
Descripción
launch-wizard-1 created 2025-11-25T13:34:17.857Z
ID de la VPC
vpc-0ee8ae8cb384cd2d7
Propietario
533267356151
Número de reglas de entrada
5 Entradas de permisos
Número de reglas de salida
1 Entrada de permiso
Reglas de entrada
Reglas de salida
Compartiendo : novedad
Asociaciones de VPC : novedad
Etiquetas
Reglas de entrada (5)
Administrar etiquetas
Editar reglas de entrada
Name
ID de la regla del gr...
Versión de IP
Tipo
Protocolo
Intervalo de puertos
Origen
Descripción
sgr-0d08116c8cc2fc8d5
IPv4
TCP personalizado
TCP
8081
0.0.0.0/0
sgr-0d717cdaa2df6432a
IPv4
TCP personalizado
TCP
8082
0.0.0.0/0
sgr-0c843402ce34cb9af
IPv4
TCP personalizado
TCP
8080
0.0.0.0/0
sgr-0ef6962b4c4f63e19
IPv4
TCP personalizado
TCP
8443
0.0.0.0/0
sgr-0d9de4a2bf2216450
IPv4
SSH
TCP
22
0.0.0.0/0

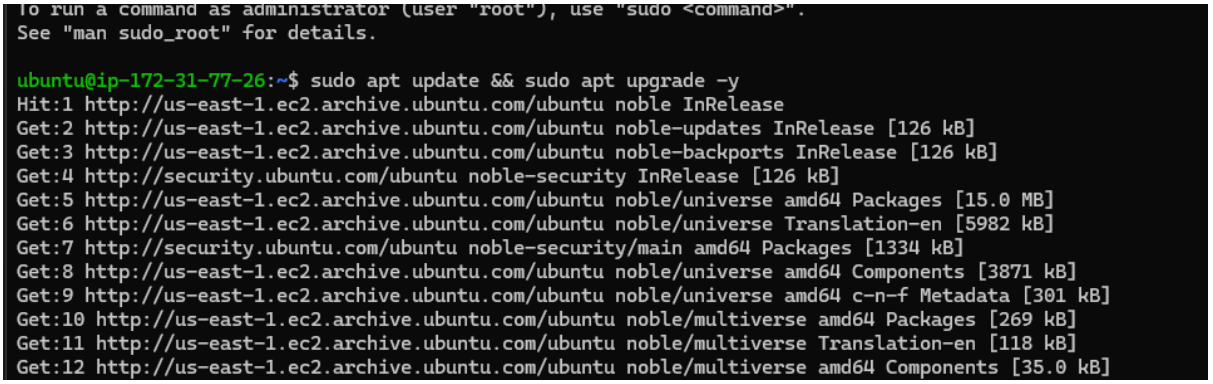

juan@A6Alumno21: ~
run a command as administrator (user "root"), use "sudo <command>".
e "man sudo_root" for details.
an@A6Alumno21:~$ mkdir -p ~/.ssh
mod 700 ~/.ssh
an@A6Alumno21:~$ cp /mnt/c/Users/Alumno.DESKTOP-DI5KTUG/Downloads/labsuser.pem ~/.ssh/
an@A6Alumno21:~$ chmod 400 ~/.ssh/labsuser.pem
an@A6Alumno21:~$ ls -la ~/.ssh/labsuser.pem
--------- 1 juan juan 1678 Nov 25 14:41 /home/juan/.ssh/labsuser.pem
an@A6Alumno21:~$ ssh -i ~/.ssh/labsuser.pem ubuntu@3.214.184.254
e authenticity of host '3.214.184.254 (3.214.184.254)' can't be established.
25519 key fingerprint is SHA256:StsVNJqLs3UWM5+qby5XVp6M/SinR60qzhU5eEQFFkU.
is key is not known by any other names.
e you sure you want to continue connecting (yes/no/[fingerprint])? yes


Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-1015-aws x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/pro
System information as of Tue Nov 25 13:45:26 UTC 2025
System load: 0.0
Usage of /: 26.2% of 6.71GB
Memory usage: 23%
Swap usage: 0%
Temperature: -273.1 C
Processes: 111
Users logged in: 1
IPv4 address for ens5: 172.31.77.26
Expanded Security Maintenance for Applications is not enabled.
0 updates can be applied immediately.
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
The list of available updates is more than a week old.
To check for new updates run: sudo apt update
Last login: Tue Nov 25 13:35:56 2025 from 18.206.107.27
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
ubuntu@ip-172-31-77-26:~$

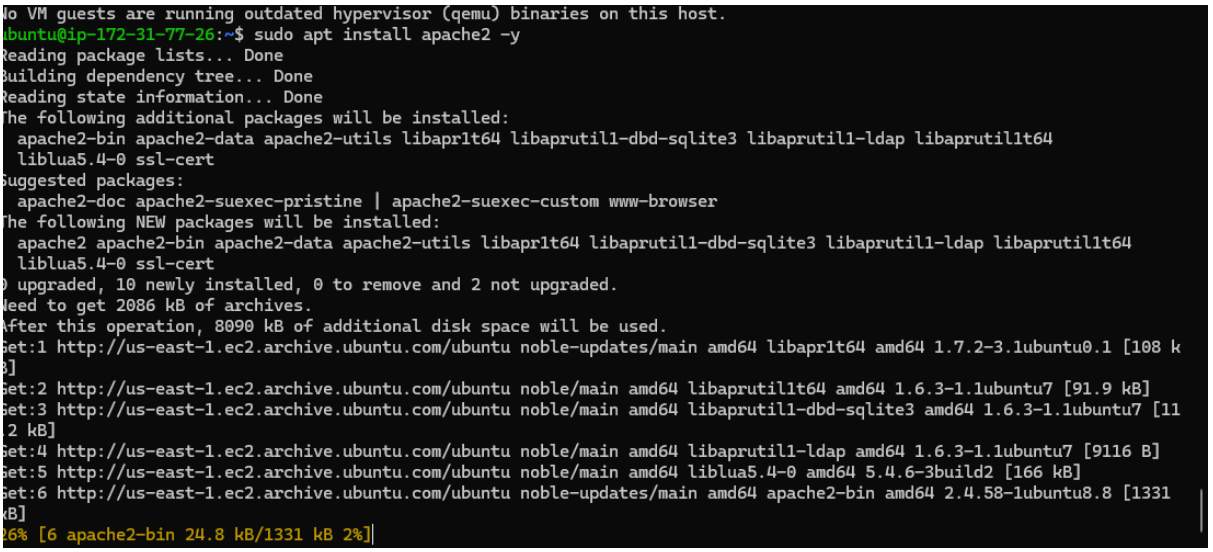
SECCIÓN 2 — Instalación y configuración de los servidores web

2.1 Instalación y prueba de Apache2

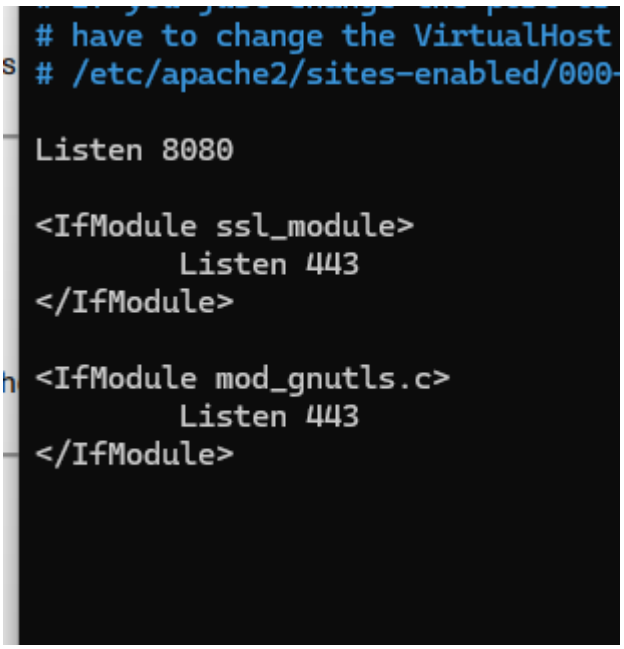
conexión por SSH y actualización del sistema → corresponde a *preparación inicial antes de instalar Apache*.
Se instaló el servidor Apache2, se modificó el puerto por defecto a 8080, se configuró el VirtualHost y se verificó el servicio.



instalación de Apache2



modificación de ports.conf (Listen 8080)



modificación de 000-default.conf

```
  GNU nano 7.2                          /etc/apache2/sites-available/000-defaul
<VirtualHost *:8080>
        # The ServerName directive sets the request scheme, hostname and port t
        # the server uses to identify itself. This is used when creating
        # redirection URLs. In the context of virtual hosts, the ServerName
        # specifies what hostname must appear in the request's Host: header to
        # match this virtual host. For the default virtual host (this file) thi
        # value is not decisive as it is used as a last resort host regardless.
        # However, you must set it for any further virtual host explicitly.
        #ServerName www.example.com

        ServerAdmin webmaster@localhost
        DocumentRoot /var/www/html

        # Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
        # error, crit, alert, emerg.
        # It is also possible to configure the loglevel for particular
        # modules, e.g.
        #LogLevel info ssl:warn

        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined

        # For most configuration files from conf-available/, which are
        # enabled or disabled at a global level, it is possible to
        # include a line for only one particular virtual host. For example the
        # following line enables the CGI configuration for this host only
                                                    [ Read 29 lines ]
```

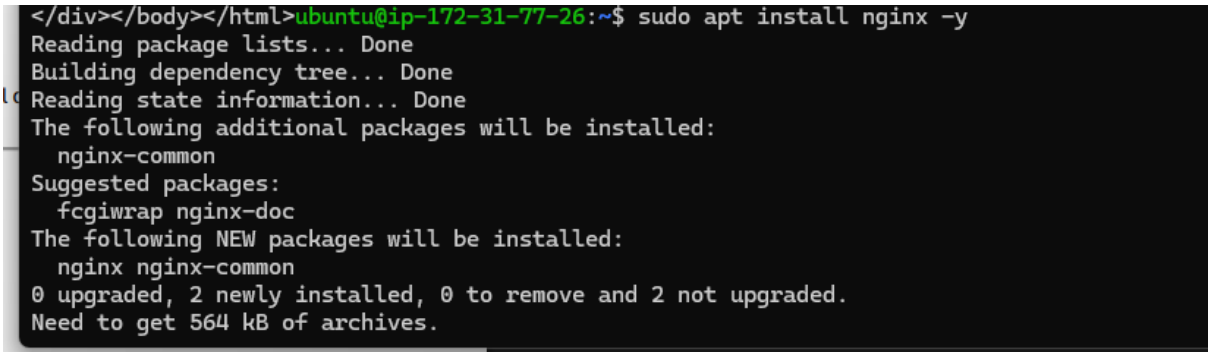
estado de Apache

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-77-26:~$ sudo systemctl restart apache2
ubuntu@ip-172-31-77-26:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: enabled)
     Active: active (running) since Tue 2025-11-25 13:51:42 UTC; 9s ago
       Docs: https://httpd.apache.org/docs/2.4/
    Process: 17944 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
   Main PID: 17947 (apache2)
      Tasks: 6 (limit: 1008)
     Memory: 10.7M (peak: 11.1M)
        CPU: 51ms
     CGroup: /system.slice/apache2.service
             ├─17947 /usr/sbin/apache2 -k start
             ├─17949 /usr/sbin/apache2 -k start
             ├─17950 /usr/sbin/apache2 -k start
             ├─17951 /usr/sbin/apache2 -k start
             ├─17952 /usr/sbin/apache2 -k start
             └─17953 /usr/sbin/apache2 -k start

Nov 25 13:51:42 ip-172-31-77-26 systemd[1]: Starting apache2.service - The Apache HTTP Server...
Nov 25 13:51:42 ip-172-31-77-26 systemd[1]: Started apache2.service - The Apache HTTP Server.
ubuntu@ip-172-31-77-26:~$
```

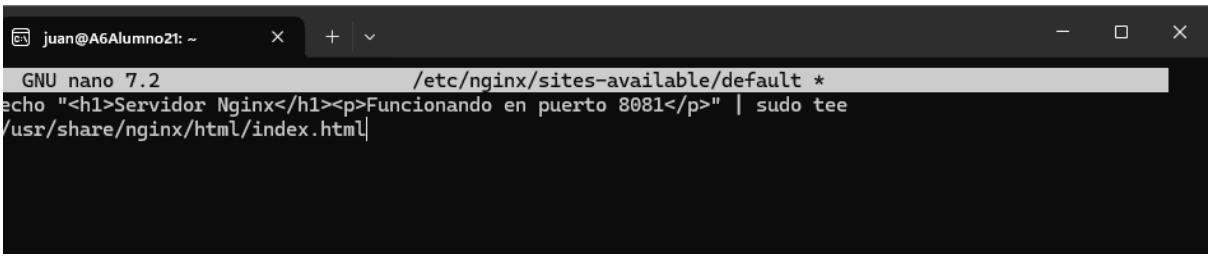
2.2 Instalación y prueba de Nginx

Nginx fue configurado para escuchar en el puerto 8081. Se creó una página HTML de prueba y se verificó el funcionamiento.

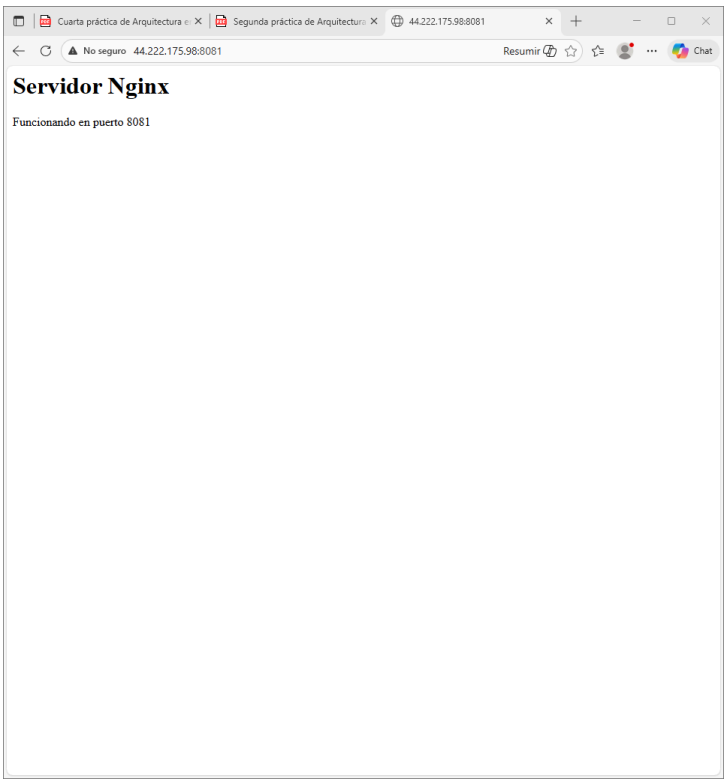
instalación de nginx

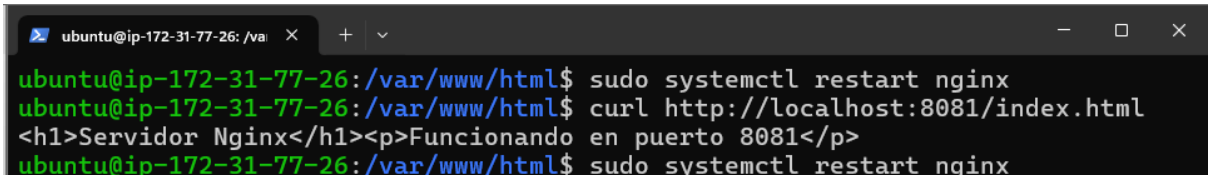


creación de index.html de Nginx

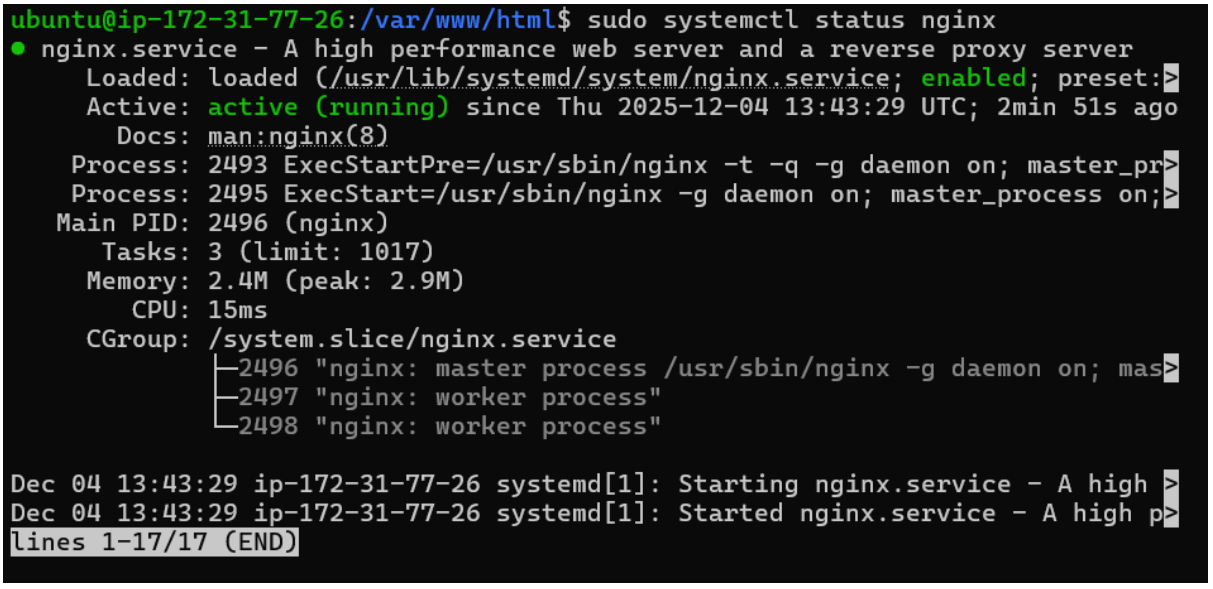


navegador mostrando “Servidor Nginx funcionando en puerto 8081



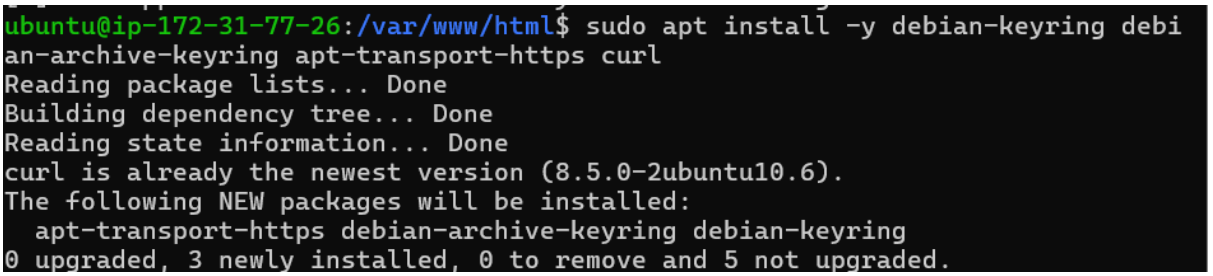


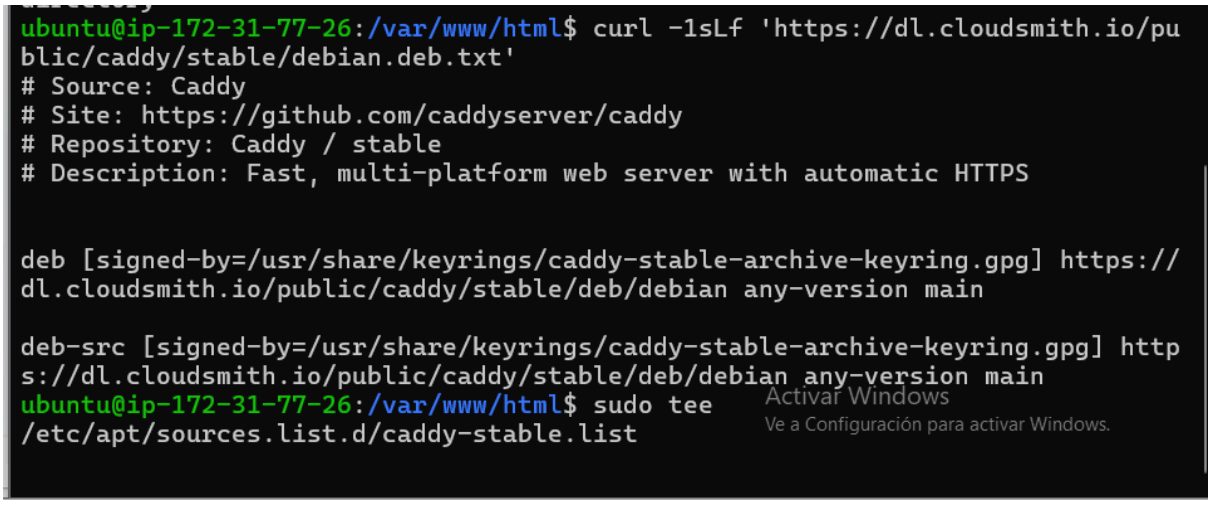
estado del servicio nginx



2.3 Instalación y prueba de Caddy

instalación de repositorio GPG de Caddy





instalación completa de Caddy

```
lmOP+k+NyIgKVOW9+vF2HpUvY2cNwjSAU96C3R4W4z/ykHco/6HhZcAb/MydMkPy
cI8jUDKa++Dk88xvq/AsRH++ri5WIY3n/HIkDyxGX5KCyxAfU1xuGkosnu7iBxoz
2YVIV5GUwjf7ysOmgkb7FAcb73hUnCdGxcbWiQofABEBAAGJBHIEGAEKACYWIQRl
dgxR7eogF86iyhUVW215ylbqNAUCX+uckAIbAgUJCWYBgAJACRAVW215ylbqNMF0
IAQZAQoAHRYhBC9cO+mIas0pEyme+6uh+biHWmZhBQJf65yQAAoJEKuh+biHWmZh
ZIIP/2FxCz40ev/sR60ozPRg/eMqAx8M8tmwACjPk84tCZryTRQ9dQ2nKzIWIQvt
rLljl0OU3CCLgHRHl5lEjTgeDSfvrCLgss48fKAenBlHLGTzaMqdI6bs1fg7Ieh5
dZQd9Crf6xLC7tBSjEzaqaPseux9tEdLEbHn8oJlQAgymW4wBko+ymriZpjs43Hx
ir8iHn/H+oSJe4tOwaGmLzbMY5LMffvUWVKnoacjIx92XiVlUVypkh22iSa0upsz
vseu+hiytwBMyxU99dsRwOQy2BZd3P/tCwpnDI8hSZCzBTyuo6XNgwLHZzvUuNKc
qXZK4kxPRTVGyur9S1rYbZqnmPf4Wy7wFtwRUvbVve6BVdc7v9zWsTkEtTEJ4Buh
GHSwBTdGKy8CJJgRN8K2umGCPxnUNvoCOsqW6xIJTp2baM1nRWZf1UvNjgVhwyJt
AlrMk1xdmDDqVUO80Y5p7Jn2G1XPlQOVHcjyjFtM4sIWPqnrRzTzB4xTAZ1push3
EOys2+4IGLgS7P6z0q+4Cxwtnm32ZueQDWyQA5gOOZAodb8HCku6sIIiF+zGtrNO
F45xsKAoJVPt5VvH4zOKK+TbYyHAN/Ujpf09zXrTtmrnHwjB8PD+Uq2Ober/Zf5Q
4MGnzQAy/Qkw8suciIxgLC9kCNwJIFRULHMTUsAFaAq+L9+IBmwP/R2Yt/Gop4Nl
IfJDSMIBXGVn/2I2rTW0NDU3UC1njVRSVwQ4fjyRcuxi7dM/f8YBPnNGXO2Ur709
f7LF7GkY/VgjQ9RWaZ6CB3GPhUjj1Q5nmW+lQkyehPYgx1/MuD3wq3w/BfYyrYHb
xRn5r4N5QmUasFrPH8Ey/zI2cEFwckek0Z1G2SwnkEsY0e9vy12RvCGGicHJ+Xxs
7E/L6rEjRpcQg1xzzCh1Sdx4ZKIxss9N5vJ5xCTd9kFl68ZCQJEz9zJUztEiEYcG
l6WQ+BK3W4UepkbzgZ1HVB2LWf84cHC4a983k0avI1KtKSNd6Nn4qUJUa1Hj+mw7
tlCwt97V+vbEnhFsoVjObJqsVXQOs9CdOiV2vsRqVD5tQPEq3AfowGHtNgxXbfO/
wPiLmPSzZOaAlFaRXX6Off9B6RYuh5pVd/njewpsPAJfefiYeBOS0nThrQMbweyf
S7FG/ibAE8NspI2Dn3nT+D6cUeYzCVkhNKKgBzYotODMl0N3H6pfOQwWp0aO8teo
0v07lrePvMGNQcu2GuTM1v9YOt5kMrfbNgdAfrN8BLPUV/ZseCdKlfJLNlh6/pxr
STw95n1JvFHpSZCMR5NWbiEdtXZmlJTFlMNMww8vO3DwTkA9hdqnKl04yPHQQpMD
A5zVwuXbvH6GHaZJVHUrII6w8rjimo5r
=e4lF
-----END PGP PUBLIC KEY BLOCK-----
ubuntu@ip-172-31-77-26:/var/www/html$ sudo gpg --dearmor -o
/usr/share/keyrings/caddy-stable-archive-keyring.gpg
gpg: missing argument for option "-o"
-bash: /usr/share/keyrings/caddy-stable-archive-keyring.gpg: No such file or
directory
ubuntu@ip-172-31-77-26:/var/www/html$ exit
logout
There are stopped jobs.
ubuntu@ip-172-31-77-26:/var/www/html$ /usr/share/keyrings/caddy-stable-archiv
e-keyring.gpg
-bash: /usr/share/keyrings/caddy-stable-archive-keyring.gpg: No such file or
directory
ubuntu@ip-172-31-77-26:/var/www/html$
```


creación del sitio web en /var/www/caddy

```
ubuntu@ip-172-31-77-26:/var/www/html$ sudo apt update && sudo apt install cad
dy -y
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InReleas
e
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... 54%
```

```
ubuntu@ip-172-31-77-26:/var/www/html$ echo "Este servidor está funcionando co
rrectamente." | sudo tee -a
/var/www/caddy/README.md
Este servidor está funcionando correctamente.
```

```
/var/www/caddy/README.md
# Bienvenido a Caddy
ubuntu@ip-172-31-77-26:/var/www/html$ echo "" | sudo tee -a /var/www/caddy/RE
ADME.md

ubuntu@ip-172-31-77-26:/var/www/html$ echo "Este servidor está funcionando co
rrectamente." | sudo tee -a
Este servidor está funcionando correctamente.
ubuntu@ip-172-31-77-26:/var/www/html$ echo "Este servidor está funcionando co
rrectamente." | sudo tee -a
/var/www/caddy/README.md
Este servidor está funcionando correctamente.
-bash: /var/www/caddy/README.md: Permission denied
ubuntu@ip-172-31-77-26:/var/www/html$ sudo tee -a
/var/www/caddy/README.md
^Z
[3]+  Stopped                 sudo tee -a
-bash: /var/www/caddy/README.md: Permission denied
ubuntu@ip-172-31-77-26:/var/www/html$ echo "" | sudo tee -a /var/www/caddy/RE
ADME.md

ubuntu@ip-172-31-77-26:/var/www/html$ echo "## Características" | sudo tee -a
 /var/www/caddy/README.md
## Características
ubuntu@ip-172-31-77-26:/var/www/html$ echo "- Servidor moderno" | sudo tee -a
 /var/www/caddy/README.md
- Servidor moderno
ubuntu@ip-172-31-77-26:/var/www/html$ echo "- HTTPS automático" | sudo tee -a
 /var/www/caddy/README.md
- HTTPS automático
ubuntu@ip-172-31-77-26:/var/www/html$ echo "- Fácil configuración" | sudo tee
 -a /var/www/caddy/README.md
- Fácil configuración
ubuntu@ip-172-31-77-26:/var/www/html$
```



```
juan@A6Alumno21:~$ curl -o /tmp/test-image.jpg "https://www.python.org/static
/apple-touch-icon-144x144-precomposed.png"
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Curre
nt
                                 Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--
100  7382  100  7382    0     0   140k      0 --:--:-- --:--:-- --:--:--  144
k
juan@A6Alumno21:~$
```

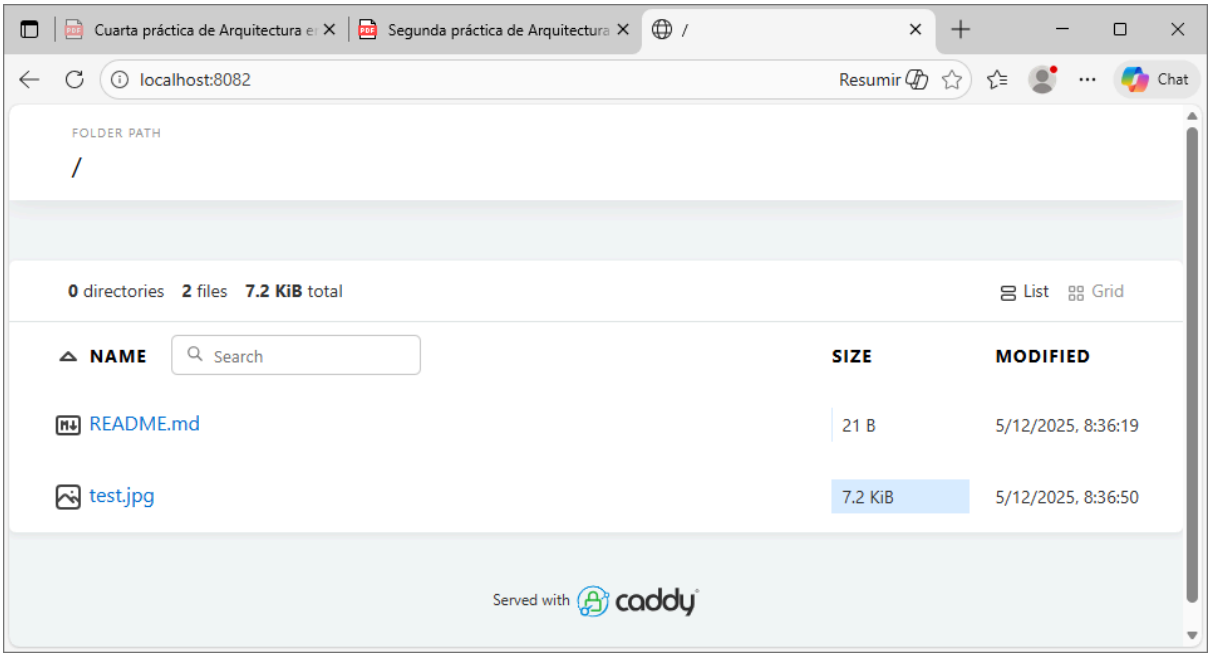
```
# The Caddyfile is an easy way to configure your Caddy web server.
#
# Unless the file starts with a global options block, the first
# uncommented line is always the address of your site.
#
# To use your own domain name (with automatic HTTPS), first make
# sure your domain's A/AAAA DNS records are properly pointed to
# this machine's public IP, then replace ":80" below with your
# domain name.

:8082 {
    root * /var/www/caddy
    file_server browse

    @markdown path *.md
    header @markdown Content-Type text/plain
}
```

systemctl restart caddy y estado del servicio

```
juan@A6Alumno21:~$ ls -l /etc/caddy
total 4
-rw-r--r-- 1 root root 769 Aug 23 03:47 Caddyfile
juan@A6Alumno21:~$ sudo nano /etc/caddy/Caddyfile
juan@A6Alumno21:~$ sudo nano /etc/caddy/Caddyfile
juan@A6Alumno21:~$ sudo systemctl restart caddy
juan@A6Alumno21:~$
```


Caddy se configuró como servidor web en el puerto 8082, con un sitio básico de prueba y acceso mediante dashboard.

```
juan@A6Alumno21:~$ sudo systemctl status caddy
● caddy.service - Caddy
     Loaded: loaded (/usr/lib/systemd/system/caddy.service; enabled; preset:>
     Active: active (running) since Fri 2025-12-05 08:28:21 CET; 13s ago
       Docs: https://caddyserver.com/docs/
   Main PID: 4694 (caddy)
      Tasks: 13 (limit: 9350)
     Memory: 12.6M (peak: 13.4M)
        CPU: 47ms
     CGroup: /system.slice/caddy.service
             └─4694 /usr/bin/caddy run --environ --config /etc/caddy/Caddyfi>

Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9944>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9946>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"warn","ts":1764919701.9946>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"warn","ts":1764919701.9946>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9946>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9948>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9948>
Dec 05 08:28:21 A6Alumno21 systemd[1]: Started caddy.service - Caddy.
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9965>
Dec 05 08:28:21 A6Alumno21 caddy[4694]: {"level":"info","ts":1764919701.9966>
lines 1-21/21 (END)
```



SECCIÓN 3 — Implementación de HTTPS con Apache (Certbot + SSL)

Se habilitó el módulo SSL de Apache, se configuró un certificado autofirmado y se verificó el acceso por HTTPS.

instalación de certbot + módulo apache

```
juan@A6Alumno21:~$ sudo systemctl restart caddy
juan@A6Alumno21:~$ sudo apt install certbot python3-certbot-apache -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils augeas-lenses libapr1t64
```

```
juan@A6Alumno21:~$ sudo apt update
Get:1 https://dl.cloudsmith.io/public/caddy/stable/deb/debian any-version InR
elease [14.8 kB]
Hit:2 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Fetched 14.8 kB in 0s (44.5 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
50 packages can be upgraded. Run 'apt list --upgradable' to see them.
juan@A6Alumno21:~$ certbot --version
certbot 2.9.0
juan@A6Alumno21:~$
```

```
juan@A6Alumno21:~$ certbot --version
certbot 2.9.0
juan@A6Alumno21:~$ sudo ls /usr/lib/python3/dist-packages/certbot_apache
__init__.py  __pycache__  _internal  py.typed
juan@A6Alumno21:~$
```

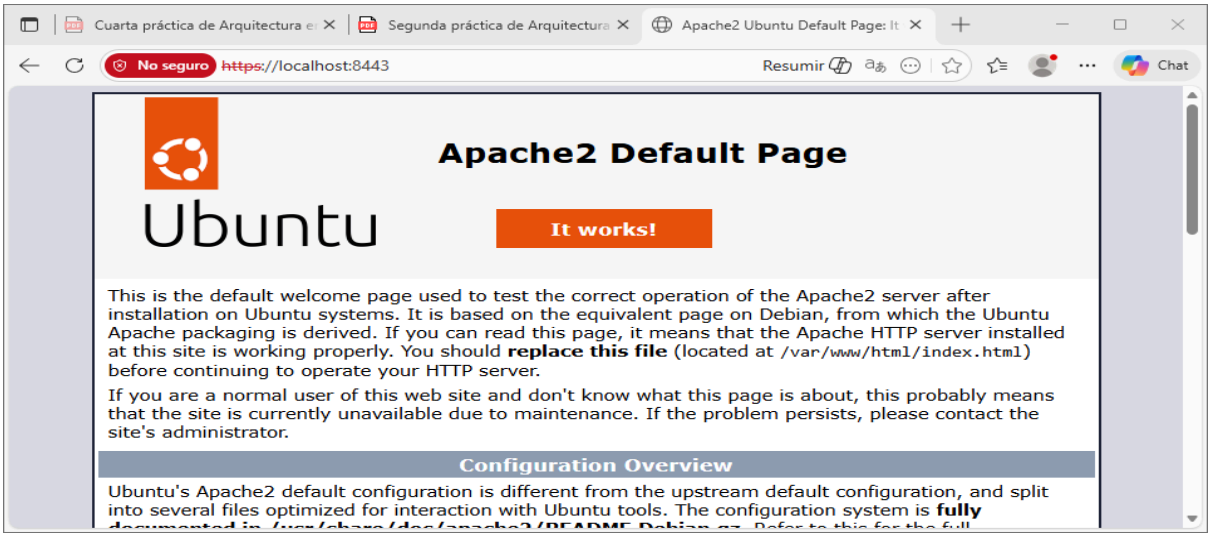

Habilitar SSL (a2enmod ssl)

```
juan@A6Alumno21:~$ sudo a2enmod ssl
Considering dependency mime for ssl:
Module mime already enabled
Considering dependency socache_shmcb for ssl:
Enabling module socache_shmcb.
Enabling module ssl.
See /usr/share/doc/apache2/README.Debian.gz on how to configure SSL and creat
e self-signed certificates.
To activate the new configuration, you need to run:
  systemctl restart apache2
juan@A6Alumno21:~$
```


Editar ports.conf para Listen 8443

```
juan@A6Alumno21:~$ sudo nano /etc/apache2/ports.conf
juan@A6Alumno21:~$ sudo ss -tulpn | grep apache2
tcp   LISTEN 0      511                *:8443            *:*    users:(("apa
che2",pid=6643,fd=4),("apache2",pid=6642,fd=4),("apache2",pid=6640,fd=4))
juan@A6Alumno21:~$ sudo a2ensite default-ssl.conf
Site default-ssl already enabled
juan@A6Alumno21:~$ sudo systemctl restart apache2
juan@A6Alumno21:~$ sudo ss -tulpn | grep apache2
tcp   LISTEN 0      511                *:8443            *:*    users:(("apa
che2",pid=6739,fd=4),("apache2",pid=6738,fd=4),("apache2",pid=6736,fd=4))
juan@A6Alumno21:~$
```

Acceso por navegador a https://IP:8443



SECCIÓN 4 — Verificación de servicios

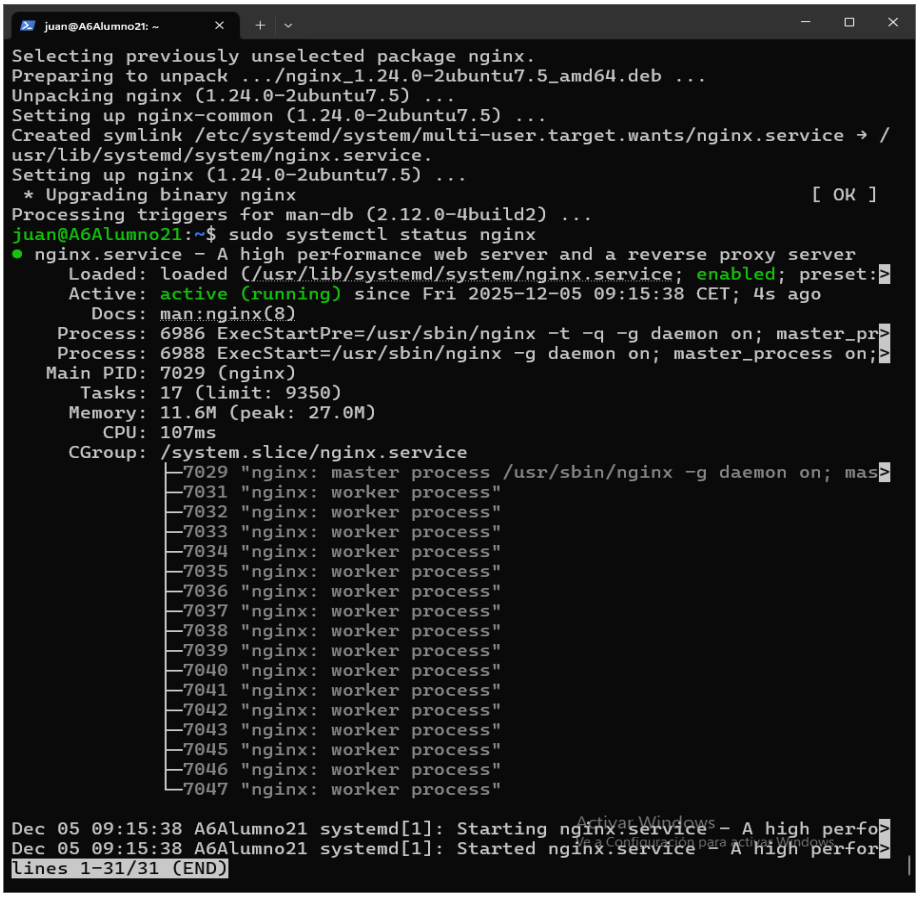
Estado de Apache

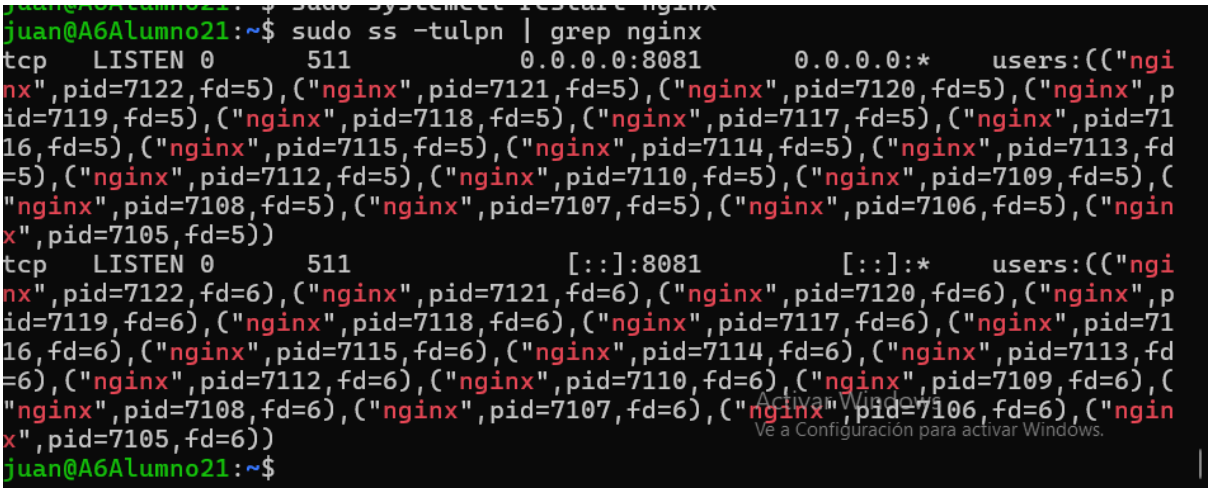
```
juan@A6Alumno21:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; prese>
     Active: active (running) since Fri 2025-12-05 09:12:43 CET; 1min 13s ago
       Docs: https://httpd.apache.org/docs/2.4/
    Process: 6733 ExecStart=/usr/sbin/apachectl start (code=exited, status=0>
   Main PID: 6736 (apache2)
      Tasks: 55 (limit: 9350)
     Memory: 6.8M (peak: 8.8M)
        CPU: 29ms
     CGroup: /system.slice/apache2.service
             ├─6736 /usr/sbin/apache2 -k start
             ├─6738 /usr/sbin/apache2 -k start
             └─6739 /usr/sbin/apache2 -k start

Dec 05 09:12:43 A6Alumno21 systemd[1]: Starting apache2.service - The Apache>
Dec 05 09:12:43 A6Alumno21 systemd[1]: Started apache2.service - The Apache >
lines 1-16/16 (END)
```



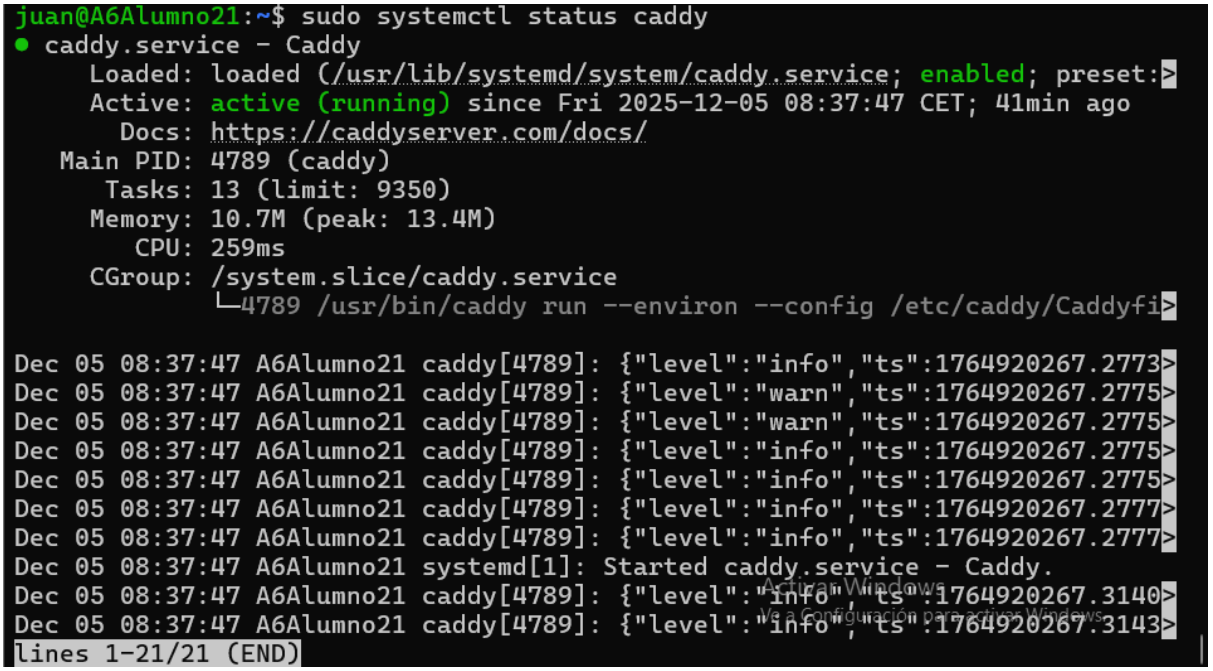
```
[2]+  Stopped                 sudo systemctl status apache2
juan@A6Alumno21:~$ sudo ss -tulpn | grep apache2
tcp   LISTEN 0      511                *:8443             *:*    users:(("apa
che2",pid=6739,fd=4),("apache2",pid=6738,fd=4),("apache2",pid=6736,fd=4))
juan@A6Alumno21:~$
```

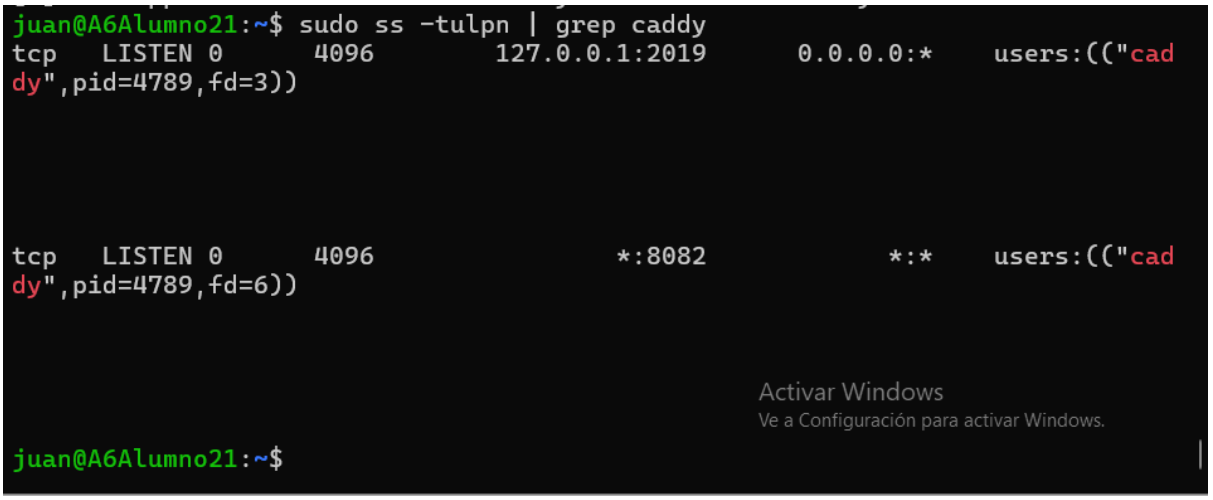
Estado de Nginx (systemctl status nginx)





Estado de Caddy (systemctl status caddy)





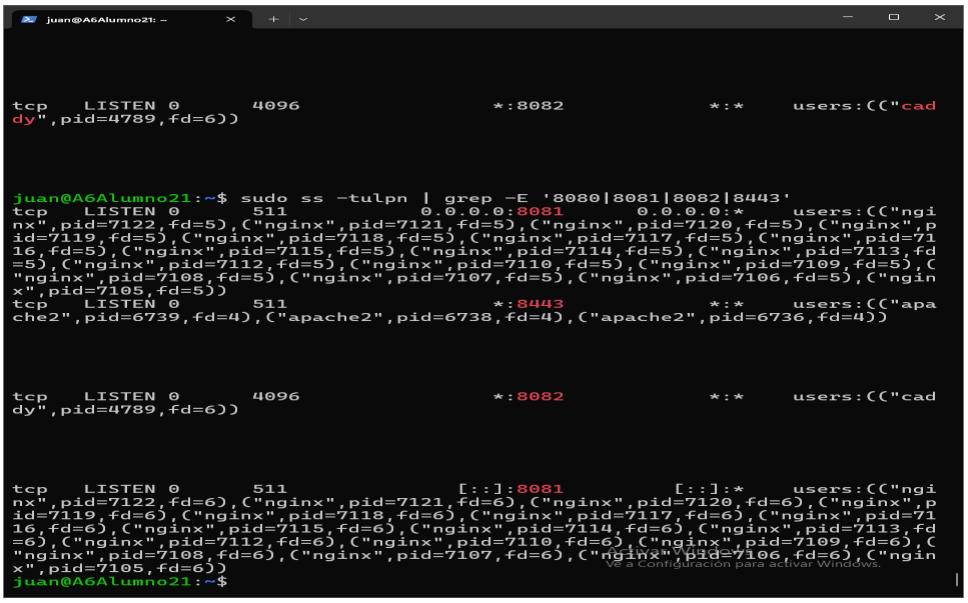
SECCIÓN 5 — Comprobación de puertos

Los servicios escuchan en los puertos configurados simultáneamente, permitiendo coexistencia en la misma EC2

Se observan:

- Apache en 8080 y 8443
- Nginx en 8081
- Caddy en 8082

Comando ss -tulnp | grep -E "8080|8081|8082|8443"



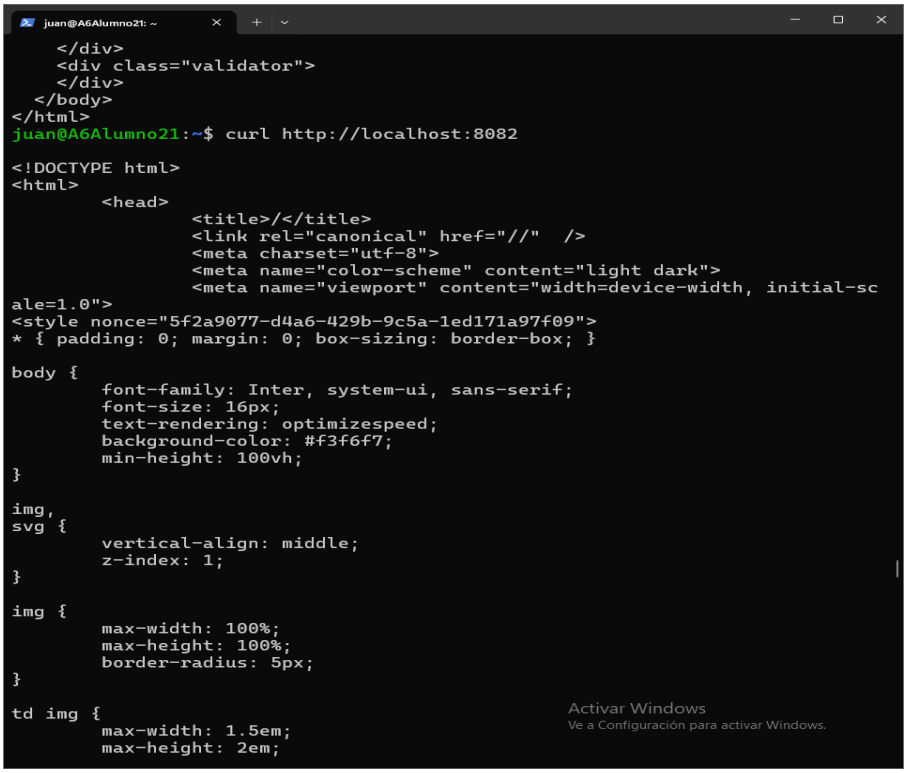
SECCIÓN 6 — Verificación final de funcionamiento de los tres servidores

6.2 Pruebas de respuesta con cURL (Apache, Nginx y Caddy)

Muestra la respuesta HTML de Nginx funcionando correctamente.

curl http://localhost:8081 (Nginx)

curl http://localhost:8082 (Caddy)



curl -i -k https://localhost:8443 (Apache SSL)