

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



Hecho por Juan Medrano

INDICE

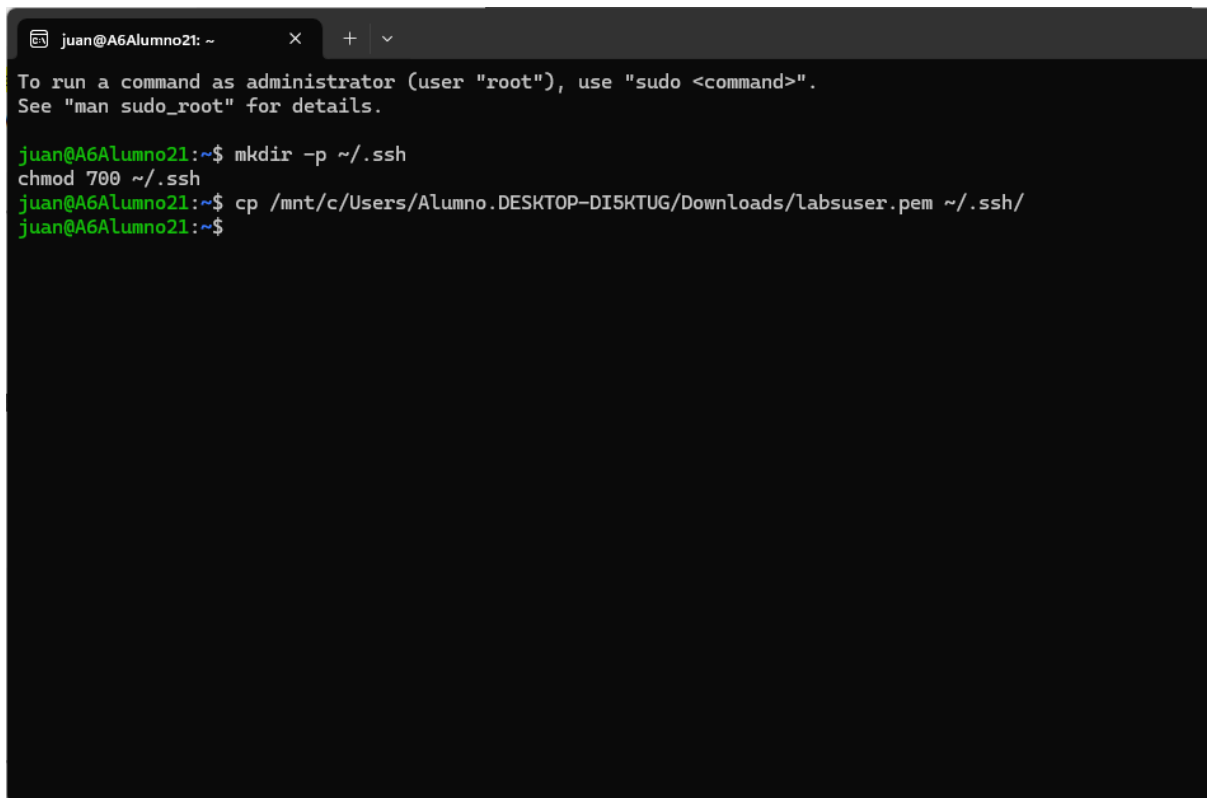
SECCIÓN 1 — PREPARACIÓN DEL ENTORNO Y CONEXIÓN REMOTA (WSL + SSH + AWS).....	3
1.1 Verificación y preparación de WSL.....	3
1.2 Descarga y preparación de la clave PEM.....	4
1.3 Creación de la instancia EC2.....	4
1.4 Selección de la AMI (Imagen del Sistema Operativo).....	5
1.5 Selección del tipo de instancia.....	6
1.6 Configuración de red y almacenamiento.....	6
1.7 Configuración del Grupo de Seguridad (Security Group).....	7
1.7.1 Reglas iniciales del Security Group.....	7
1.7.2 Añadir reglas para servidores web.....	7
SECCIÓN 2 — Instalación y configuración de los servidores web.....	10
2.1 Instalación y prueba de Apache2.....	10
2.2 Instalación y prueba de Nginx.....	13
2.3 Instalación y prueba de Caddy.....	14
SECCIÓN 3 — Implementación de HTTPS con Apache (Certbot + SSL).....	18
instalación de certbot + módulo apache.....	18
Habilitar SSL (a2enmod ssl).....	19
Editar ports.conf para Listen 8443.....	19
Acceso por navegador a https://IP:8443.....	20
SECCIÓN 4 — Verificación de servicios.....	20
Estado de Apache.....	20
Estado de Nginx (systemctl status nginx).....	21
Estado de Caddy (systemctl status caddy).....	22
SECCIÓN 5 — Comprobación de puertos.....	23
Comando ss -tulnp grep -E "8080 8081 8082 8443".....	23
SECCIÓN 6 — Verificación final de funcionamiento de los tres servidores.....	24
6.2 Pruebas de respuesta con cURL (Apache, Nginx y Caddy).....	24
curl http://localhost:8081 (Nginx).....	24
curl http://localhost:8082 (Caddy).....	25

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.

A terminal window titled 'juan@A6Alumno21: ~' with standard window controls. It displays a message about running commands as administrator, followed by three commands: 'mkdir -p ~/.ssh', 'chmod 700 ~/.ssh', and 'cp /mnt/c/Users/Alumno.DESKTOP-DI5KTUG/Downloads/labsuser.pem ~/.ssh/'.

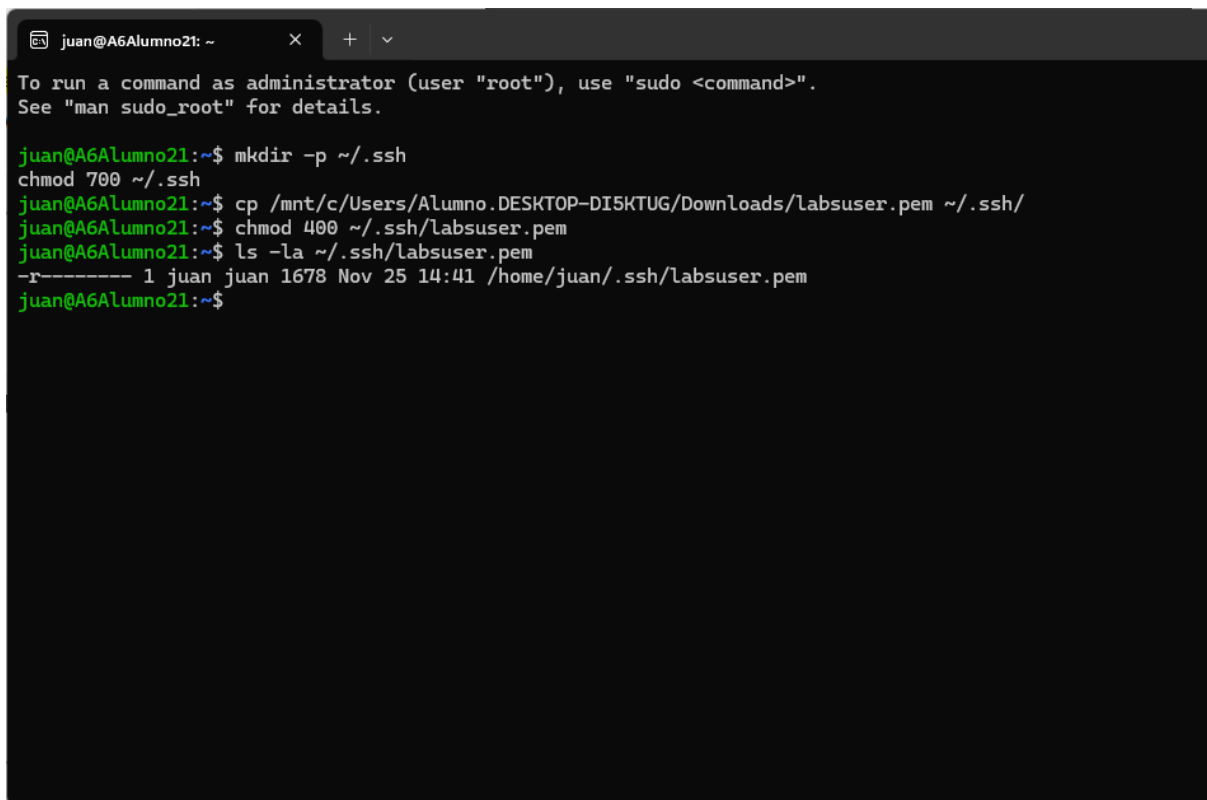
```
juan@A6Alumno21: ~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
juan@A6Alumno21:~$ mkdir -p ~/.ssh  
chmod 700 ~/.ssh  
juan@A6Alumno21:~$ cp /mnt/c/Users/Alumno.DESKTOP-DI5KTUG/Downloads/labsuser.pem ~/.ssh/  
juan@A6Alumno21:~$
```

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
```



```
juan@A6Alumno21: ~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
juan@A6Alumno21:~$ mkdir -p ~/.ssh  
chmod 700 ~/.ssh  
juan@A6Alumno21:~$ cp /mnt/c/Users/Alumno.DESKTOP-DI5KTUG/Downloads/labsuser.pem ~/.ssh/  
juan@A6Alumno21:~$ chmod 400 ~/.ssh/labsuser.pem  
juan@A6Alumno21:~$ ls -la ~/.ssh/labsuser.pem  
-r----- 1 juan juan 1678 Nov 25 14:41 /home/juan/.ssh/labsuser.pem  
juan@A6Alumno21:~$
```

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.

The screenshot shows the AWS Academy lab interface. The main content area displays a terminal window with the command `ec2_kc_5426808@ubuntu197808:~$`. The right sidebar shows 'Cloud Access' information, including 'AWS CLI', 'Cloud Labs' session details, and 'SSH key' options. The bottom navigation bar includes 'Anterior' and 'Siguiente' buttons.

Cloud Access

AWS CLI: [Show](#)

Cloud Labs

Remaining session time: 03:55:09(236 minutes)
Session started at: 2025-11-25T05:27:30-0800
Session to end at: 2025-11-25T09:27:41-0800

Accumulated lab time: 00:04:00 (4 minutes)

No running instance

SSH key: [Show](#) [Download PEM](#) [Download PPK](#)

AWS SSO: [Download URL](#)

AWSAccountid	533267356151
Region	us-east-1

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.

The screenshot shows the AWS Management Console for the EC2 service. The left sidebar contains navigation links for EC2, Instancias, Tipos de instancia, Plantillas de lanzamiento, Solicitudes de spot, Savings Plans, Instancias reservadas, Alojamiento dedicado, Reservas de capacidad, Capacity Manager, Imágenes, AMI, Catálogo de AMI, Elastic Block Store, Volúmenes, Instantáneas, Administrador del ciclo de vida, and Red y seguridad. The main content area is divided into several sections: 'Recursos' (Resources) showing a summary of EC2 resources; 'Lanzar la instancia' (Launch instance) with buttons for 'Lanzar la instancia' and 'Migrar un servidor'; 'Estado del servicio' (Service status) showing the service is operational; 'Zonas' (Zones) listing available zones; 'Alarmas de instancia' (Instance alarms) showing no alarms; and 'Eventos programados' (Scheduled events) showing no events. A tooltip for 'Color de la cuenta' is visible in the top right corner.

1.6 Configuración de red y almacenamiento

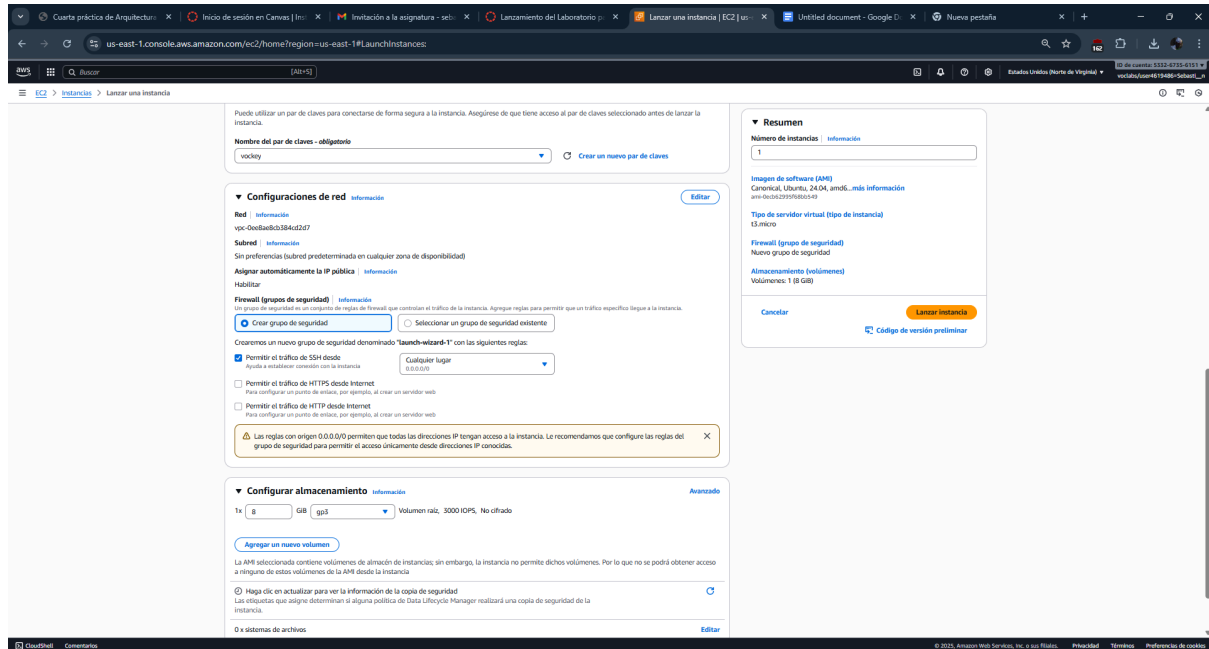
Se configura la red donde estará la instancia, asignación de IP pública y tamaño del volumen EBS.

The screenshot shows the 'Lanzar una instancia' (Launch instance) wizard in the AWS Management Console. The 'Imágenes de aplicaciones y sistemas operativos' section shows the selection of the Ubuntu Server 24.04 LTS (HVM) AMI. The 'Tipo de instancia' section shows the selection of the t2.micro instance type. The 'Resumen' section shows the configuration summary, including the number of instances, the AMI, the instance type, the network, and the storage. The 'Lanzar instancia' button is visible in the bottom right corner.

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#SecurityGroups:securityGroupId=sg-0ec041d643af46c71

Buscar

Alt+5

EC2 > Grupos de seguridad > sg-0ec041d643af46c71 - launch-wizard-1

Panel
Vista global de EC2
Eventos

▼ Instancias
Instancias
Tipos de instancia
Plantillas de lanzamiento
Solicitudes de spot
Savings Plans
Instancias reservadas
Alojamientos dedicados
Reservas de capacidad
Capacity Manager

▼ Imágenes
AMI
Catálogo de AMI

▼ Elastic Block Store
Volúmenes
Instantáneas
Administrador del ciclo de vida

▼ Red y seguridad
Security Groups
Direcciones IP elásticas
Grupos de ubicación
Pares de claves

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-0ee8a8e8cb384cd2d7

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	-

CloudShell

Comentarios

© 2025, Amazon Web Services, Inc. o sus filiales. Privacidad Términos Preferencias de cookies

us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#SecurityGroups:group-id=sg-0ec041d643af46c71

Buscar

Alt+5

EC2 > Grupos de seguridad > sg-0ec041d643af46c71 - launch-wizard-1

Panel
Vista global de EC2
Eventos

▼ Instancias
Instancias
Tipos de instancia
Plantillas de lanzamiento
Solicitudes de spot
Savings Plans
Instancias reservadas
Alojamientos dedicados
Reservas de capacidad
Capacity Manager

▼ Imágenes
AMI
Catálogo de AMI

▼ Elastic Block Store
Volúmenes
Instantáneas
Administrador del ciclo de vida

▼ Red y seguridad
Security Groups
Direcciones IP elásticas
Grupos de ubicación
Pares de claves

Las reglas del grupo de seguridad de entrada se han modificado correctamente en el grupo de seguridad (sg-0ec041d643af46c71) [launch-wizard-1]

Detalles

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-0ee8a8e8cb384cd2d7

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-0c843402ca34cb9af	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	-

CloudShell

Comentarios

© 2025, Amazon Web Services, Inc. o sus filiales. Privacidad Términos Preferencias de cookies


```
juan@A6Alumno21: ~  
run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
juan@A6Alumno21:~$ mkdir -p ~/.ssh  
juan@A6Alumno21:~$ chmod 700 ~/.ssh  
juan@A6Alumno21:~$ cp /mnt/c/Users/Alumno.DESKTOP-DI5KTUG/Downloads/labsuser.pem ~/.ssh/  
juan@A6Alumno21:~$ chmod 400 ~/.ssh/labsuser.pem  
juan@A6Alumno21:~$ ls -la ~/.ssh/labsuser.pem  
----- 1 juan juan 1678 Nov 25 14:41 /home/juan/.ssh/labsuser.pem  
juan@A6Alumno21:~$ ssh -i ~/.ssh/labsuser.pem ubuntu@3.214.184.254  
Warning: authenticity of host '3.214.184.254 (3.214.184.254)' can't be established.  
25519 key fingerprint is SHA256:StsVNJqLs3UWM5+qby5XVp6M/SinR60qzhU5eEQFFkU.  
This key is not known by any other names.  
Are 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           Temperature:    -273.1 C  
Usage of /:   26.2% of 6.71GB Processes:      111  
Memory usage: 23%          Users logged in: 1  
Swap usage:   0%           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.

```
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-77-26:~$ sudo apt update && sudo apt upgrade -y
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [1334 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [269 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation-en [118 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Components [35.0 kB]
```

instalación de Apache2

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-77-26:~$ sudo apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1t64 libaprutil1-dbd-sqlite3 libaprutil1-ldap libaprutil1t64
  liblua5.4-0 ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1t64 libaprutil1-dbd-sqlite3 libaprutil1-ldap libaprutil1t64
  liblua5.4-0 ssl-cert
0 upgraded, 10 newly installed, 0 to remove and 2 not upgraded.
Need to get 2086 kB of archives.
After this operation, 8090 kB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libapr1t64 amd64 1.7.2-3.1ubuntu0.1 [108 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1t64 amd64 1.6.3-1.1ubuntu7 [91.9 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.3-1.1ubuntu7 [112 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1-ldap amd64 1.6.3-1.1ubuntu7 [9116 B]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 liblua5.4-0 amd64 5.4.6-3build2 [166 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-bin amd64 2.4.58-1ubuntu8.8 [1331 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-data amd64 2.4.58-1ubuntu8.8 [1331 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-utils amd64 2.4.58-1ubuntu8.8 [1331 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 ssl-cert all 1ubuntu1 [1331 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2 all 2.4.58-1ubuntu8.8 [1331 kB]
26% [6 apache2-bin 24.8 kB/1331 kB 2%]
```

modificación de ports.conf (Listen 8080)

```
# If you just change the port on  
# have to change the VirtualHost  
# /etc/apache2/sites-enabled/000-  
  
Listen 8080  
  
<IfModule ssl_module>  
    Listen 443  
</IfModule>  
  
h <IfModule mod_gnutls.c>  
    Listen 443  
</IfModule>
```

modificación de 000-default.conf

```
GNU nano 7.2 /etc/apache2/sites-available/000-default
<VirtualHost *:8080>
    # The ServerName directive sets the request scheme, hostname and port that
    # 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) this
    # 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.

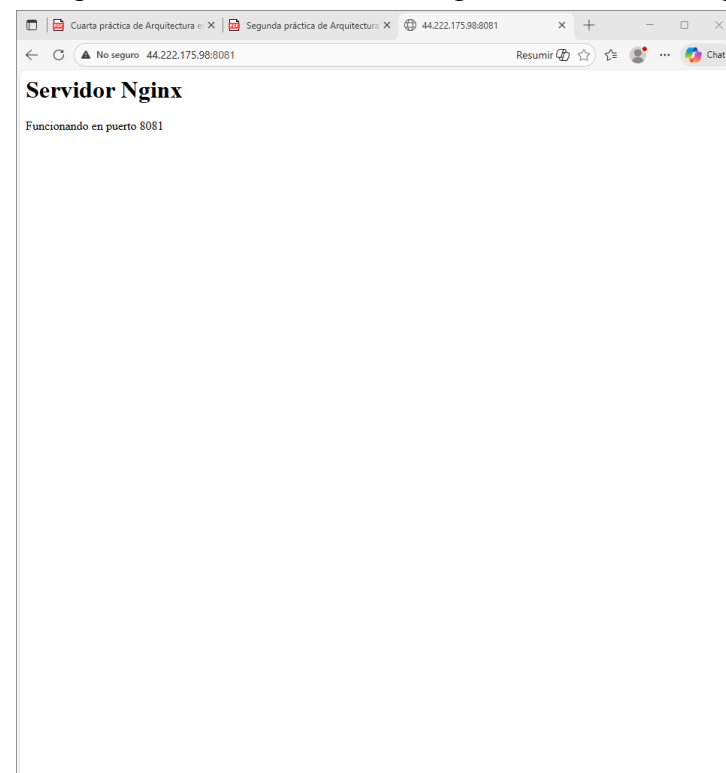
instalación de nginx

```
</div></body></html>ubuntu@ip-172-31-77-26:~$ sudo apt install nginx -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  nginx-common
Suggested packages:
  fcgiwrap nginx-doc
The following NEW packages will be installed:
  nginx nginx-common
0 upgraded, 2 newly installed, 0 to remove and 2 not upgraded.
Need to get 564 kB of archives.
```

creación de index.html de Nginx

```
GNU nano 7.2 /etc/nginx/sites-available/default *
echo "<h1>Servidor Nginx</h1><p>Funcionando en puerto 8081</p>" | sudo tee
/usr/share/nginx/html/index.html
```

navegador mostrando “Servidor Nginx funcionando en puerto 8081



```

ubuntu@ip-172-31-77-26: /va x + v
ubuntu@ip-172-31-77-26:/var/www/html$ sudo systemctl restart nginx
ubuntu@ip-172-31-77-26:/var/www/html$ curl http://localhost:8081/index.html
<h1>Servidor Nginx</h1><p>Funcionando en puerto 8081</p>
ubuntu@ip-172-31-77-26:/var/www/html$ sudo systemctl restart nginx

```

estado del servicio nginx

```

ubuntu@ip-172-31-77-26:/var/www/html$ sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset:
   Active: active (running) since Thu 2025-12-04 13:43:29 UTC; 2min 51s ago
     Docs: man:nginx(8)
   Process: 2493 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_pr
   Process: 2495 ExecStart=/usr/sbin/nginx -g daemon on; master_process on;
  Main PID: 2496 (nginx)
    Tasks: 3 (limit: 1017)
   Memory: 2.4M (peak: 2.9M)
      CPU: 15ms
   CGroup: /system.slice/nginx.service
           └─2496 "nginx: master process /usr/sbin/nginx -g daemon on; mas
             └─2497 "nginx: worker process"
               └─2498 "nginx: worker process"

Dec 04 13:43:29 ip-172-31-77-26 systemd[1]: Starting nginx.service - A high
Dec 04 13:43:29 ip-172-31-77-26 systemd[1]: Started nginx.service - A high p
lines 1-17/17 (END)

```

2.3 Instalación y prueba de Caddy

instalación de repositorio GPG de Caddy

```

ubuntu@ip-172-31-77-26:/var/www/html$ sudo apt install -y debian-keyring debi
an-archive-keyring apt-transport-https curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
curl is already the newest version (8.5.0-2ubuntu10.6).
The following NEW packages will be installed:
  apt-transport-https debian-archive-keyring debian-keyring
0 upgraded, 3 newly installed, 0 to remove and 5 not upgraded.

```

```

ubuntu@ip-172-31-77-26:/var/www/html$ curl -1sLf 'https://dl.cloudsmith.io/pu
blic/caddy/stable/debian.deb.txt'
# Source: Caddy
# Site: https://github.com/caddyserver/caddy
# Repository: Caddy / stable
# Description: Fast, multi-platform web server with automatic HTTPS

deb [signed-by=/usr/share/keyrings/caddy-stable-archive-keyring.gpg] https://
dl.cloudsmith.io/public/caddy/stable/deb/debian any-version main

deb-src [signed-by=/usr/share/keyrings/caddy-stable-archive-keyring.gpg] http
s://dl.cloudsmith.io/public/caddy/stable/deb/debian any-version main
ubuntu@ip-172-31-77-26:/var/www/html$ sudo tee
/etc/apt/sources.list.d/caddy-stable.list

```

instalación completa de Caddy

```
LMOP+RfNyIgvOW9+fVf2HpUVY2cNwJSA096C3R4W4Z/YRHc0/6HhZcAB/MydMKPy
cI8jUDKa++Dk88xvq/AsRH++ri5WIY3n/HIkDyxGX5KCyxAfU1xuGkosnu7iBxoz
2YVIV5GUWj-f7ysOmgb7FAcb73hUnCdGxcbWiQofABEBAAGJBHIEGAEKACYWIQRl
dgxR7eogF86iyhUVW215ylbqNAUCX+uckAIbAgUJCWYBgAJACRAVW215ylbqNMF0
IAQZAQoAHRyhBC9c0+mIas0pEyme+6uh+biHwMZhBQJf65yQAAoJEKuh+biHwMZh
ZIIP/2FxCz40ev/sR60ozPRg/eMqAx8M8tmwACjPk84tCZryTRQ9dQ2nKzIWIQvt
rLljl00U3CCLgHRHl5LEjTgeDSfvrCLgss48fKAenBlHLGTzaMqdI6bs1fg7Ieh5
dZQd9Cr6xLC7tBSjEzaqaPseux9tEdLEbHn8oJlQAgymW4wBko+ymriZpjs43Hx
ir8iHn/H+oSJe4tOwaGmLzbMY5LMffvUWVKnoacjIx92XiVLUVypkh22iSa0upsz
vseu+hiytwBMyxU99dsRwOQy2BZd3P/tCwpmDI8hSZCzBTyuo6XNgwLHZzvUuNkc
qXZK4kxPRTVGyur9S1rYbZqnmPf4Wy7wFtwRUvbVve6BVdc7v9zWsTkEtTEJ4Buh
GHSwBTdGKy8CJJgRN8K2umGCPxnUNvoC0sqW6xIJTp2baM1nRWZf1UvNjgVhwyJt
AlrMk1xdmDDqVU080Y5p7Jn2G1XPlQOVHcjyJfTm4sIWPqnrRzTzB4xTAZ1push3
EOys2+4IGLgS7P6z0q+4Cxwtm32ZueQDwyQA5g00ZAodb8HCku6sIIiF+zGtrN0
F45xsKAoJVpt5VvH4z0KK+TbYyHAN/Ujpf09zXrTtmrnHwjB8PD+Uq20ber/Zf5Q
4MGnzQAY/Qkw8suciIxgLC9kCNwJIFRULHMTUsAFaAq+L9+IBmwP/R2Yt/Gop4Nl
IfJDSMIBXGVn/2I2rTW0NDU3UC1njVRSVwQ4fjyRcuxi7dM/f8YBPnNGX02Ur709
f7LF7GkY/Vgjq9RwZ6CB3GPhUjj1Q5nmW+lQkyehPYgx1/MuD3wq3w/BfYyrYHb
xRn5r4N5QmUasFrPH8Ey/zI2cEFwckek0Z1G2SwnkEsY0e9vy12RvCGGicHJ+Xxs
7E/L6rEjRpcQg1xzzCh1Sdx4ZKIXss9N5vJ5xCTd9kFl68ZCQJEz9zJUztEiEYcG
l6WQ+BK3W4UepkbzgZ1HVB2LWf84cHC4a983k0avI1KtKSnd6Nn4qUJUa1Hj+mw7
tlCwt97V+vbEnhFsoVj0bJqsVXQ0s9Cd0iV2vsRqVD5tQPEq3AfowGHtNgxXbfo/
wPiLmPSzZOaAlFaRX60ff9B6RYuh5pVd/njewpsPAJfefiYeBOS0nThrQMbweyf
S7FG/ibAE8NspI2Dn3nT+D6cUeYzCVkhNKKgBzYotODML0N3H6pfOQwWp0a08teo
0v077lrePvMGNQcu2GuTM1v9Y0t5kMrfbNgdAfrN8BLPUV/ZseCdKlfJLnlh6/pxr
STw95n1JvFHpSZCMR5NWbiEdtXZmlJTFLNMmww8v03DwTkA9hdqnKl04yPHQQpMD
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
  libaprutil1-dbd-sqlite3 libaprutil1-ldap libaprutil1t64 libaugeas0
juan@A6Alumno21:~$ sudo apt update
Get:1 https://dl.cloudsmith.io/public/caddy/stable/deb/debian any-version InRelease [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:~$

```

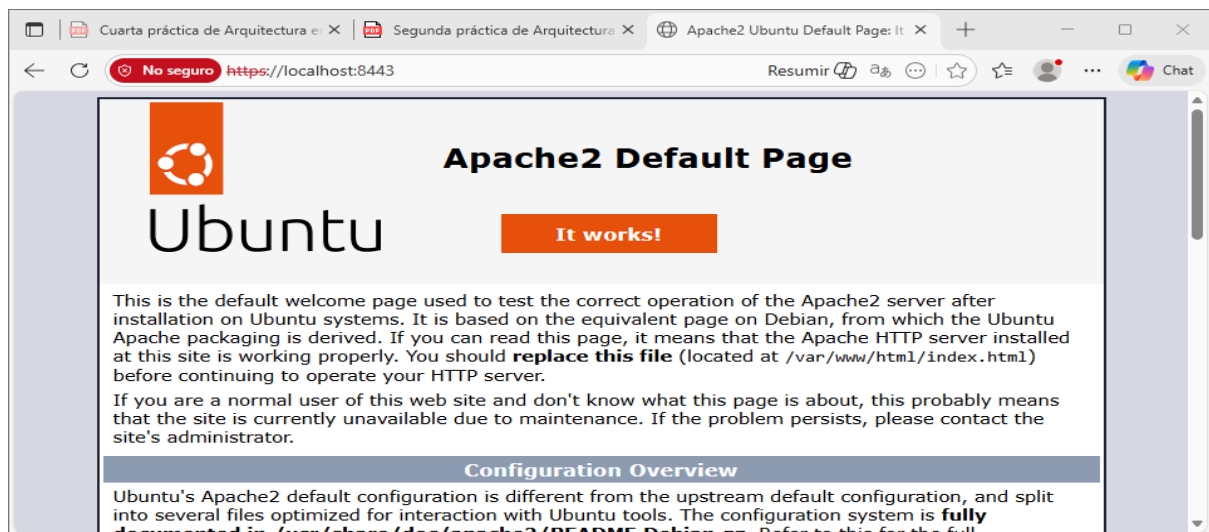
Editar ports.conf para Listen 8443

```

juan@A6Alumno21:~$ sudo nano /etc/apache2/ports.conf
juan@A6Alumno21:~$ sudo ss -tulpn | grep apache2
tcp    LISTEN 0      511      *:8443      *:~ users:(("apac
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:(("apac
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)

```

Selecting previously unselected package nginx.
Preparing to unpack .../nginx_1.24.0-2ubuntu7.5_amd64.deb ...
Unpacking nginx (1.24.0-2ubuntu7.5) ...
Setting up nginx-common (1.24.0-2ubuntu7.5) ...
Created symlink /etc/systemd/system/multi-user.target.wants/nginx.service → /usr/lib/systemd/system/nginx.service.
Setting up nginx (1.24.0-2ubuntu7.5) ...
* Upgrading binary nginx [ OK ]
Processing triggers for man-db (2.12.0-4build2) ...
juan@A6Alumno21:~$ sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset:➤
   Active: active (running) since Fri 2025-12-05 09:15:38 CET; 4s ago
     Docs: man:nginx(8)
  Process: 6986 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_pr➤
  Process: 6988 ExecStart=/usr/sbin/nginx -g daemon on; master_process on;➤
 Main PID: 7029 (nginx)
    Tasks: 17 (limit: 9350)
  Memory: 11.6M (peak: 27.0M)
     CPU: 107ms
   CGroup: /system.slice/nginx.service
           └─7029 "nginx: master process /usr/sbin/nginx -g daemon on; mas➤
             └─7031 "nginx: worker process"
               └─7032 "nginx: worker process"
                 └─7033 "nginx: worker process"
                   └─7034 "nginx: worker process"
                     └─7035 "nginx: worker process"
                       └─7036 "nginx: worker process"
                         └─7037 "nginx: worker process"
                           └─7038 "nginx: worker process"
                             └─7039 "nginx: worker process"
                               └─7040 "nginx: worker process"
                                 └─7041 "nginx: worker process"
                                   └─7042 "nginx: worker process"
                                     └─7043 "nginx: worker process"
                                       └─7045 "nginx: worker process"
                                         └─7046 "nginx: worker process"
                                           └─7047 "nginx: worker process"

Dec 05 09:15:38 A6Alumno21 systemd[1]: Starting nginx.service: A high perfor➤
Dec 05 09:15:38 A6Alumno21 systemd[1]: Started nginx.service: A high perfor➤
lines 1-31/31 (END)
```

```

juan@A6Alumno21:~$ sudo systemctl restart nginx
juan@A6Alumno21:~$ sudo ss -tulpn | grep nginx
tcp    LISTEN 0      511      0.0.0.0:8081      0.0.0.0:*      users:(("ngi
nx",pid=7122,fd=5),("nginx",pid=7121,fd=5),("nginx",pid=7120,fd=5),("nginx",p
id=7119,fd=5),("nginx",pid=7118,fd=5),("nginx",pid=7117,fd=5),("nginx",pid=71
16,fd=5),("nginx",pid=7115,fd=5),("nginx",pid=7114,fd=5),("nginx",pid=7113,fd
=5),("nginx",pid=7112,fd=5),("nginx",pid=7110,fd=5),("nginx",pid=7109,fd=5),("
nginx",pid=7108,fd=5),("nginx",pid=7107,fd=5),("nginx",pid=7106,fd=5),("ngin
x",pid=7105,fd=5))
tcp    LISTEN 0      511      [::]:8081      [::]:*      users:(("ngi
nx",pid=7122,fd=6),("nginx",pid=7121,fd=6),("nginx",pid=7120,fd=6),("nginx",p
id=7119,fd=6),("nginx",pid=7118,fd=6),("nginx",pid=7117,fd=6),("nginx",pid=71
16,fd=6),("nginx",pid=7115,fd=6),("nginx",pid=7114,fd=6),("nginx",pid=7113,fd
=6),("nginx",pid=7112,fd=6),("nginx",pid=7110,fd=6),("nginx",pid=7109,fd=6),("
nginx",pid=7108,fd=6),("nginx",pid=7107,fd=6),("nginx",pid=7106,fd=6),("ngin
x",pid=7105,fd=6))
juan@A6Alumno21:~$
```

Estado de Caddy (systemctl status caddy)

```
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 08:37:47 CET; 41min ago
     Docs: https://caddyserver.com/docs/
   Main PID: 4789 (caddy)
    Tasks: 13 (limit: 9350)
   Memory: 10.7M (peak: 13.4M)
      CPU: 259ms
   CGroup: /system.slice/caddy.service
           └─4789 /usr/bin/caddy run --environ --config /etc/caddy/Caddyfi>

Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2773>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"warn","ts":1764920267.2775>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"warn","ts":1764920267.2775>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2775>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2775>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2777>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2777>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.2777>
Dec 05 08:37:47 A6Alumno21 systemd[1]: Started caddy.service - Caddy.
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.3140>
Dec 05 08:37:47 A6Alumno21 caddy[4789]: {"level":"info","ts":1764920267.3143>
lines 1-21/21 (END)
```

```
juan@A6Alumno21:~$ sudo ss -tulpn | grep caddy
tcp    LISTEN 0      4096      127.0.0.1:2019      0.0.0.0:*      users:((("cad
dy",pid=4789,fd=3))
```

```
tcp    LISTEN 0      4096      *:8082              *:~              users:((("cad
dy",pid=4789,fd=6))
```

Activar Windows
Ve a Configuración para activar Windows.

```
juan@A6Alumno21:~$
```

SECCIÓN 5 — Comprobación de puertos

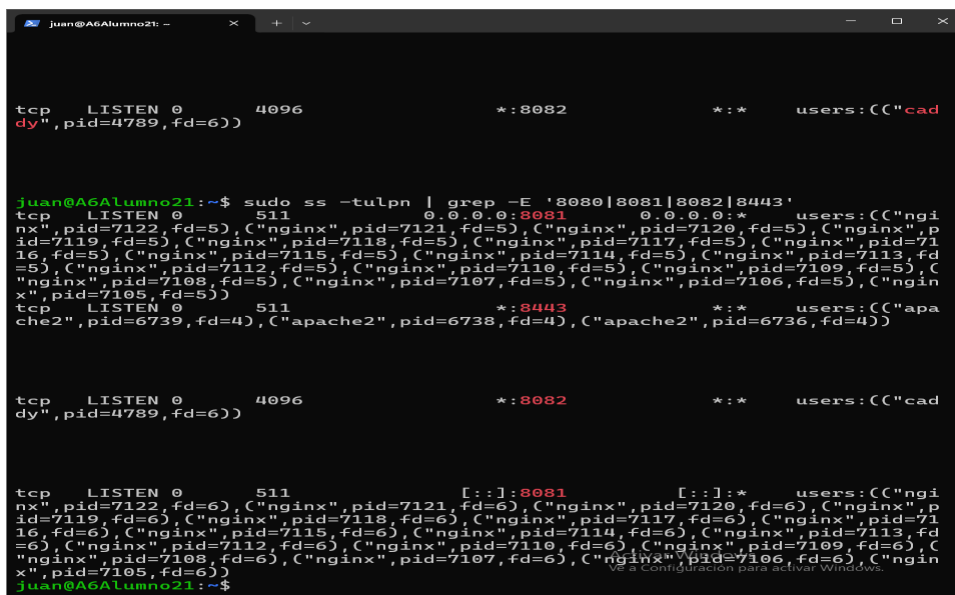
Los servicios escuchan en los puertos configurados simultáneamente, permitiendo coexistencia en la misma EC2

Se observan:

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

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

```
juan@A6Alumno21: ~$ ss -tulnp | grep -E '8080|8081|8082|8443'
```



```
tcp LISTEN 0 511 0.0.0.0:8082 0.0.0.0:* users:(("caddy",pid=4789,fd=6))

tcp LISTEN 0 511 0.0.0.0:8443 0.0.0.0:* users:(("apache2",pid=6739,fd=4),("apache2",pid=6738,fd=4),("apache2",pid=6736,fd=4))

tcp LISTEN 0 511 [::]:8081 [::]:* users:(("nginx",pid=7122,fd=5),("nginx",pid=7121,fd=5),("nginx",pid=7120,fd=5),("nginx",pid=7119,fd=5),("nginx",pid=7118,fd=5),("nginx",pid=7117,fd=5),("nginx",pid=7116,fd=5),("nginx",pid=7115,fd=5),("nginx",pid=7114,fd=5),("nginx",pid=7113,fd=5),("nginx",pid=7112,fd=5),("nginx",pid=7110,fd=5),("nginx",pid=7109,fd=5),("nginx",pid=7108,fd=5),("nginx",pid=7107,fd=5),("nginx",pid=7106,fd=5),("nginx",pid=7105,fd=5))
```

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)

```
juan@A6Alumno21: ~$ curl http://localhost:8081
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3
.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
  <!--
    Modified from the Debian original for Ubuntu
    Last updated: 2022-03-22
    See: https://launchpad.net/bugs/1966004
  -->
  <head>
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />
    <title>Apache2 Ubuntu Default Page: It works</title>
    <style type="text/css" media="screen">
      *
      {
        margin: 0px 0px 0px 0px;
        padding: 0px 0px 0px 0px;
      }

      body, html {
        padding: 3px 3px 3px 3px;

        background-color: #D8DBE2;

        font-family: Ubuntu, Verdana, sans-serif;
        font-size: 11pt;
        text-align: center;
      }

      div.main_page {
        position: relative;
        display: table;

        width: 800px;
```


curl <http://localhost:8082> (Caddy)

```
juan@A6Alumno21: ~  
</div>  
<div class="validator">  
</div>  
</body>  
</html>  
juan@A6Alumno21:~$ curl http://localhost:8082  
<!DOCTYPE html>  
<html>  
  <head>  
    <title></title>  
    <link rel="canonical" href="/" />  
    <meta charset="utf-8">  
    <meta name="color-scheme" content="light dark">  
    <meta name="viewport" content="width=device-width, initial-sc  
ale=1.0">  
    <style nonce="5f2a9077-d4a6-429b-9c5a-1ed171a97f09">  
    * { padding: 0; margin: 0; box-sizing: border-box; }  
  
    body {  
      font-family: Inter, system-ui, sans-serif;  
      font-size: 16px;  
      text-rendering: optimizespeed;  
      background-color: #f3f6f7;  
      min-height: 100vh;  
    }  
  
    img,  
    svg {  
      vertical-align: middle;  
      z-index: 1;  
    }  
  
    img {  
      max-width: 100%;  
      max-height: 100%;  
      border-radius: 5px;  
    }  
  
    td img {  
      max-width: 1.5em;  
      max-height: 2em;  
    }  
  </head>  
</html>
```

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

```
juan@A6Alumno21: ~  
</script>  
</body>  
</html>  
juan@A6Alumno21:~$ curl -i -k https://localhost:8443  
HTTP/1.1 200 OK  
Date: Fri, 05 Dec 2025 08:22:53 GMT  
Server: Apache/2.4.58 (Ubuntu)  
Last-Modified: Fri, 05 Dec 2025 07:40:15 GMT  
ETag: "29af-6452f8e666fd8"  
Accept-Ranges: bytes  
Content-Length: 10671  
Vary: Accept-Encoding  
Content-Type: text/html  
  
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3  
.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">  
<html xmlns="http://www.w3.org/1999/xhtml">  
  <!--  
    Modified from the Debian original for Ubuntu  
    Last updated: 2022-03-22  
    See: https://launchpad.net/bugs/1966004  
  -->  
  <head>  
    <meta http-equiv="Content-Type" content="text/html; charset=UTF-8" />  
    <title>Apache2 Ubuntu Default Page: It works</title>  
    <style type="text/css" media="screen">  
    * {  
      margin: 0px 0px 0px 0px;  
      padding: 0px 0px 0px 0px;  
    }  
  
    body, html {  
      padding: 3px 3px 3px 3px;  
  
      background-color: #D8DBE2;  
  
      font-family: Ubuntu, Verdana, sans-serif;  
      font-size: 11pt;  
      text-align: center;  
    }  
  
    div.main_page {
```