Building a Web Server on AWS EC2: A Journey from Manual Setup to Cloud Automation

Introduction: Building a Cloud Web Server the Smart Way

Imagine launching a web server in the cloud. For most beginners, it's a monumental task, but with the right tools, we can simplify the process while still learning the ropes of **AWS**, **Apache**, **SSL**, and **CloudFormation**.

In this journey, I'll guide you through setting up a **web server** on **AWS EC2**, installing **Apache**, securing the connection with **SSL certificates**, and automating the process using **CloudFormation**. Along the way, you'll see both the manual and automated approaches — the "manual" approach lets us learn every step thoroughly, while the "automated" approach saves us time and headaches in the future.

Let's start with a manual configuration, then use **AWS CloudFormation** to replicate the setup automatically. We'll finish by connecting our **custom domain** and securing the server with **Let's Encrypt SSL**.

Part 1: The Manual Setup - Understanding the Basics

Before diving into automation, we'll first manually configure the server. Think of this step as the "DIY" phase. While automation can save time, it's important to understand the fundamental steps that go into setting up the server.

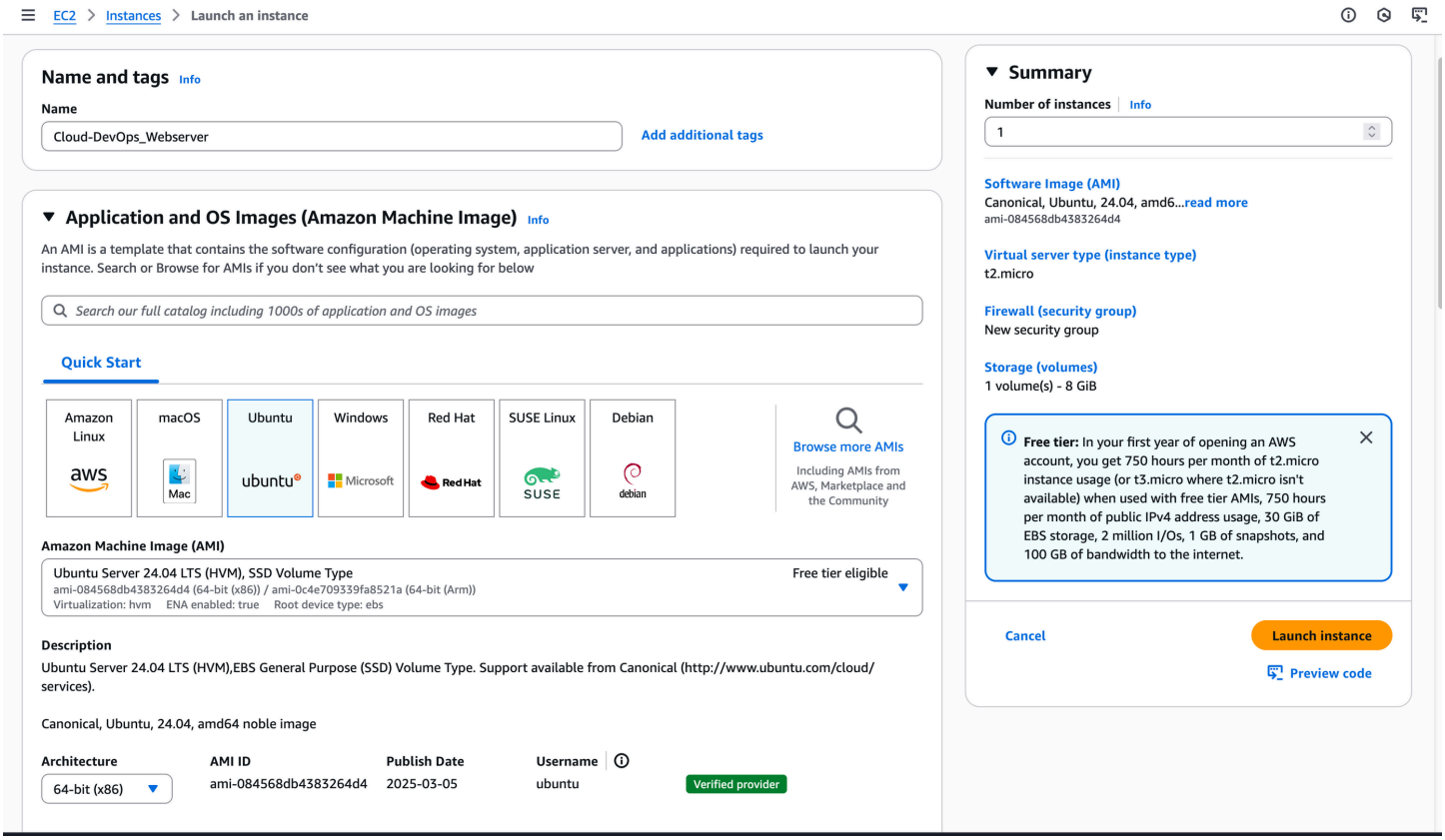
Step 1: Launching the EC2 Instance

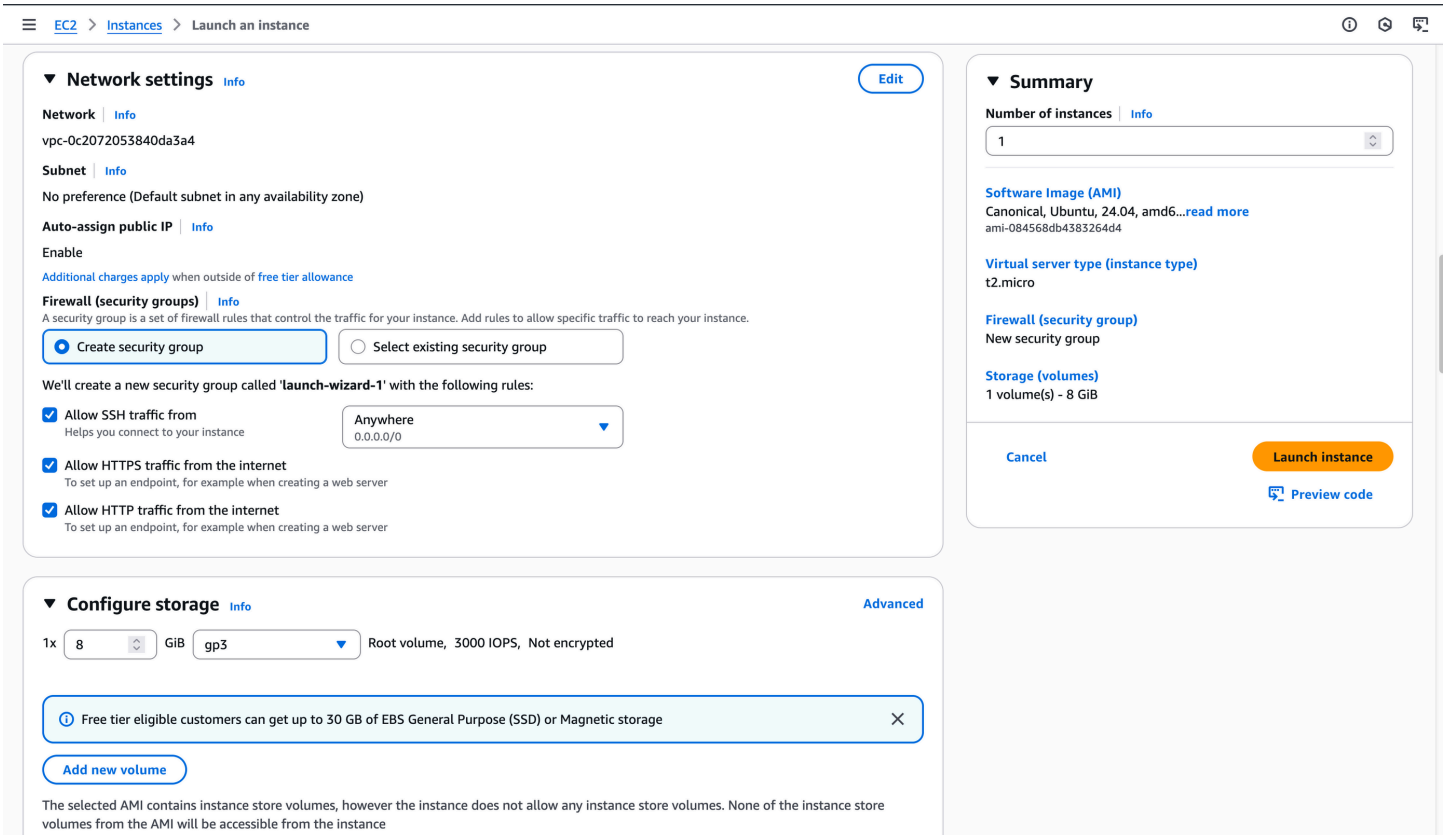
AWS EC2 (Elastic Compute Cloud) is the heart of cloud computing. It provides **scalable compute capacity**, and you can think of it as your virtual machine in the cloud. For our project, we're using a **t2.micro** instance — a great choice for learning and small applications, especially since it falls under the AWS Free Tier.

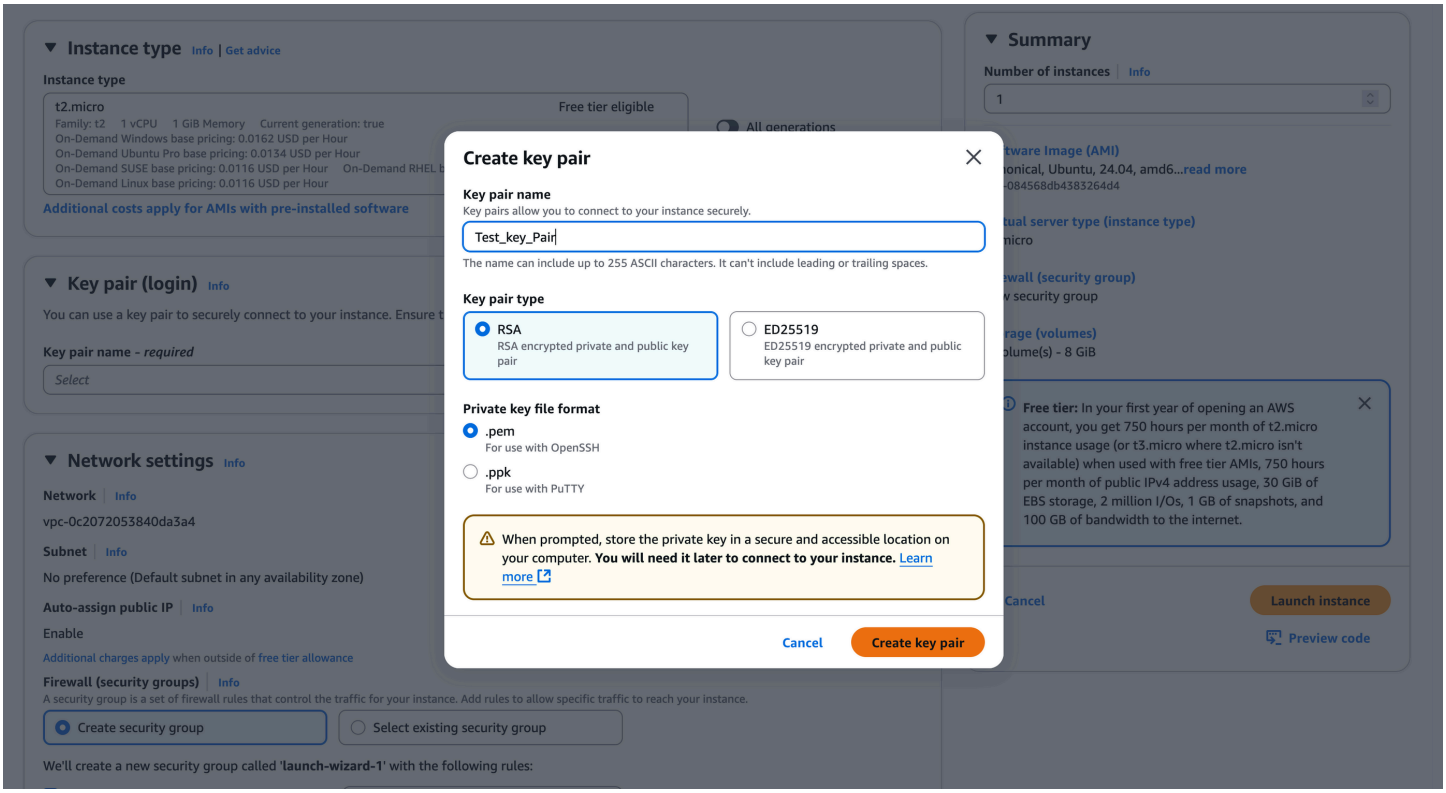
- Log into your **AWS Management Console** and navigate to **EC2**.
- Click **Launch Instance**, and select **Ubuntu** as the operating system.
- Choose **t2.micro** (because it's free within the AWS Free Tier).
- Set up a **Security Group** that allows traffic on:
  - **Port 22 (SSH)**: So we can access the server.
  - **Port 80 (HTTP)**: To serve our website.
  - **Port 443 (HTTPS)**: For encrypted traffic (more on this soon).
  - **Port 10000**: For Webmin (our server management tool).

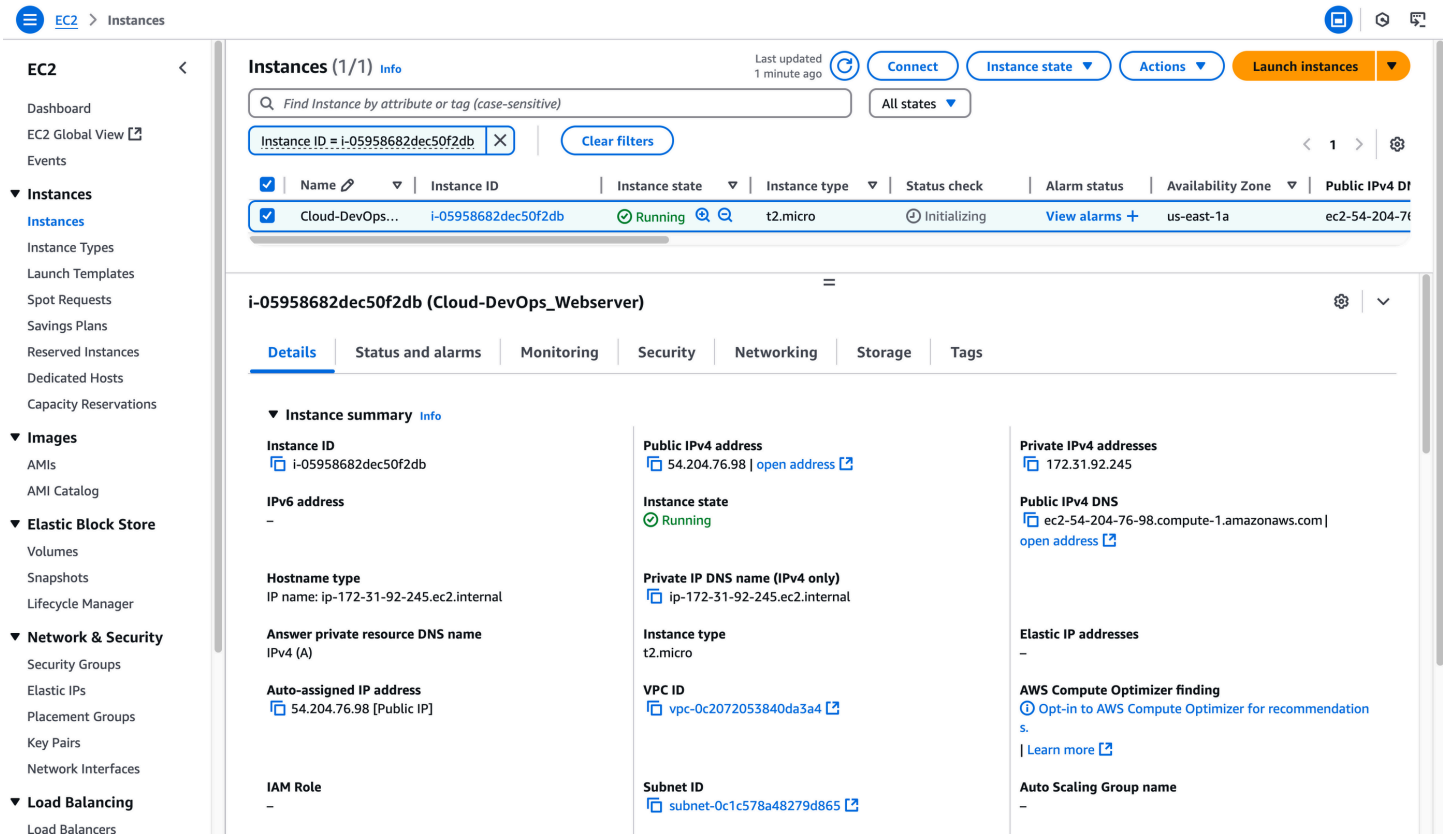
Why EC2?
AWS EC2 is widely used for its flexibility and scalability. You can easily resize instances as your needs grow. Whether you're building a small app or a full enterprise infrastructure, EC2 has you covered.

EC2 Instance Launch Settings







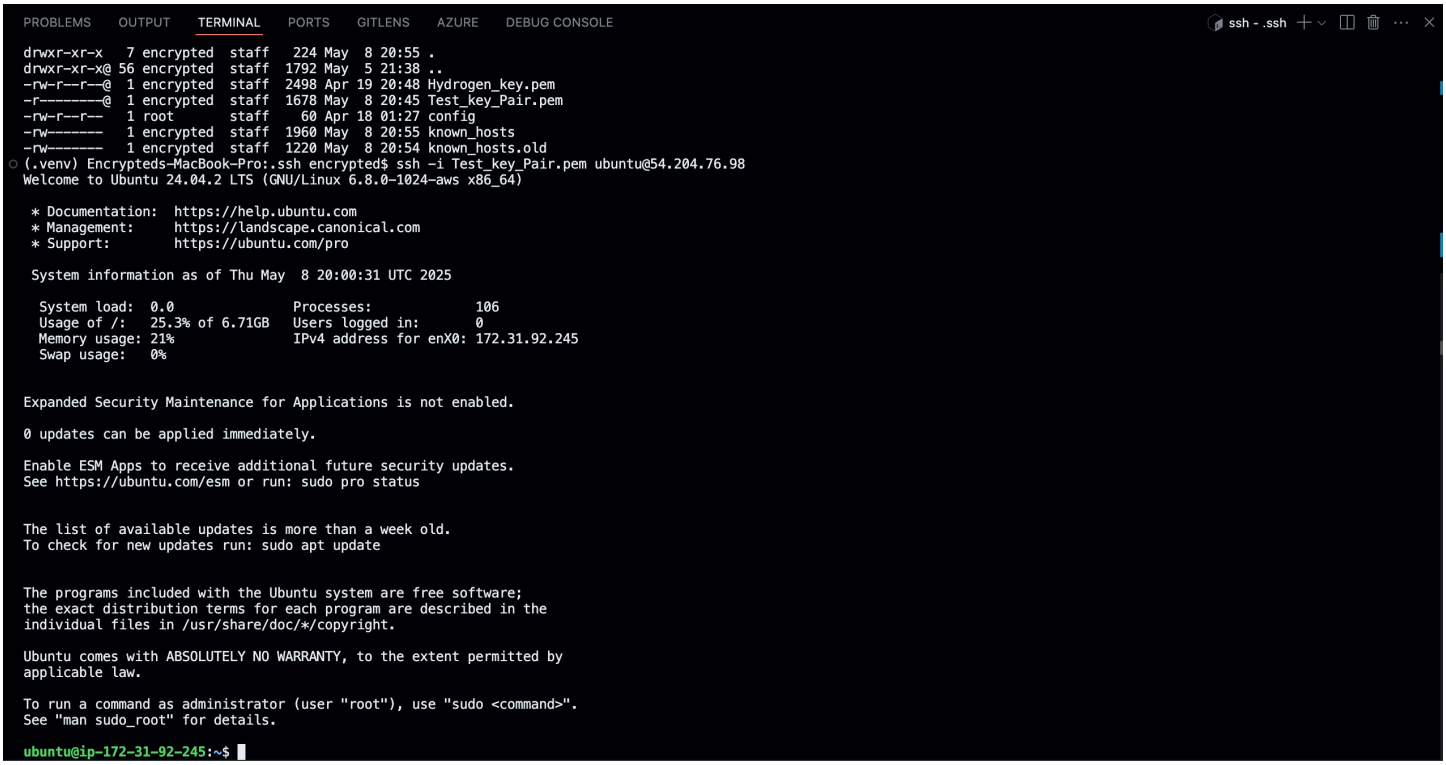


Step 2: Connecting via SSH

Once the instance is running, it's time to **SSH into** it. Think of SSH as your secure tunnel to your remote server. By connecting via SSH, you can issue commands and configure the server as if you were sitting in front of it.

ssh -i Test_key_Pair.pem ubuntu@your-ec2-ip

Here, the **Test_key_Pair.pem** is your SSH key that AWS provided. You'll need it to access your instance securely. Don't lose it!



Step 3: Installing Apache

Apache is one of the most popular **open-source web servers**. It's easy to configure, well-documented, and robust enough for most web applications.

Let's install Apache, enable it, and start it:

sudo apt update

sudo apt install -y apache2

sudo systemctl enable apache2

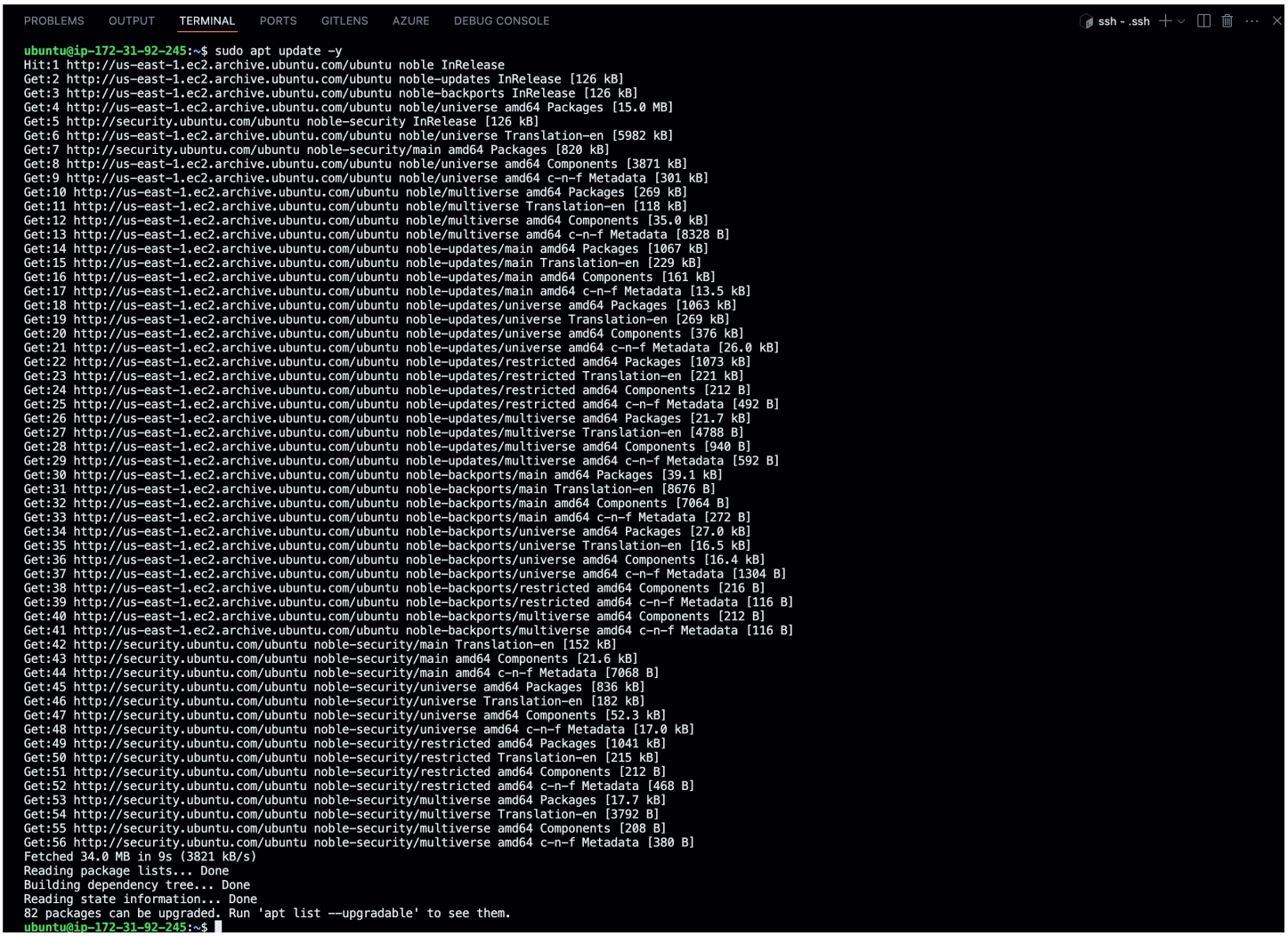
sudo systemctl start apache2

Now, Apache is up and running! Let's replace the default Apache landing page with something more personalized.

echo "<h1>🚀 CloudFormation Web Server</h1> This page was deployed automatically via CloudFormation. " > /var/www/html/index.html

Why Apache?
Apache is a classic choice for web hosting. While there are newer web servers (like Nginx), Apache remains a solid, reliable option for hosting websites, making it a great tool for this lab.

Apache Installation and HTML Page



```
PROBLEMS  OUTPUT  TERMINAL  PORTS  GITLENS  AZURE  DEBUG CONSOLE                ssh - .ssh

ubuntu@ip-172-31-92-245:~$ sudo apt update -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://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:5 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
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 [820 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]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f Metadata [8328 B]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1067 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [229 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [161 kB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f Metadata [13.5 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1063 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [269 kB]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [376 kB]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [26.0 kB]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [1073 kB]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [221 kB]
Get:24 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:25 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 c-n-f Metadata [492 B]
Get:26 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [21.7 kB]
Get:27 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [4788 B]
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:29 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f Metadata [592 B]
Get:30 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Packages [39.1 kB]
Get:31 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main Translation-en [8676 B]
Get:32 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7064 B]
Get:33 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 c-n-f Metadata [272 B]
Get:34 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [27.0 kB]
Get:35 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [16.5 kB]
Get:36 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [16.4 kB]
Get:37 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 c-n-f Metadata [1304 B]
Get:38 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:39 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 c-n-f Metadata [116 B]
Get:40 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:41 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 c-n-f Metadata [116 B]
Get:42 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [152 kB]
Get:43 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:44 http://security.ubuntu.com/ubuntu noble-security/main amd64 c-n-f Metadata [7068 B]
Get:45 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [836 kB]
Get:46 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [182 kB]
Get:47 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.3 kB]
Get:48 http://security.ubuntu.com/ubuntu noble-security/universe amd64 c-n-f Metadata [17.0 kB]
Get:49 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [1041 kB]
Get:50 http://security.ubuntu.com/ubuntu noble-security/restricted Translation-en [215 kB]
Get:51 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:52 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 c-n-f Metadata [468 B]
Get:53 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Packages [17.7 kB]
Get:54 http://security.ubuntu.com/ubuntu noble-security/multiverse Translation-en [3792 B]
Get:55 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Get:56 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 c-n-f Metadata [380 B]
Fetched 34.0 MB in 9s (3821 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
82 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-92-245:~$
```

```
ubuntu@ip-172-31-92-245:~$ 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 82 not upgraded.
Need to get 2084 kB of archives.
After this operation, 8094 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 [11.2 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 2.4.58-1ubuntu8.6 [1330 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-data all 2.4.58-1ubuntu8.6 [163 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-utils amd64 2.4.58-1ubuntu8.6 [97.2 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2 amd64 2.4.58-1ubuntu8.6 [90.2 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 ssl-cert all 1.1.2ubuntu1 [17.8 kB]
Fetched 2084 kB in 0s (38.2 MB/s)
Preconfiguring packages
```

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-92-245:~$ sudo systemctl enable apache2
Synchronizing state of apache2.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable apache2
ubuntu@ip-172-31-92-245:~$ sudo systemctl start apache2
ubuntu@ip-172-31-92-245:~$
```

ðŸš€ Welcome to My EC2 Web Server!

This page is custom-made and manually configured on AWS.

Step 4: Setting Up SSL with Let's Encrypt

We need to ensure our website is secure. **SSL certificates** encrypt the data between the server and the client, which is crucial for user privacy and trust.

To get an SSL certificate for free, we'll use **Let's Encrypt**, a non-profit that provides free certificates.

First, we install **Certbot**, a tool for obtaining and managing Let's Encrypt certificates:

sudo apt install -y certbot python3-certbot-apache

Now, let's request an SSL certificate for our domain:

sudo certbot --apache -d yourdomain.com -d www.yourdomain.com

Certbot automatically configures Apache to use SSL. It's as simple as that!

Why Let's Encrypt?
Let's Encrypt is a game-changer for website security. It provides free SSL certificates and automates the installation and renewal process. This has become a best practice in the industry.

Certbot SSL Installation


PROBLEMS
OUTPUT
TERMINAL
PORTS
GITLENS
AZURE
DEBUG CONSOLE
ssh - .ssh
ubuntu@ip-172-31-92-245:~$ sudo apt install software-properties-common -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
python3-software-properties
The following packages will be upgraded:
python3-software-properties software-properties-common
2 upgraded, 0 newly installed, 0 to remove and 80 not upgraded.
Need to get 44.3 kB of archives.
After this operation, 1024 B of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 software-properties-common all 0.99.49.2 [14.4 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 python3-software-properties all 0.99.49.2 [29.8 kB]
Fetched 44.3 kB in 0s (2533 kB/s)
(Reading database ... 71283 files and directories currently installed.)
Preparing to unpack .../software-properties-common_0.99.49.2_all.deb ...
Unpacking software-properties-common (0.99.49.2) over (0.99.49.1) ...
Preparing to unpack .../python3-software-properties_0.99.49.2_all.deb ...
Unpacking python3-software-properties (0.99.49.2) over (0.99.49.1) ...
Setting up python3-software-properties (0.99.49.2) ...
Setting up software-properties-common (0.99.49.2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for dbus (1.14.10-4ubuntu4.1) ...
Scanning processes...
Scanning linux images...
Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-92-245:~$ sudo add-apt-repository universe -y
Adding component(s) 'universe' to all repositories.
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 InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
ubuntu@ip-172-31-92-245:~$ sudo apt update -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 InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
80 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-92-245:~$ 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:
augeas-lenses libaugeas0 python3-acme python3-augeas python3-certbot python3-configargparse python3-icu python3-josepy python3-parsedatetime python3-rfc3339
Suggested packages:
augeas-doc python-certbot-doc python3-certbot-nginx augeas-tools python-acme-doc python-certbot-apache-doc
The following NEW packages will be installed:
augeas-lenses certbot libaugeas0 python3-acme python3-augeas python3-certbot python3-certbot-apache python3-configargparse python3-icu python3-josepy python3-parsedatetime
python3-rfc3339
0 upgraded, 12 newly installed, 0 to remove and 80 not upgraded.

```
ubuntu@ip-172-31-86-242:~$ sudo certbot --apache -d cloud-devops.xyz
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Enter email address (used for urgent renewal and security notices)
 (Enter 'c' to cancel):
Invalid email address: .


If you really want to skip this, you can run the client with
--register-unsafely-without-email but you will then be unable to receive notice
about impending expiration or revocation of your certificates or problems with
your Certbot installation that will lead to failure to renew.

Enter email address (used for urgent renewal and security notices)
 (Enter 'c' to cancel):

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Please read the Terms of Service at
https://letsencrypt.org/documents/LE-SA-v1.5-February-24-2025.pdf. You must
agree in order to register with the ACME server. Do you agree?
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
(Y)es/(N)o: Y

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Would you be willing, once your first certificate is successfully issued, to
share your email address with the Electronic Frontier Foundation, a founding
partner of the Let's Encrypt project and the non-profit organization that
develops Certbot? We'd like to send you email about our work encrypting the web,
EFF news, campaigns, and ways to support digital freedom.
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
(Y)es/(N)o: N
Account registered.
Requesting a certificate for cloud-devops.xyz

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/cloud-devops.xyz/fullchain.pem
Key is saved at:         /etc/letsencrypt/live/cloud-devops.xyz/privkey.pem
This certificate expires on 2025-08-06.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for cloud-devops.xyz to /etc/apache2/sites-available/000-default-le-ssl.conf
Congratulations! You have successfully enabled HTTPS on https://cloud-devops.xyz

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
If you like Certbot, please consider supporting our work by:
 * Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
 * Donating to EFF:                    https://eff.org/donate-le
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
ubuntu@ip-172-31-86-242:~$
```

```
PROBLEMS  OUTPUT  TERMINAL  PORTS  GITLENS  AZURE  DEBUG CONSOLE                ssh - .ssh

ubuntu@ip-172-31-92-245:~$ sudo certbot --apache
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Please enter the domain name(s) you would like on your certificate (comma and/or
space separated) (Enter 'c' to cancel): cloud-devops.xyz
Requesting a certificate for cloud-devops.xyz

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/cloud-devops.xyz/fullchain.pem
Key is saved at:         /etc/letsencrypt/live/cloud-devops.xyz/privkey.pem
This certificate expires on 2025-08-06.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for cloud-devops.xyz to /etc/apache2/sites-available/000-default-le-ssl.conf
Congratulations! You have successfully enabled HTTPS on https://cloud-devops.xyz

- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
If you like Certbot, please consider supporting our work by:
 * Donating to ISRG / Let's Encrypt:   https://letsencrypt.org/donate
 * Donating to EFF:                    https://eff.org/donate-le
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

Step 5: Auto-Renewing SSL Certificates

We don’t want to manually renew our certificates every 90 days. Instead, we set up a **cron job** to renew them automatically:

sudo crontab -e

Add the following line:

0 3 * * * certbot renew --quiet

Now, **Certbot** will automatically renew your SSL certificates every day at 3:00 AM.

Cron Job for SSL Renewal

```
ubuntu@ip-172-31-92-245:~$ sudo crontab -e
no crontab for root - using an empty one

Select an editor.  To change later, run 'select-editor'.
  1. /bin/nano        <---- easiest
  2. /usr/bin/vim.basic
  3. /usr/bin/vim.tiny
  4. /bin/ed

Choose 1-4 [1]: 1
crontab: installing new crontab
ubuntu@ip-172-31-92-245:~$ wget http://prdownloads.sourceforge.net/webadmin/webmin_2.105_all.deb
--2025-05-08 20:31:22--  http://prdownloads.sourceforge.net/webadmin/webmin_2.105_all.deb
Resolving prdownloads.sourceforge.net (prdownloads.sourceforge.net)... 104.18.12.149, 104.18.13.149, 2606:4700::6812:d95, ...
Connecting to prdownloads.sourceforge.net (prdownloads.sourceforge.net)|104.18.12.149|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: http://downloads.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb [following]
--2025-05-08 20:31:22--  http://downloads.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb
Resolving downloads.sourceforge.net (downloads.sourceforge.net)... 104.18.12.149, 104.18.13.149, 2606:4700::6812:c95, ...
Reusing existing connection to prdownloads.sourceforge.net:80.
HTTP request sent, awaiting response... 302 Found
Location: http://netactuate.dl.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb?viasf=1 [following]
--2025-05-08 20:31:22--  http://netactuate.dl.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb?viasf=1
Resolving netactuate.dl.sourceforge.net (netactuate.dl.sourceforge.net)... 104.225.3.66
Connecting to netactuate.dl.sourceforge.net (netactuate.dl.sourceforge.net)|104.225.3.66|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 33671982 (32M) [application/octet-stream]
Saving to: 'webmin_2.105_all.deb'

webmin_2.105_all.deb                      100%[=============================================================================================>]  32.11M  57.5MB/s    in 0.6s

2025-05-08 20:31:23 (57.5 MB/s) - 'webmin_2.105_all.deb' saved [33671982/33671982]

ubuntu@ip-172-31-92-245:~$ sudo apt install ./webmin_2.105_all.deb
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'webmin' instead of './webmin_2.105_all.deb'
The following additional packages will be installed:
  bzip2 libalgorithm-c3-perl libauthen-pam-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libclass-c3-perl libclass-c3-xs-perl libclass-data-inheritable-perl
  libclass-inspector-perl libclass-method-modifiers-perl libclass-singleton-perl libclass-xsaccessor-perl libdata-optlist-perl libdatetime-locale-perl libdatetime-perl
  libdatetime-timezone-perl libdevel-callchecker-perl libdevel-caller-perl libdevel-lexalias-perl libdevel-stacktrace-perl libdynaloader-functions-perl libencode-detect-perl
  libeval-closure-perl libexception-class-perl libfile-sharedir-perl libio-pty-perl libmodule-implementation-perl libmodule-runtime-perl libmro-compat-perl
  libnamespace-autoclean-perl libnamespace-clean-perl libnet-ssleay-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl
  libparams-util-perl libparams-validationcompiler-perl libreadonly-perl libref-util-perl libref-util-xs-perl librole-tiny-perl libspecio-perl libsub-exporter-perl
  libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libsub-quote-perl libtry-tiny-perl libvariable-magic-perl libxstring-perl lynx
  lynx-common mailcap perl-openssl-defaults unzip
Suggested packages:
  bzip2-doc libscalar-number-perl libtest-fatal-perl debhelper zip
The following NEW packages will be installed:
  bzip2 libalgorithm-c3-perl libauthen-pam-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libclass-c3-perl libclass-c3-xs-perl libclass-data-inheritable-perl
  libclass-inspector-perl libclass-method-modifiers-perl libclass-singleton-perl libclass-xsaccessor-perl libdata-optlist-perl libdatetime-locale-perl libdatetime-perl
  libdatetime-timezone-perl libdevel-callchecker-perl libdevel-caller-perl libdevel-lexalias-perl libdevel-stacktrace-perl libdynaloader-functions-perl libencode-detect-perl
  libeval-closure-perl libexception-class-perl libfile-sharedir-perl libio-pty-perl libmodule-implementation-perl libmodule-runtime-perl libmro-compat-perl
  libnamespace-autoclean-perl libnamespace-clean-perl libnet-ssleay-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl
  libparams-util-perl libparams-validationcompiler-perl libreadonly-perl libref-util-perl libref-util-xs-perl librole-tiny-perl libspecio-perl libsub-exporter-perl
  libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libsub-quote-perl libtry-tiny-perl libvariable-magic-perl libxstring-perl lynx
  lynx-common mailcap perl-openssl-defaults unzip webmin
0 upgraded, 58 newly installed, 0 to remove and 80 not upgraded.
Need to get 6433 kB/40.1 MB of archives.
```

```
PROBLEMS  OUTPUT  TERMINAL  PORTS  GITLENS  AZURE  DEBUG CONSOLE

  GNU nano 7.2                                                /tmp/crontab.GqVetn/crontab *
# Edit this file to introduce tasks to be run by cron.
#
# Each task to run has to be defined through a single line
# indicating with different fields when the task will be run
# and what command to run for the task
#
# To define the time you can provide concrete values for
# minute (m), hour (h), day of month (dom), month (mon),
# and day of week (dow) or use '*' in these fields (for 'any').
#
# Notice that tasks will be started based on the cron's system
# daemon's notion of time and timezones.
#
# Output of the crontab jobs (including errors) is sent through
# email to the user the crontab file belongs to (unless redirected).
#
# For example, you can run a backup of all your user accounts
# at 5 a.m every week with:
# 0 5 * * 1 tar -zcf /var/backups/home.tgz /home/
#
# For more information see the manual pages of crontab(5) and cron(8)
#
# m h  dom mon dow   command
0 0 * * * /usr/bin/certbot renew --quiet
```

🔧 Webmin Configuration

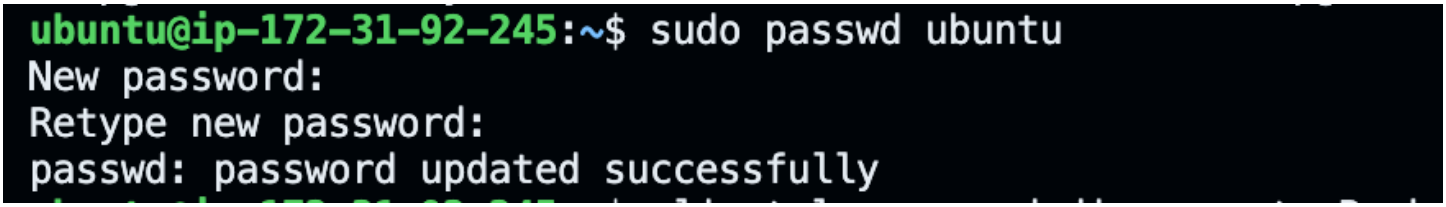
Before transitioning into automation, I took an extra step to enhance server management via a browser interface by configuring **Webmin**. This tool provides a rich GUI for system

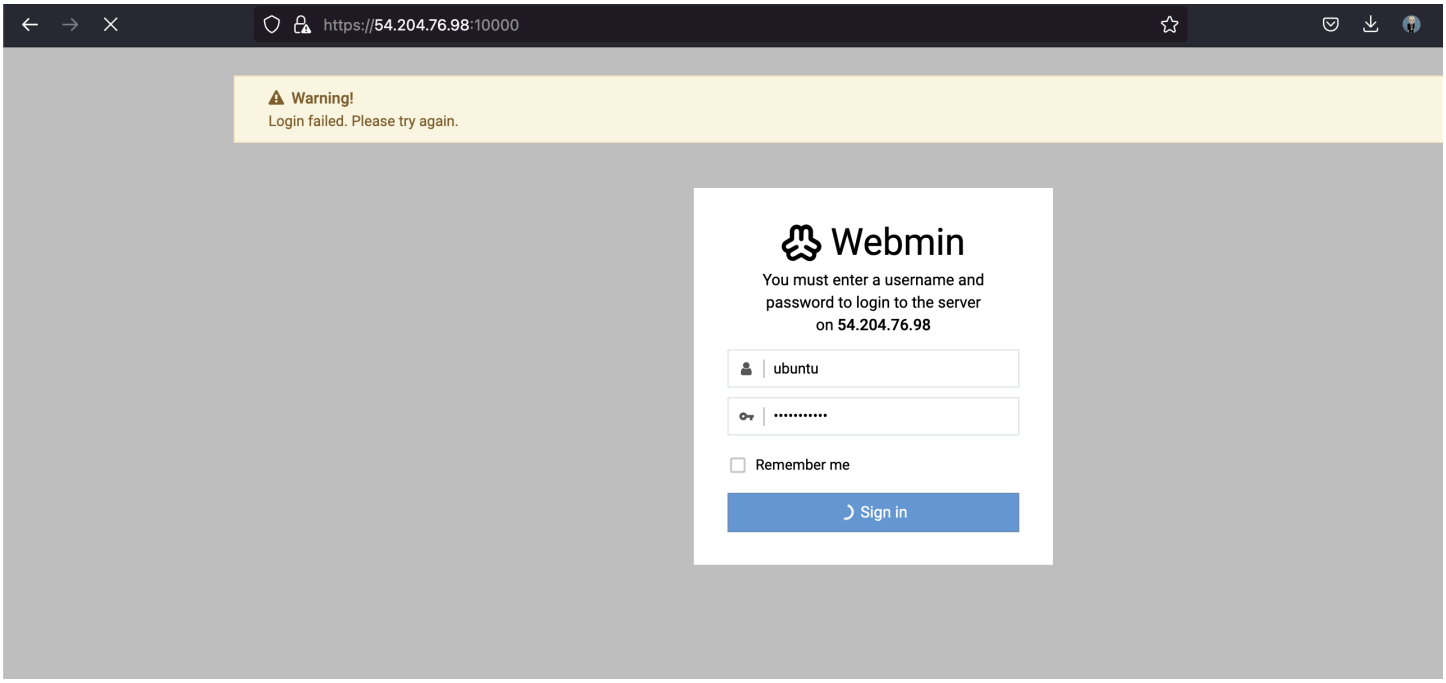
administration tasks like user management, package updates, and more.

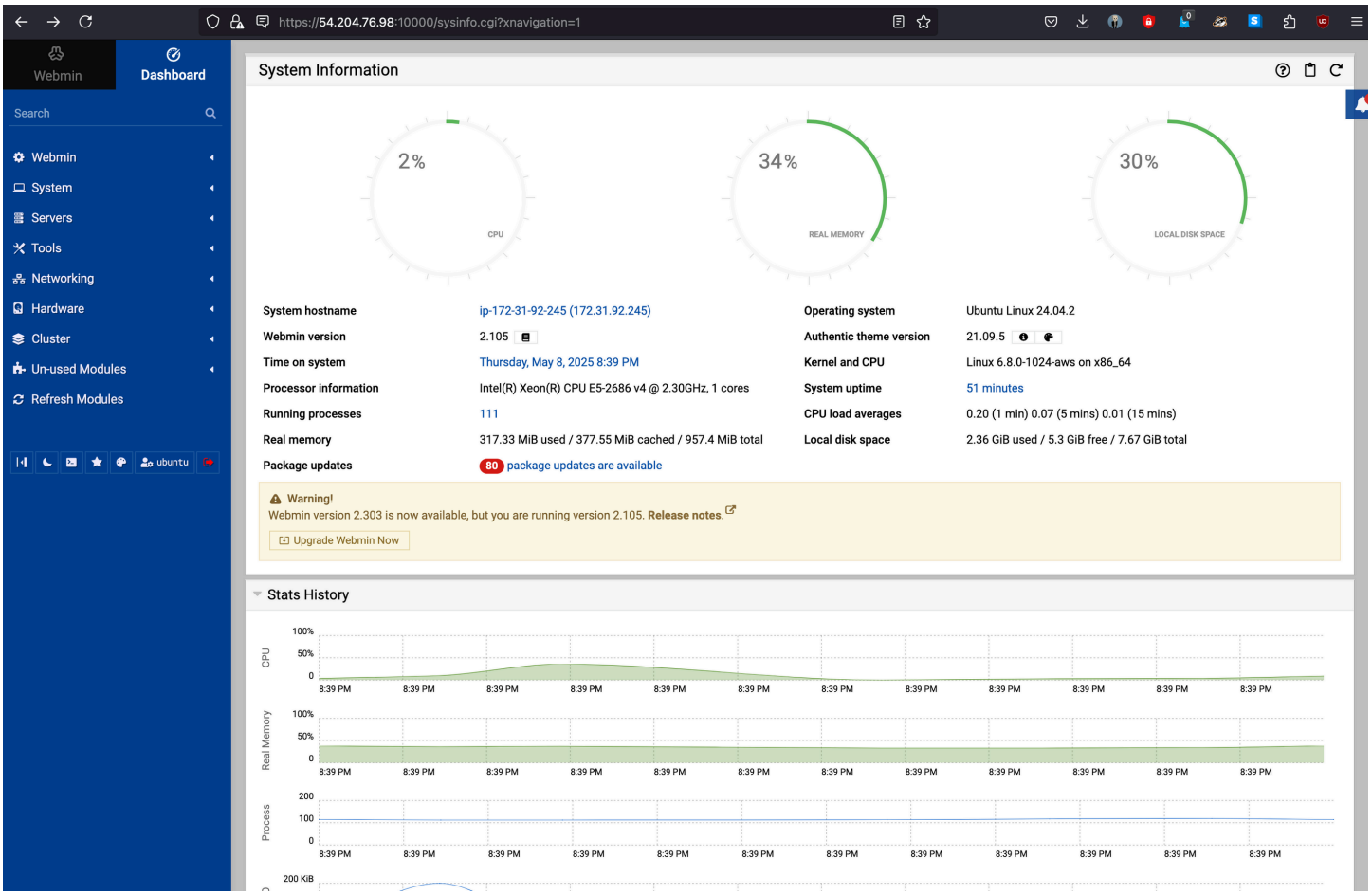
🛠️ **Steps Taken:**

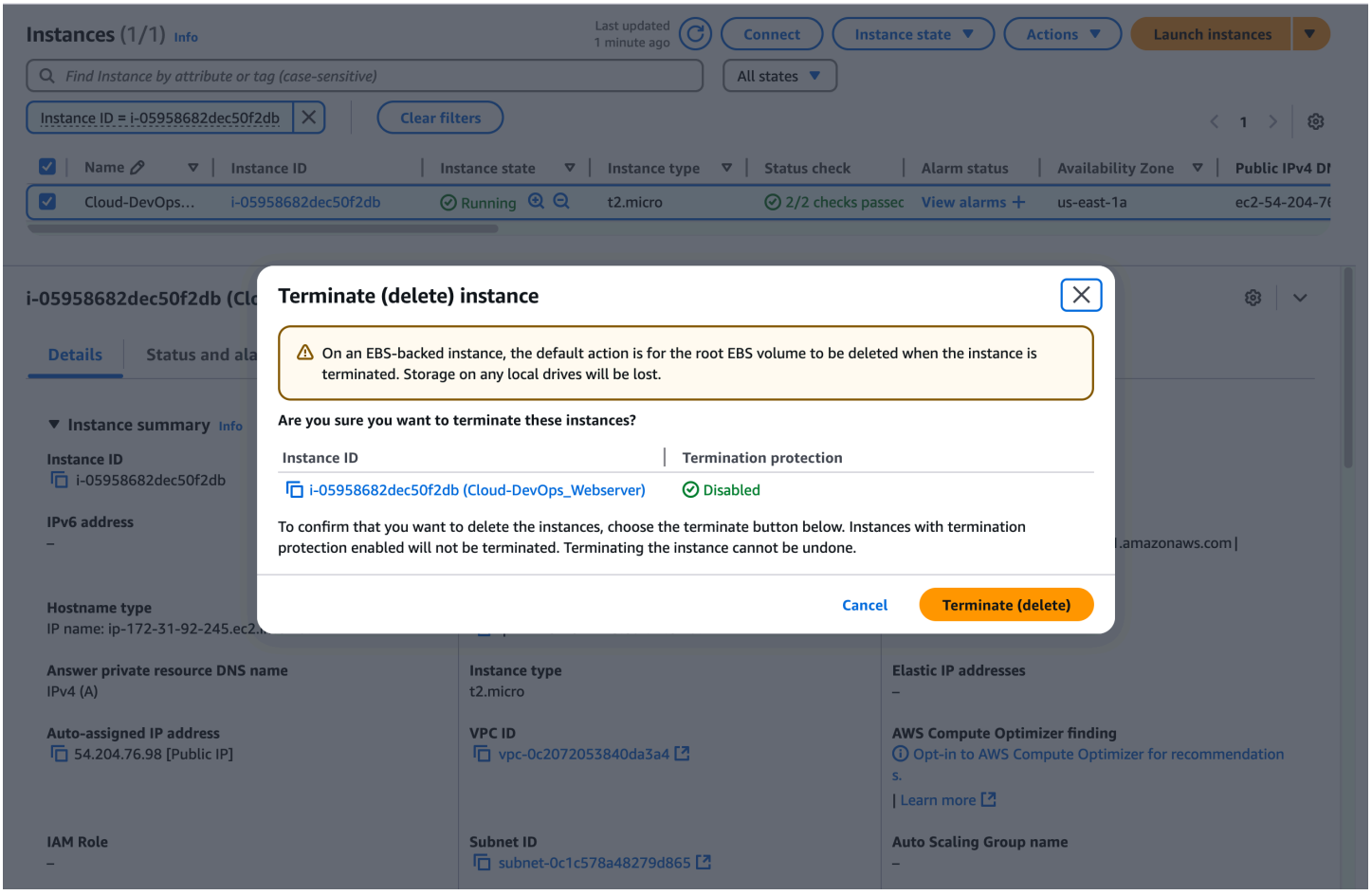
1. **Downloaded and installed Webmin** on the EC2 instance:
2. wget https://www.webmin.com/download/deb/webmin-current.deb
3. sudo dpkg -i webmin-current.deb
4. sudo apt --fix-broken install
5. **Resolved permission error** during the .deb install:
   - **Error encountered:**
   - N: Download is performed unsandboxed as root as file '/home/ubuntu/webmin_2.105_all.deb' couldn't be accessed by user '_apt'.
   - **Fix:** We manually moved the .deb file and reran the install with the proper privileges.
6. **Opened port 10000** for Webmin access:
7. **Accessed Webmin via browser** at:
8. https://your-server-ip:10000
9. **Logged in with:**
   - **Username:** ubuntu
   - **Password:** (set manually during the initial setup)

This gave me an alternative, secure way to manage the instance before proceeding with the CloudFormation setup in Part 2.









Part 2: Automating the Process with CloudFormation

Now that we've manually set up our server, let's make it repeatable. **AWS CloudFormation** allows us to automate the entire infrastructure deployment.

Step 1: CloudFormation Template Creation

CloudFormation is like the **blueprint** of your AWS resources. It allows you to define and provision infrastructure using code. Here's a basic YAML template that launches an EC2 instance, sets up Apache, and configures security groups.

AWSTemplateFormatVersion: '2010-09-09'

Description: > Launch an EC2 instance, install Apache web server, allow traffic on ports 80, 443, 22, and 10000 (Webmin), and display a custom HTML page.

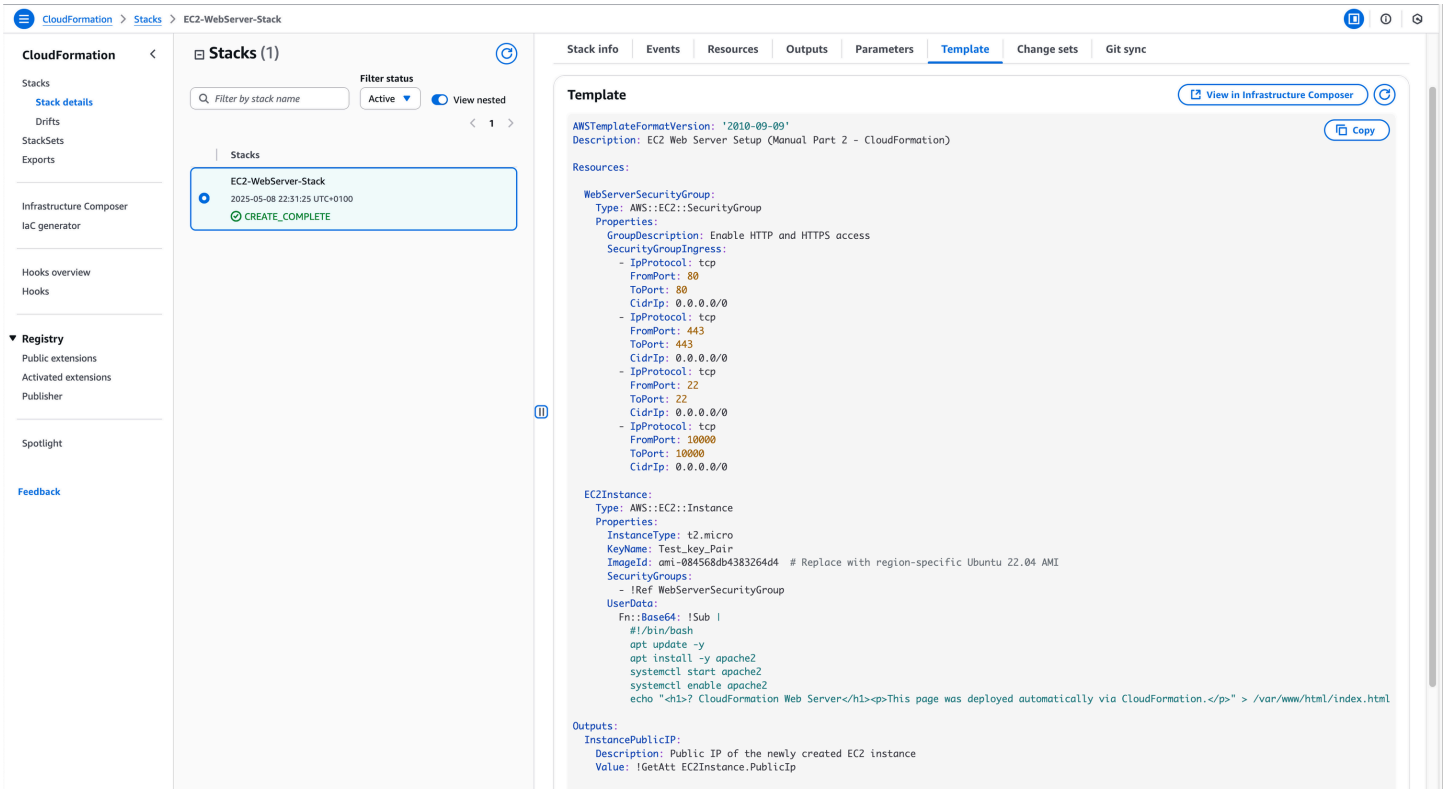
This template defines:

- An **EC2 instance** running **Ubuntu**.
- A **Security Group** allowing inbound traffic on the necessary ports.
- A **User Data** script that installs Apache and serves our custom page.

Why CloudFormation?

CloudFormation is perfect for **Infrastructure as Code (IaC)**. It allows you to define your infrastructure in YAML or JSON and deploy it with the click of a button, ensuring consistency across multiple environments.

CloudFormation Template Code



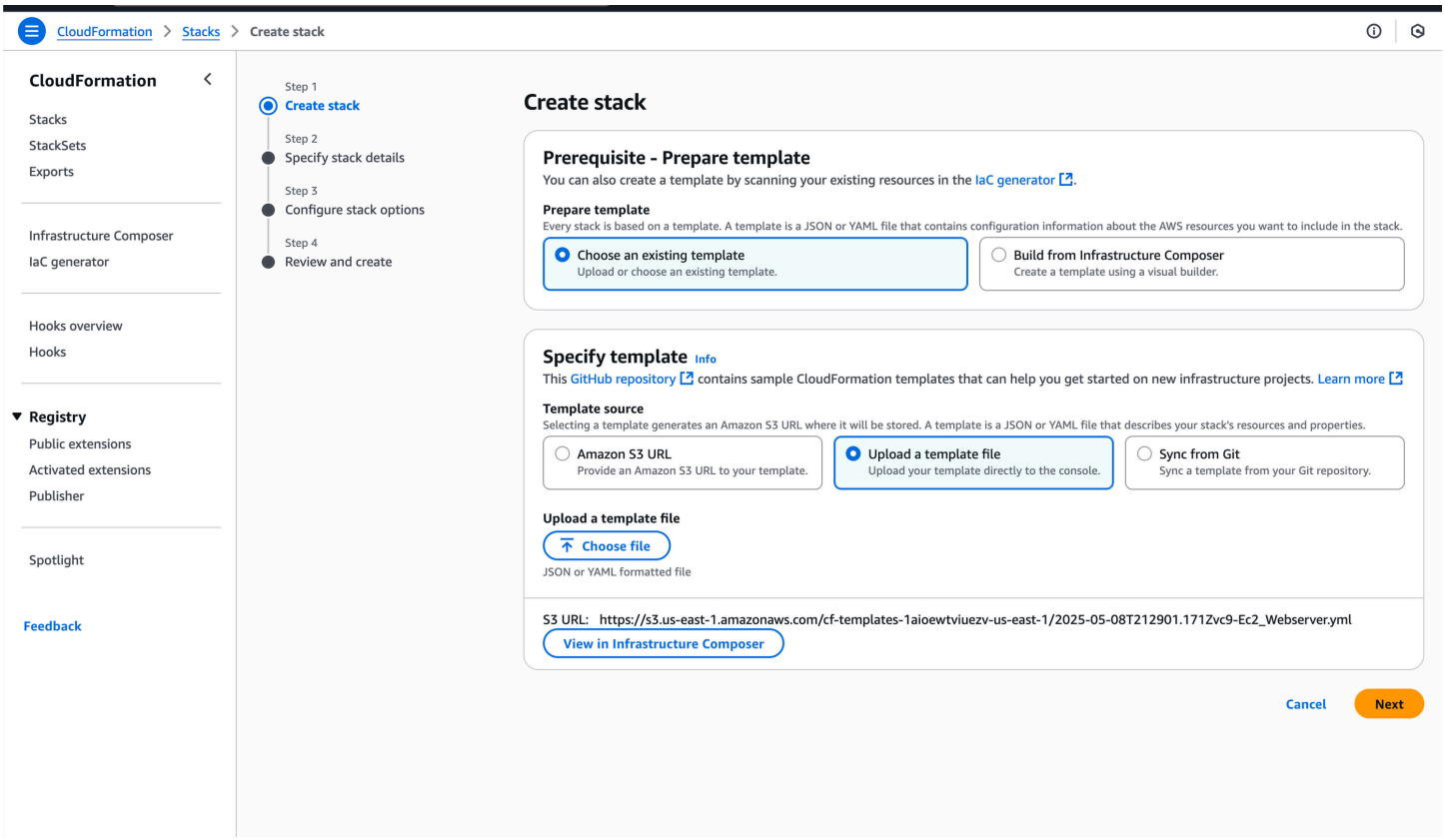
Step 2: Deploying the Stack

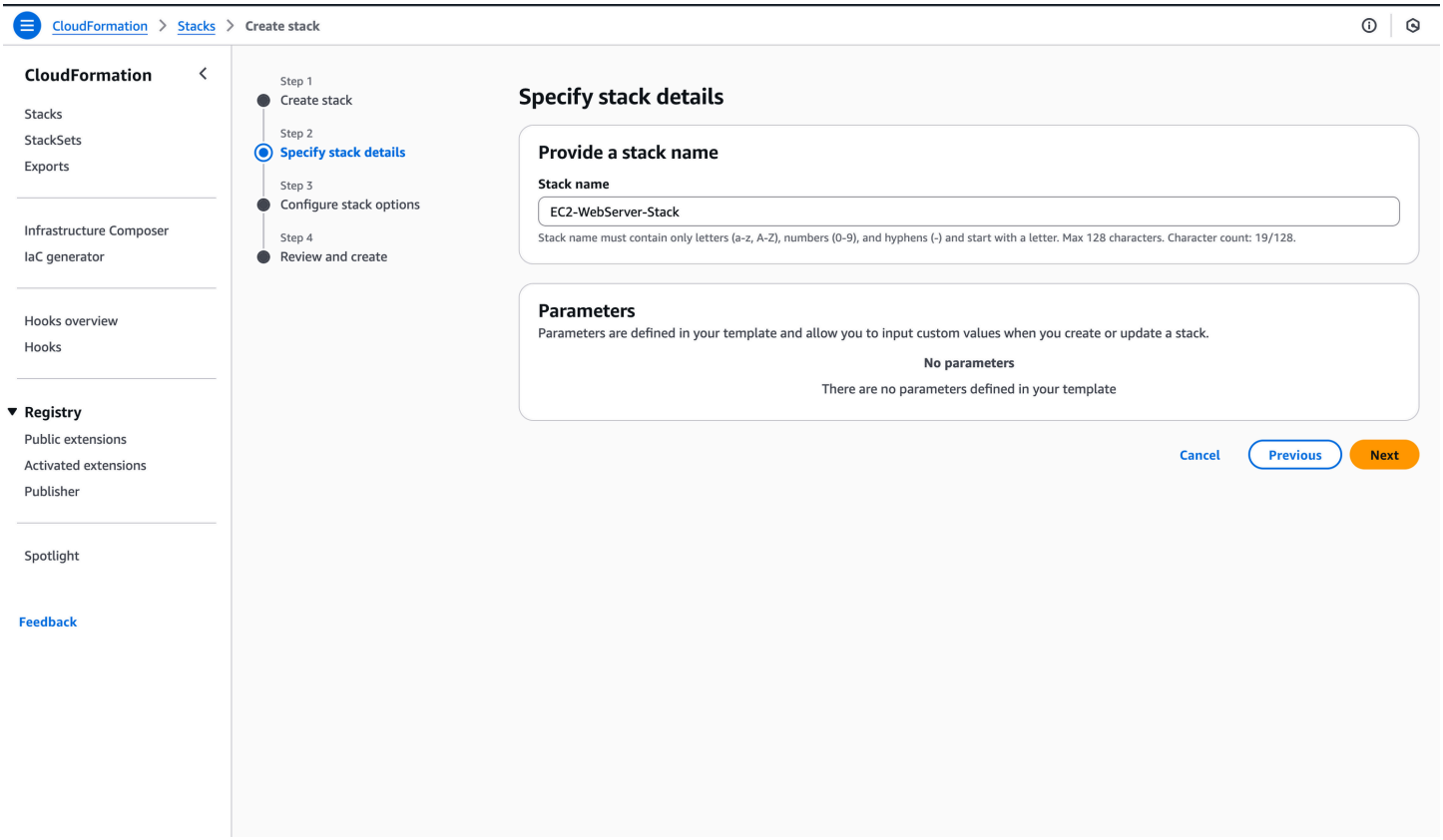
After writing the template, we deploy it as a **CloudFormation Stack**:

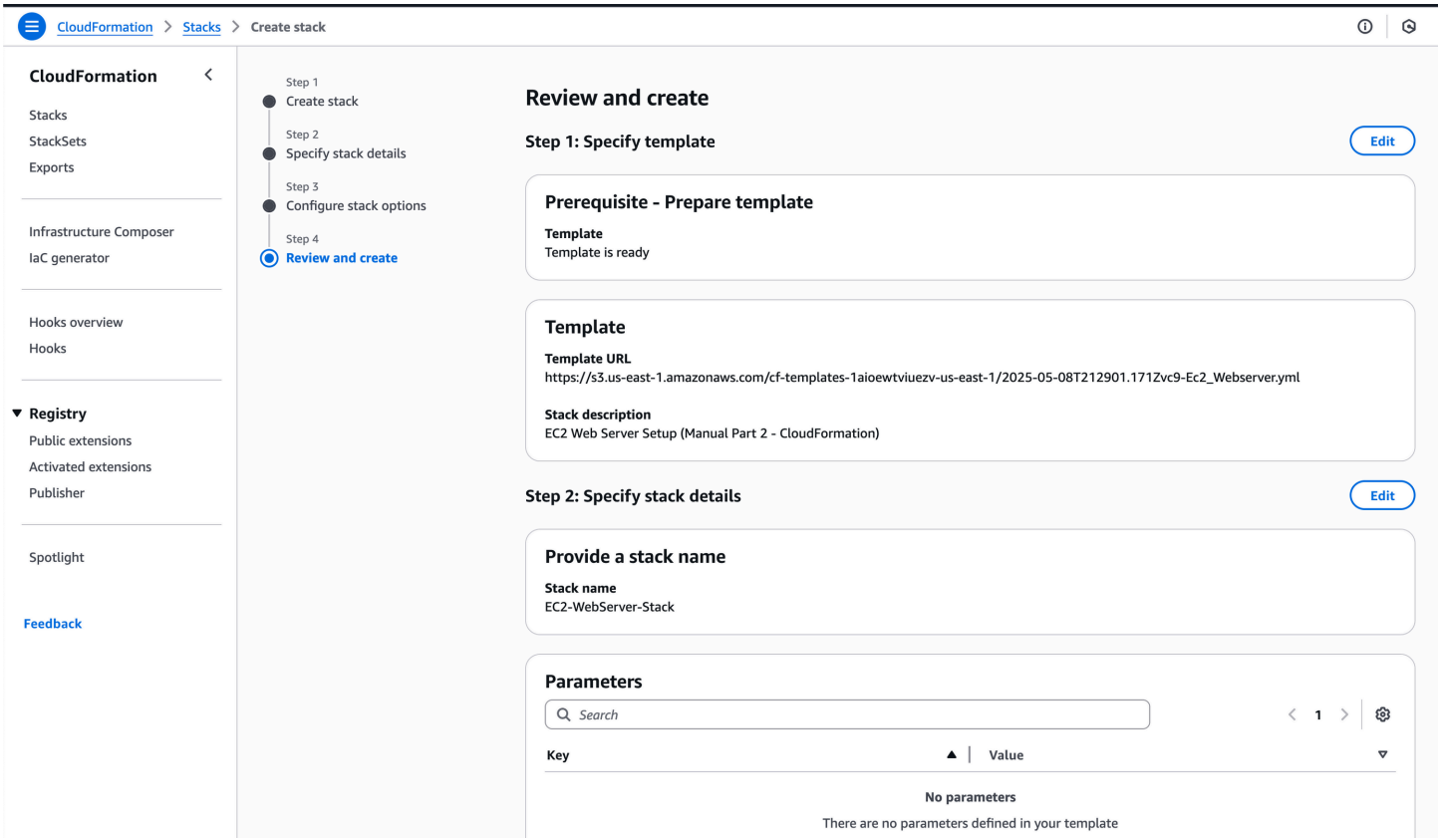
1. Go to **CloudFormation** and click **"Create Stack"**.
2. Upload or paste your CloudFormation YAML template.
3. Enter the **KeyName** parameter (your EC2 key pair name) and launch the stack.

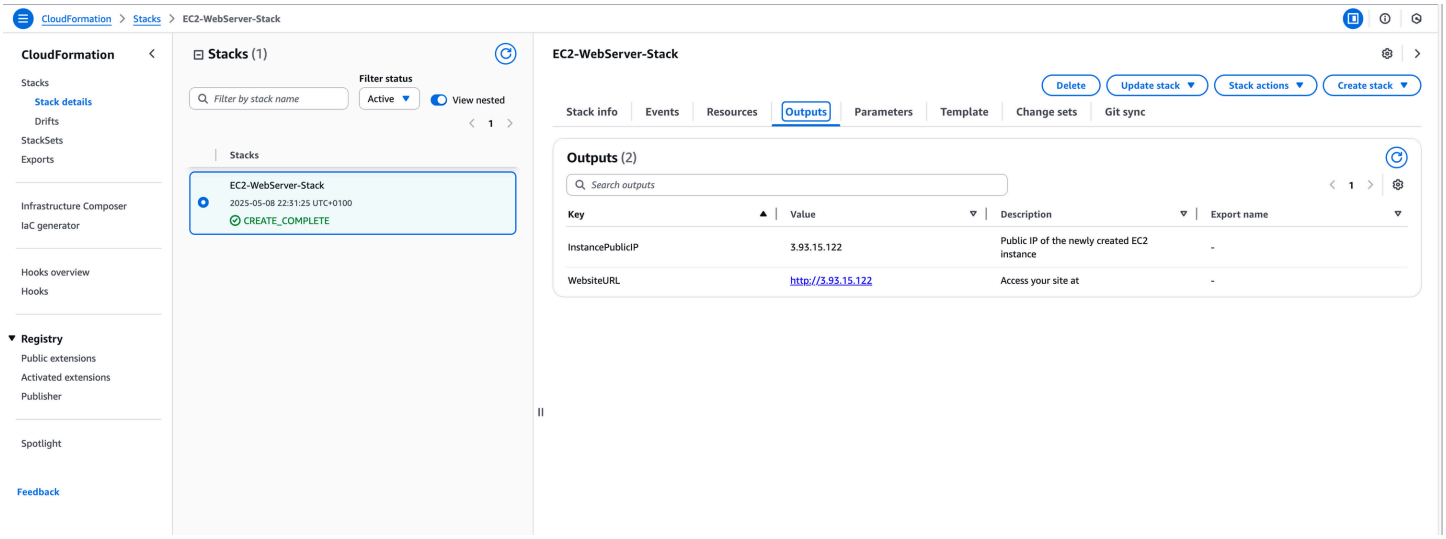
CloudFormation will then take care of everything, from creating the EC2 instance to setting up Apache.

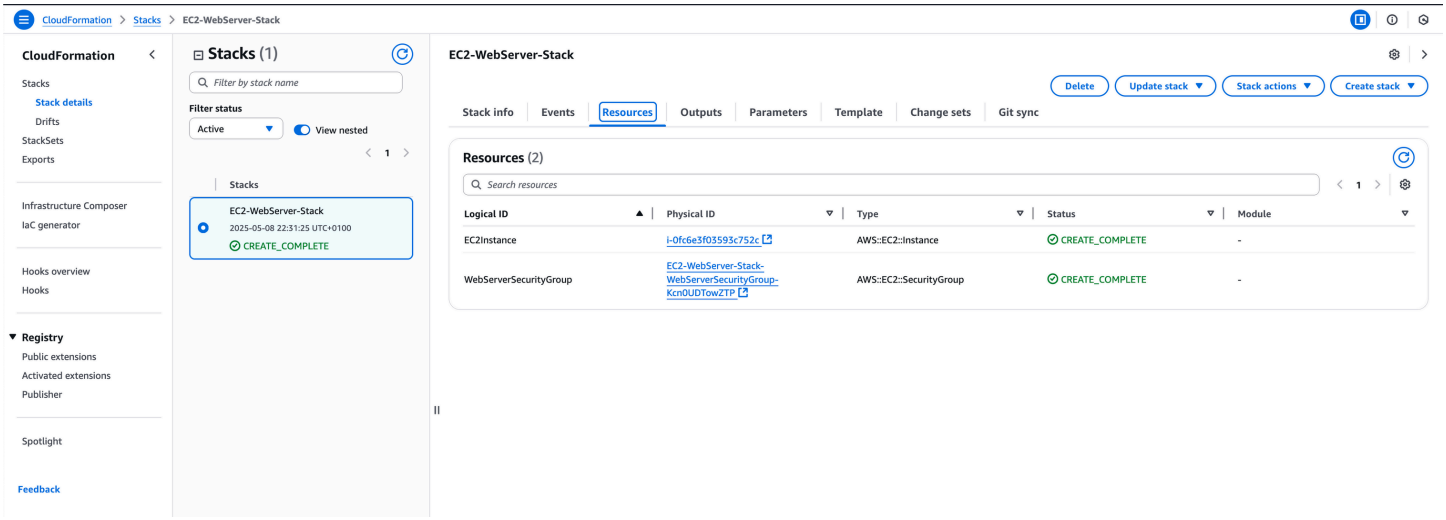
CloudFormation Stack Deployment




CloudFormation > Stacks > Create stack
CloudFormation
Stacks
StackSets
Exports
Infrastructure Composer
IaC generator
Hooks overview
Hooks
Registry
Public extensions
Activated extensions
Publisher
Spotlight
Feedback
Step 1
Create stack
Step 2
Specify stack details
Step 3
Configure stack options
Step 4
Review and create
Specify stack details
Provide a stack name
Stack name
EC2-WebServer-Stack
Stack name must contain only letters (a-z, A-Z), numbers (0-9), and hyphens (-) and start with a letter. Max 128 characters. Character count: 19/128.
Parameters
Parameters are defined in your template and allow you to input custom values when you create or update a stack.
No parameters
There are no parameters defined in your template
Cancel
Previous
Next


CloudFormation > Stacks > Create stack
CloudFormation
Stacks
StackSets
Exports
Infrastructure Composer
IaC generator
Hooks overview
Hooks
Registry
Public extensions
Activated extensions
Publisher
Spotlight
Feedback
Step 1
Create stack
Step 2
Specify stack details
Step 3
Configure stack options
Step 4
Review and create
Review and create
Step 1: Specify template
Edit
Prerequisite - Prepare template
Template
Template is ready
Template
Template URL
https://s3.us-east-1.amazonaws.com/cf-templates-1aioewtviuezv-us-east-1/2025-05-08T212901.171Zvc9-Ec2_Webserver.yml
Stack description
EC2 Web Server Setup (Manual Part 2 - CloudFormation)
Step 2: Specify stack details
Edit
Provide a stack name
Stack name
EC2-WebServer-Stack
Parameters
Search
1
Key
Value
No parameters
There are no parameters defined in your template





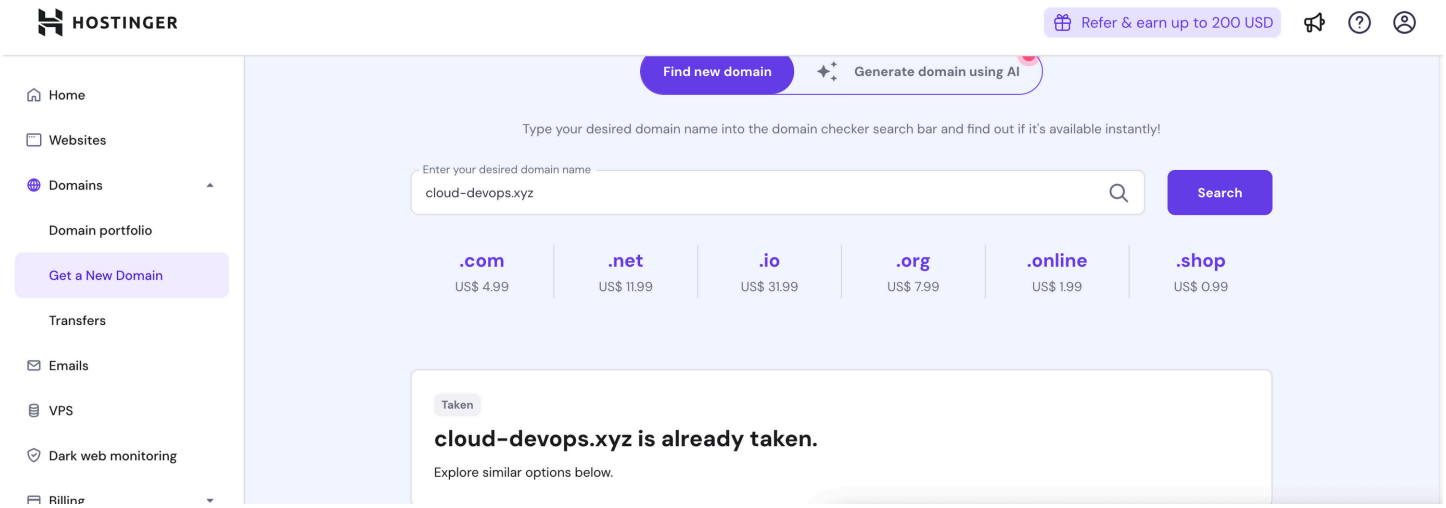
Part 3: Connect Domain and Install SSL

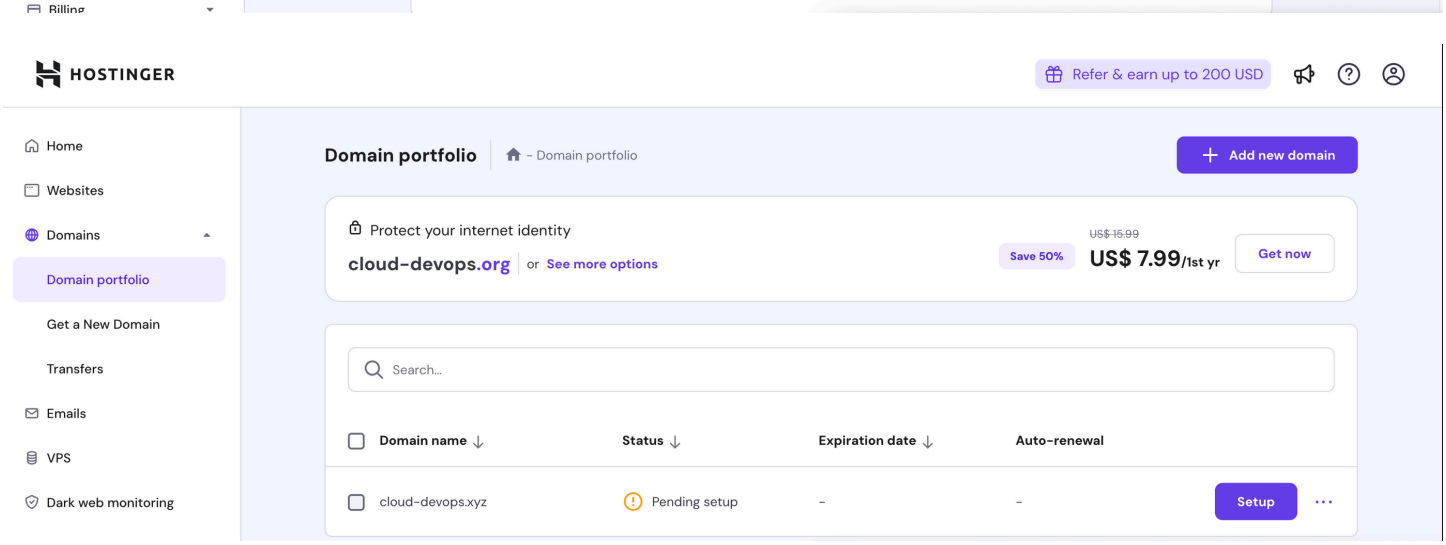
Once our server is up and running, we connect our **custom domain** and **install the SSL certificate**.

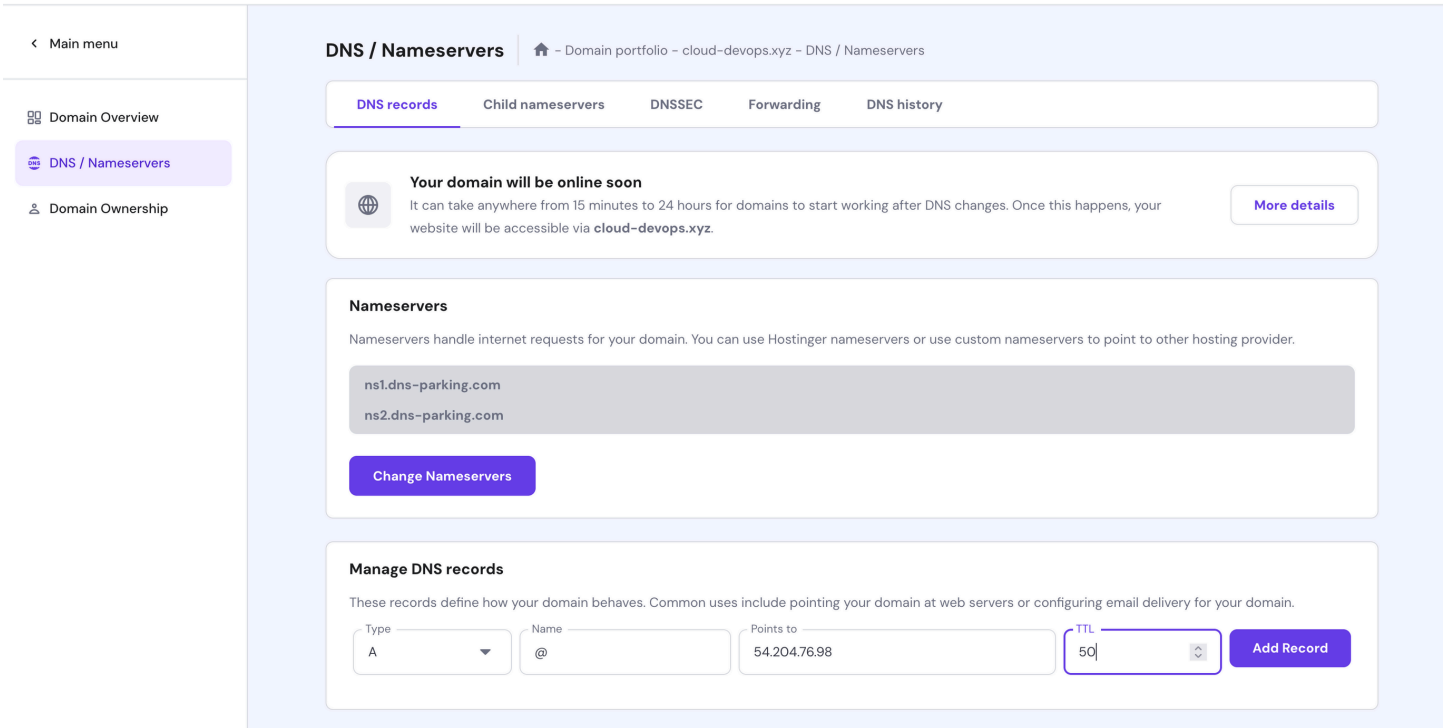
Step 1: Update DNS Settings

We use **Hostinger**, **GoDaddy**, or any other domain provider to create an **A record** that points to our EC2 instance's IP address.

Domain Registrar DNS Settings


HOSTINGER
Refer & earn up to 200 USD
Home
Websites
Domains
Domain portfolio
Get a New Domain
Transfers
Emails
VPS
Dark web monitoring
Billing
Find new domain
Generate domain using AI
Type your desired domain name into the domain checker search bar and find out if it's available instantly!
Enter your desired domain name
cloud-devops.xyz
Search
.com US$ 4.99
.net US$ 11.99
.io US$ 31.99
.org US$ 7.99
.online US$ 1.99
.shop US$ 0.99
Taken
cloud-devops.xyz is already taken.
Explore similar options below.


HOSTINGER
Refer & earn up to 200 USD
Home
Websites
Domains
Domain portfolio
Get a New Domain
Transfers
Emails
VPS
Dark web monitoring
Domain portfolio
- Domain portfolio
Add new domain
Protect your internet identity
cloud-devops.org
or See more options
Save 50%
US$ 15.99
US$ 7.99/1st yr
Get now
Search...
Domain name
Status
Expiration date
Auto-renewal
cloud-devops.xyz
Pending setup
-
-
Setup


Main menu
Domain Overview
DNS / Nameservers
Domain Ownership
DNS / Nameservers
- Domain portfolio - cloud-devops.xyz - DNS / Nameservers
DNS records
Child nameservers
DNSSEC
Forwarding
DNS history
Your domain will be online soon
It can take anywhere from 15 minutes to 24 hours for domains to start working after DNS changes. Once this happens, your website will be accessible via cloud-devops.xyz.
More details
Nameservers
Nameservers handle internet requests for your domain. You can use Hostinger nameservers or use custom nameservers to point to other hosting provider.
ns1.dns-parking.com
ns2.dns-parking.com
Change Nameservers
Manage DNS records
These records define how your domain behaves. Common uses include pointing your domain at web servers or configuring email delivery for your domain.
Type
A
Name
@
Points to
54.204.76.98
TTL
50
Add Record

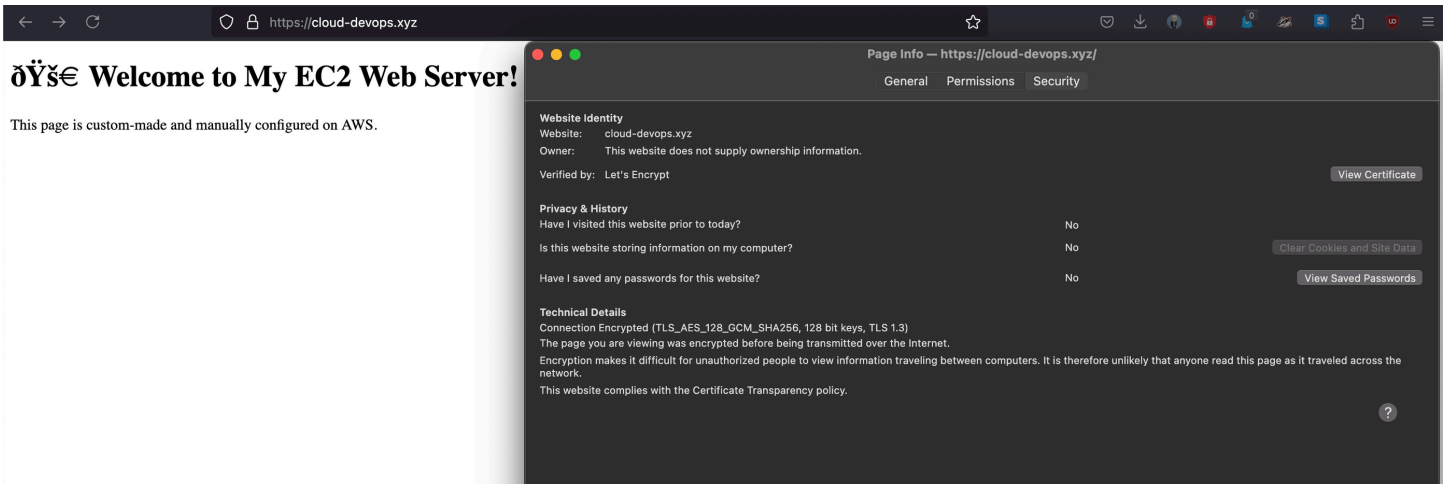
```
PROBLEMS  OUTPUT  TERMINAL  PORTS  GITLENS  AZURE  DEBUG CONSOLE

encrypted@Encrypteds-MacBook-Pro GitHub % nslookup cloud-devops.xyz
Server:         103.86.96.100
Address:        103.86.96.100#53

Non-authoritative answer:
Name:   cloud-devops.xyz
Address: 54.204.76.98

encrypted@Encrypteds-MacBook-Pro GitHub %
```

Step 2: Install SSL Using Certbot

We SSH into our EC2 instance and run the same **Certbot** commands as before to install SSL:

sudo certbot --apache -d yourdomain.com -d www.yourdomain.com

Now, our website is secure, and we have **HTTPS** running.



Conclusion: From Manual to Automated Deployment

With the manual setup, we learned how to configure and secure a web server step by step. Then, we took that knowledge and automated it using **AWS CloudFormation**, simplifying future deployments. By connecting a custom domain and adding SSL, we've built a **secure, scalable web server** hosted on AWS.

Next Steps

- Use this template as a base for scaling and adding more services.
- Explore integrating this setup with **AWS Elastic Load Balancers** or **Auto Scaling** for high availability.

You're absolutely right! Including the errors we encountered and how we resolved them adds a layer of authenticity to the tutorial. It provides real-world context and demonstrates problem-solving, which is invaluable for readers, especially those who might run into the same issues.

Troubleshooting Common Errors During Setup

No journey is without its challenges! During the manual setup, we encountered a few issues. Here's a breakdown of the errors, what caused them, and how we fixed them.

Error 1: "N: Download is performed unsandboxed as root as file '/home/ubuntu/webmin_2.105_all.deb' couldn't be accessed by user '_apt'. - pkgAcquire::Run (13: Permission denied)"

What Happened?
While trying to install **Webmin** using the .deb package on our EC2 instance, we encountered the following error:

N: Download is performed unsandboxed as root as file '/home/ubuntu/webmin_2.105_all.deb' couldn't be accessed by user '_apt'. - pkgAcquire::Run (13: Permission denied)

Cause of the Issue:
This error occurs when the **APT package manager** (which handles package installation on Ubuntu) is run as root and doesn't have proper permissions for downloading the .deb package. The system is essentially trying to download the file without proper access rights.

How We Resolved It:
To resolve the issue, we had to fix the permissions of the directory where the file was being downloaded. Here’s the fix we applied:

1. **Remove the partially downloaded file:**
   First, we cleaned up the directory and removed any partially downloaded files:
2. sudo rm -f /home/ubuntu/webmin_2.105_all.deb
3. **Install the package again with proper permissions:**
   We tried running the installation again, but with elevated privileges to ensure the download happened correctly:
4. sudo dpkg -i webmin_2.105_all.deb

Lesson Learned:
When installing packages via dpkg, it’s important to ensure that the user running the command has the right permissions to download and install files. Running as root (without the proper environment) can sometimes interfere with the process, so checking permissions and file locations is critical.

Terminal Output with the Error and Resolution

```
ubuntu@ip-172-31-92-245:~$ wget http://prdownloads.sourceforge.net/webadmin/webmin_2.105_all.deb
--2025-05-08 20:31:22--  http://prdownloads.sourceforge.net/webadmin/webmin_2.105_all.deb
Resolving prdownloads.sourceforge.net (prdownloads.sourceforge.net)... 104.18.12.149, 104.18.13.149, 2606:4700::6812:d95, ...
Connecting to prdownloads.sourceforge.net (prdownloads.sourceforge.net)|104.18.12.149|:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: http://downloads.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb [following]
--2025-05-08 20:31:22--  http://downloads.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb
Resolving downloads.sourceforge.net (downloads.sourceforge.net)... 104.18.12.149, 104.18.13.149, 2606:4700::6812:c95, ...
Reusing existing connection to prdownloads.sourceforge.net:80.
HTTP request sent, awaiting response... 302 Found
Location: http://netactuate.dl.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb?viasf=1 [following]
--2025-05-08 20:31:22--  http://netactuate.dl.sourceforge.net/project/webadmin/webmin/2.105/webmin_2.105_all.deb?viasf=1
Resolving netactuate.dl.sourceforge.net (netactuate.dl.sourceforge.net)... 104.225.3.66
Connecting to netactuate.dl.sourceforge.net (netactuate.dl.sourceforge.net)|104.225.3.66|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 33671982 (32M) [application/octet-stream]
Saving to: 'webmin_2.105_all.deb'

webmin_2.105_all.deb                      100%[=============================================================================================>]  32.11M  57.5MB/s    in 0.6s

2025-05-08 20:31:23 (57.5 MB/s) - 'webmin_2.105_all.deb' saved [33671982/33671982]

ubuntu@ip-172-31-92-245:~$ sudo apt install ./webmin_2.105_all.deb
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'webmin' instead of './webmin_2.105_all.deb'
The following additional packages will be installed:
  bzip2 libalgorithm-c3-perl libauthen-pam-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libclass-c3-perl libclass-c3-xs-perl libclass-data-inheritable-perl
  libclass-inspector-perl libclass-method-modifiers-perl libclass-singleton-perl libclass-xsaccessor-perl libdata-optlist-perl libdatetime-locale-perl libdatetime-perl
  libdatetime-timezone-perl libdevel-callchecker-perl libdevel-caller-perl libdevel-lexalias-perl libdevel-stacktrace-perl libdynaloader-functions-perl libencode-detect-perl
  libeval-closure-perl libexception-class-perl libfile-sharedir-perl libio-pty-perl libmodule-implementation-perl libmodule-runtime-perl libmro-compat-perl
  libnamespace-autoclean-perl libnamespace-clean-perl libnet-ssleay-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl
  libparams-util-perl libparams-validationcompiler-perl libreadonly-perl libref-util-perl libref-util-xs-perl librole-tiny-perl libspecio-perl libsub-exporter-perl
  libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libsub-quote-perl libtry-tiny-perl libvariable-magic-perl libxstring-perl lynx
  lynx-common mailcap perl-openssl-defaults unzip
Suggested packages:
  bzip2-doc libscalar-number-perl libtest-fatal-perl debhelper zip
The following NEW packages will be installed:
  bzip2 libalgorithm-c3-perl libauthen-pam-perl libb-hooks-endofscope-perl libb-hooks-op-check-perl libclass-c3-perl libclass-c3-xs-perl libclass-data-inheritable-perl
  libclass-inspector-perl libclass-method-modifiers-perl libclass-singleton-perl libclass-xsaccessor-perl libdata-optlist-perl libdatetime-locale-perl libdatetime-perl
  libdatetime-timezone-perl libdevel-callchecker-perl libdevel-caller-perl libdevel-lexalias-perl libdevel-stacktrace-perl libdynaloader-functions-perl libencode-detect-perl
  libeval-closure-perl libexception-class-perl libfile-sharedir-perl libio-pty-perl libmodule-implementation-perl libmodule-runtime-perl libmro-compat-perl
  libnamespace-autoclean-perl libnamespace-clean-perl libnet-ssleay-perl libpackage-stash-perl libpackage-stash-xs-perl libpadwalker-perl libparams-classify-perl
  libparams-util-perl libparams-validationcompiler-perl libreadonly-perl libref-util-perl libref-util-xs-perl librole-tiny-perl libspecio-perl libsub-exporter-perl
  libsub-exporter-progressive-perl libsub-identify-perl libsub-install-perl libsub-name-perl libsub-quote-perl libtry-tiny-perl libvariable-magic-perl libxstring-perl lynx
  lynx-common mailcap perl-openssl-defaults unzip webmin
0 upgraded, 58 newly installed, 0 to remove and 80 not upgraded.
Need to get 6433 kB/40.1 MB of archives.
```

```
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
N: Download is performed unsandboxed as root as file '/home/ubuntu/webmin_2.105_all.deb' couldn't be accessed by user '_apt'. - pkgAcquire::Run (13: Permission denied)
ubuntu@ip-172-31-92-245:~$ sudo mv ~/webmin_2.105_all.deb /tmp/
ubuntu@ip-172-31-92-245:~$ sudo apt install /tmp/webmin_2.105_all.deb
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'webmin' instead of '/tmp/webmin_2.105_all.deb'
webmin is already the newest version (2.105).
0 upgraded, 0 newly installed, 0 to remove and 80 not upgraded.
ubuntu@ip-172-31-92-245:~$
```

Error 2: "403 Forbidden" After Installing Apache

What Happened?

After setting up **Apache** and configuring the default page, we tried accessing the server via http://your-ec2-ip, but received a **403 Forbidden** error.

Cause of the Issue:

This error typically occurs when Apache is not configured to allow public access to the directory containing the web page, or if file permissions are not set correctly.

How We Resolved It:

Here's how we fixed the issue:

1. **Check the directory permissions:**
   We ensured that the directory /var/www/html where Apache serves files had the correct permissions:
2. sudo chown -R www-data:www-data /var/www/html
3. sudo chmod -R 755 /var/www/html
4. **Check the Apache configuration:**
   We confirmed that Apache's configuration allowed access to the public directory. We edited the 000-default.conf file to make sure it allowed traffic:

5. sudo nano /etc/apache2/sites-available/000-default.conf
6. Then, we checked that the following lines were set up correctly:
7. <Directory /var/www/html>
8. Options Indexes FollowSymLinks
9. AllowOverride All
10. Require all granted
11. </Directory>
12. **Restart Apache:**
    After modifying the configurations, we restarted Apache to apply the changes:
13. sudo systemctl restart apache2

Lesson Learned:
Permissions and Apache configurations are critical when setting up a web server. Always check both the filesystem permissions and the Apache configuration to ensure everything is set up correctly.

Error 3: "SSL Certificate Installation Failed"

What Happened?
After configuring **SSL with Let's Encrypt**, we encountered a **certificate installation failure**.

Cause of the Issue:
This happened because the **HTTP-01 challenge** used by Let's Encrypt requires the server to be accessible over **HTTP** (port 80). However, since we didn't have port 80 open in our security group at the time, the certificate installation failed.

How We Resolved It:
To fix this, we:

1. **Checked our Security Group:**
   We confirmed that **port 80** was open in the EC2 security group.
2. **Re-ran the Certbot Command:**
   After ensuring port 80 was open, we re-ran the Certbot command to obtain the SSL certificate:
3. sudo certbot --apache -d yourdomain.com
4. **Verified the SSL Certificate:**
   After Certbot successfully issued the certificate, we verified it by visiting the site via **https://yourdomain.com**.

Lesson Learned:
When using Let's Encrypt, it's essential to have port 80 open temporarily for the HTTP-01 challenge. Once the certificate is installed, we can secure the server with HTTPS, and traffic on port 80 can be redirected to HTTPS.

Conclusion: Troubleshooting Made Easy

Every server setup comes with its fair share of challenges, but with persistence and careful troubleshooting, the solutions are always within reach. By addressing the errors above, we were able to learn valuable lessons about permissions, Apache configurations, and SSL setup.

In the next part of this tutorial, we'll see how **CloudFormation** can streamline the process and eliminate the need for manual intervention. However, having a solid understanding of the manual steps ensures that when something goes wrong, we know exactly how to troubleshoot and resolve it.

What We've Learned

1. **Apache setup:** Configuring Apache correctly is vital, from ensuring permissions to modifying the configuration files.
2. **SSL certificates with Let's Encrypt:** Let's Encrypt makes SSL accessible and free, but we must ensure the server is properly accessible during the certificate issuance process.
3. **Troubleshooting:** Every error provides a learning opportunity. Fixing issues with the right approach not only resolves problems but also enhances your understanding of the tools.

Final Thoughts:

I hope this blog has made the process of setting up a web server on **AWS EC2** more approachable. Whether you're just starting or have some experience under your belt, there's always something new to learn in the world of cloud computing. Stay tuned for more tutorials as we continue to automate and scale our cloud infrastructure!