

Deploy Flask/Python Webb application in AWS Cloud

What is Flask?

Flask is a small and lightweight Python web framework that provides useful tools and features that make creating web applications in Python easier.

It gives developers flexibility and is a more accessible framework for new developers since you can build a web application quickly using only a single Python file.

What is Python?

Python is a computer programming language often used to build websites and software, automate tasks, and conduct data analysis.

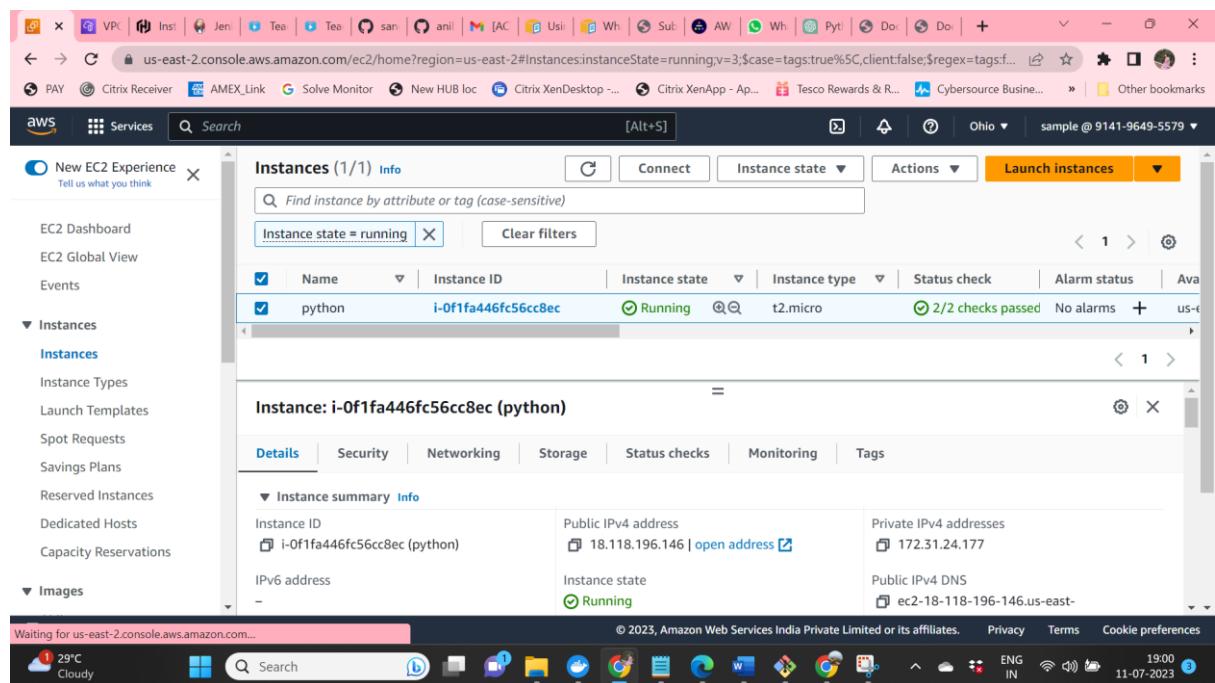
What is pip?

PIP is a package manager for Python packages, or modules.

Step - by - Step Procedure:

PART 1 – Execute python application along with pre-requisites and check the output in the browser

Create EC2 Instance (Ubuntu) with Default configuration (Free Tier).



Security Group --> Port no --> SSH - 22, HTTP - 80, TCP - 8080, 5000, 7000

The screenshot shows the AWS EC2 Instances page. A success message at the top says "Successfully terminated i-05e068970c3c0a738". The main table lists one instance:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status
python	i-0f1fa446fc56cc8ec	Running	t2.micro	Initializing	No alarms

Below the table, the "Instance: i-0f1fa446fc56cc8ec (python)" section shows the security group rules:

Name	Security group rule ID	Port range	Protocol	Source
-	sgr-0b2f41dca1e8b1751	7000	TCP	0.0.0.0/0
-	sgr-065b2e366f99bb3ad	8080	TCP	0.0.0.0/0
-	sgr-07776708a909f7147	80	TCP	0.0.0.0/0
-	sgr-0fc0d0957ab6973df	5000	TCP	0.0.0.0/0
-	sgr-056251dc7fec6f64	22	TCP	0.0.0.0/0

Connect to EC2 Instance by using GitBash.

```
$ ssh -i "ohio.pem" ubuntu@ec2-18-118-196-146.us-east-2.compute.amazonaws.com
The authenticity of host 'ec2-18-118-196-146.us-east-2.compute.amazonaws.com (18.118.196.146)' can't be established.
ED25519 key fingerprint is SHA256:edYXm0j9C1oIEX+iyvfr3Z2+tgz+8XH95CAEHnCE.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-18-118-196-146.us-east-2.compute.amazonaws.com' (ED25519) to the list of known hosts.
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1036-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 System information as of Tue Jul 11 12:57:10 UTC 2023

 System load:  0.06      Processes:          103
 Usage of /:   20.9% of 7.57GB   Users logged in:     0
 Memory usage: 23%
 Swap usage:   0%

 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

 The programs included with the Ubuntu system are free software;
 the exact distribution terms for each program are described in the
 individual files in /usr/share/doc/*/*copyright.

 Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
 applicable law.

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

ubuntu@ip-172-31-24-177:~$ |
```

Update your ubuntu machine.

- sudo apt update
- sudo apt-get full-upgrade -y

```
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

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

ubuntu@ip-172-31-24-177:~$ sudo apt-get update -y
Hit:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal InRelease [114 kB]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease [108 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease [114 kB]
Get:4 http://security.ubuntu.com/ubuntu focal-security InRelease [104 kB]
Get:5 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 Packages [8628 kB]
Get:6 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/universe Translation-en [5124 kB]
Get:7 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [2304 kB]
Get:8 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 c-n-f Metadata [265 kB]
Get:9 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/multiverse amd64 Packages [144 kB]
Get:10 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/multiverse Translation-en [104 kB]
Get:11 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/multiverse amd64 c-n-f Metadata [9136 kB]
Get:12 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2686 kB]
Get:13 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [448 kB]
Get:14 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [16.9 kB]
Get:15 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2089 kB]
Get:16 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [292 kB]
Get:17 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 c-n-f Metadata [548 kB]
Get:18 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1082 kB]
Get:19 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [258 kB]
Get:20 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [25.2 kB]
Get:21 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [31.5 kB]
Get:22 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse Translation-en [8032 kB]
Get:23 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 c-n-f Metadata [688 kB]
Get:24 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/main amd64 Packages [45.7 kB]
Get:25 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/main Translation-en [16.3 kB]
Get:26 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [366 kB]
Get:27 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/main amd64 c-n-f Metadata [1420 kB]
Get:28 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/restricted amd64 c-n-f Metadata [116 kB]
Get:29 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/universe amd64 Packages [25.0 kB]
Get:30 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/universe Translation-en [16.3 kB]
Get:31 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/universe amd64 c-n-f Metadata [880 kB]
Get:32 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-backports/multiverse amd64 c-n-f Metadata [116 kB]
Get:33 http://security.ubuntu.com/ubuntu focal-security/main amd64 c-n-f Metadata [13.0 kB]
```

```
Get:40 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 Packages [29.5 kB]
Get:41 http://security.ubuntu.com/ubuntu focal-security/multiverse Translation-en [6120 kB]
Get:42 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 c-n-f Metadata [620 kB]
Fetched 27.7 MB in 6s (4974 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-24-177:~$ sudo apt-get full-upgrade -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done

The following NEW packages will be installed:
  linux-aws-5.15-headers-5.15.0-1039 linux-headers-5.15.0-1039-aws linux-image-5.15.0-1039-aws linux-modules-5.15.0-1039-aws

The following packages will be upgraded:
  accountsservice apport bind9-dnsutils bind9-host bind9-libs bsutils ca-certificates cloud-init ec2-hibinit-agent fdisk fwupd fwupd-signed grub-common grub-pc grub-pc-bin grub2-common libabaccount libabcountservice0 libblkid1 libcap2 libfdisk1 libfwupd2 libfwupdplugin5 libglib2.0-0 libglib2.0-bin libglib2.0-data libipip4tc2 libipip6tc2 libmount1 libnurses6 libnursesw6 libnghttp2-14 libnss-systemd libpam-cap libpam-systemd libperl5.30 libpython3.8 libpython3.8-minimal libpython3.8-stdlib libsmartcols1 libssh-4 libtinfo5 libsystemd0 libtinfo6 libudev1 libuuuid1 libx11-6 libx11-data libxtables12 linux-aws
  linux-headers-aws linux-image-aws mokutil mount ncurses-base ncurses-bin ncurses-term openssl perl perl-base perl-modules-5.30 python3-apport python3-problem-report python3-requests python3.8 python3.8-minimal snapd systemd systemd-sysv systemd-timesyncd tzdata ubuntu-advantage-tools udev util-linux uuid-runtime vim vim-common vim-runtime vim-tiny xxd
82 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 130 kB of archives.
After this operation, 242 MB of additional disk space will be used.

Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 bsutils amd64 1:2.34-0.1ubuntu9.4 [63.0 kB]
0% [Working]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 curses-bin amd64 6.2-0ubuntu2.1 [172 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libperl5.30 amd64 5.30.0-9ubuntu0.4 [3959 kB]
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 perl amd64 5.30.0-9ubuntu0.4 [224 kB]
```

Install required packages/tools related for deployment project.

- sudo apt-get install python3-pip

```
root@ubuntu:~# sudo apt-get install python3-pip
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-9 dpkg-dev fakeroot g++ g++-9 gcc gcc-9 gcc-9-base libalgorithm-diff-perl
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan's libatomic libbinutils libc-dev-bin libc6-dev libcc1-0 libcrypt-dev libctf-nobfd0 libctf0 libdpkg-perl
  libexpat libfakeroot libfile-fcntllock-perl libgcc-9-dev libgomp1 libis122 liblbtm libasan0 libmpc3 libpython3.8-dev libquadmath0 libstdc++-9-dev
  libtsan0 libubsan1 linux-libc-dev make manpages-dev python3-pip-whl python3-dev python3-wheel python3.8-dev zlib1g-dev
Suggested packages:
  binutils-doc cpp-doc gcc-9-locales debian-keyring g++-multilib gcc-9-multilib gcc-multilib autoconf automake libtool flex bison gdb gcc-doc gcc-9-multilib
  libdpkg-doc libstdc++-9-doc make-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86_64-linux-gnu build-essential cpp cpp-9 dpkg-dev fakeroot g++ g++-9 gcc gcc-9 gcc-9-base libalgorithm-diff-perl
  libalgorithm-diff-xs-perl libalgorithm-merge-perl libasan's libatomic libbinutils libc-dev-bin libc6-dev libcc1-0 libcrypt-dev libctf-nobfd0 libctf0 libdpkg-perl
  libexpat libfakeroot libfile-fcntllock-perl libgcc-9-dev libgomp1 libis122 liblbtm libasan0 libmpc3 libpython3.8-dev libquadmath0 libstdc++-9-dev
  libtsan0 libubsan1 linux-libc-dev make manpages-dev python3-pip-whl python3-dev python3-wheel python3.8-dev zlib1g-dev
0 upgraded, 50 newly installed, 0 to remove and 0 not upgraded.
Need to get 2.28 MB of archives.
After this operation, 228 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils-common amd64 2.34-6ubuntu1.6 [207 kB]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libbinutils amd64 2.34-6ubuntu1.6 [473 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libctf-nobfd0 amd64 2.34-6ubuntu1.6 [74 kB]
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libquadmath0 amd64 2.34-6ubuntu1.6 [46.6 kB]
Get:5 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils-x86_64-linux-gnu amd64 2.34-6ubuntu1.6 [1613 kB]
Get:6 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 binutils amd64 2.34-6ubuntu1.6 [3376 kB]
Get:7 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libc-dev-bin amd64 2.31-0ubuntu9.9 [71.8 kB]
Get:8 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 linux-libc-dev amd64 4.4.0-13370 [3116 kB]
Get:9 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libgcc1 amd64 10.3.0-0ubuntu1.1 [102 kB]
Get:10 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libcc1-0 amd64 10.3.0-0ubuntu1.1 [102 kB]
Get:11 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libasan0 amd64 2.31-0ubuntu9.9 [2519 kB]
Get:12 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libasan1 amd64 9.4.0-1ubuntu0.9~ [2519 kB]
Get:13 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libis122 amd64 0.22.1-1 [592 kB]
Get:14 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libmpc3 amd64 1.1.0-1 [40.8 kB]
Get:15 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libgcc1 amd64 10.3.0-0ubuntu1.1 [137.6 kB]
Get:16 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libcc1-0 amd64 10.3.0-0ubuntu1.1 [48.8 kB]
Get:17 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libgomp1 amd64 10.3.0-0ubuntu1.1 [102 kB]
Get:18 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libatomic1 amd64 10.3.0-0ubuntu1.1 [26.2 kB]
Get:19 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libquadmath0 amd64 9.4.0-1ubuntu0.9~ [137.6 kB]
Get:20 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libtsan0 amd64 10.3.0-0ubuntu1.1 [835 kB]
Get:21 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libubsan0 amd64 10.3.0-0ubuntu1.1 [2009 kB]
Get:22 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libubsan1 amd64 10.3.0-0ubuntu1.1 [784 kB]
Get:23 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libquadmath0 amd64 10.3.0-0ubuntu1.1 [146 kB]
Get:24 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libgcc1 amd64 9.4.0-1ubuntu0.9~ [2539 kB]
Get:25 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libcc1-0 amd64 9.4.0-1ubuntu0.9~ [8274 kB]
Get:26 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 gcc amd64 9.4.0-1ubuntu0.9~ [5208 kB]
Get:27 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 g++ amd64 9.4.0-1ubuntu0.9~ [20.04.1 [1722 kB]
Get:28 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 libstdc++-9-dev amd64 9.4.0-1ubuntu0.9~ [20.04.1 [1722 kB]
```

Clone the project source code from GitHub to your machine (Ubuntu EC2 Instance)

- git clone <https://github.com/sangitagit/car-prediction--new.git>
- go to the source code directory cd car-prediction—new

Setup Virtual Environment in your Local machine

- sudo apt install python3-virtualenv
- virtualenv carpred

```
Processing triggers for man-db (2.9.1-1) ...
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  python3-appdirs python3-distlib python3-filelock
The following NEW packages will be installed:
  python3-appdirs python3-distlib python3-filelock python3-virtualenv
0 upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 19.9 kB of archives.
After this operation, 103.2 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 python3-appdirs all 1.4.3-2.1 [10.8 kB]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 python3-distlib all 0.3.0-1 [116 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/universe amd64 python3-filelock all 3.0.12-2 [7948 B]
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 python3-virtualenv all 20.0.17-lubuntu0.4 [62.7 kB]
Fetched 197 kB in 0s (3354 kB/s)
Selecting previously unselected package python3-appdirs.
(Reading database ... 96827 files and directories currently installed.)
Preparing to unpack .../python3-appdirs_1.4.3-2.1_all.deb ...
Unpacking python3-appdirs (1.4.3-2.1) ...
Selecting previously unselected package python3-distlib.
Preparing to unpack .../python3-distlib_0.3.0-1_all.deb ...
Unpacking python3-distlib (0.3.0-1) ...
Selecting previously unselected package python3-filelock.
Preparing to unpack .../python3-filelock_3.0.12-2_all.deb ...
Unpacking python3-filelock (3.0.12-2) ...
Selecting previously unselected package python3-virtualenv.
Preparing to unpack .../python3-virtualenv_20.0.17-lubuntu0.4_all.deb ...
Unpacking python3-virtualenv (20.0.17-lubuntu0.4) ...
Setting up python3-filelock (3.0.12-2) ...
Setting up python3-distlib (0.3.0-1) ...
Setting up python3-appdirs (1.4.3-2.1) ...
Setting up python3-virtualenv (20.0.17-lubuntu0.4) ...
Processing triggers for man-db (2.9.1-1) ...
ubuntu@ip-172-31-24-177:~/car-prediction--new$ |
```

Now, Activate Virtual Environment by using below command

- source carpred/bin/activate

Now, Install Requirements Packages

- pip install -r requirements.txt

```
ubuntu@ip-172-31-24-177:~/car-prediction--new$ virtualenv carpred
created virtual environment CPython3.8.10.final.0-64 in 261ms
  creator CPython3Posix(dest=/home/ubuntu/car-prediction--new/carpred, clear=False, global=False)
  seeder FromAppData(download=False, pip=True, setuptools=True, wheel=True, pkg_resources=True, via=copy, app_data_dir=/home/ubuntu/.local/share/virtualenv/seed-app-data/v1.0.1.deb)
an.1)
  activators BashActivator,CShellActivator,FishActivator,PowerShellActivator,PythonActivator,XonshActivator
ubuntu@ip-172-31-24-177:~/car-prediction--new$ source carpred/bin/activate
(carpred) ubuntu@ip-172-31-24-177:~/car-prediction--new$ pip install -r requirements.txt
Requirement already satisfied: click==8.1.3 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 1)) (8.1.3)
Requirement already satisfied: colorama==0.4.5 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 2)) (0.4.5)
Requirement already satisfied: Flask==2.2.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 3)) (2.2.2)
Requirement already satisfied: itsdangerous==2.1.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 4)) (2.1.2)
Requirement already satisfied: Jinja2==3.1.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 5)) (3.1.2)
Requirement already satisfied: joblib==1.1.0 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 6)) (1.1.0)
Requirement already satisfied: MarkupSafe==2.1.1 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 7)) (2.1.1)
Requirement already satisfied: numpy==1.23.3 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 8)) (1.23.3)
Requirement already satisfied: pandas==1.4.4 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 9)) (1.4.4)
Requirement already satisfied: python-dateutil==2.8.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 10)) (2.8.2)
Requirement already satisfied: pytz==2022.2.1 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 11)) (2022.2.1)
Requirement already satisfied: scikit-learn==1.1.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 12)) (1.1.2)
Requirement already satisfied: scipy==1.9.1 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 13)) (1.9.1)
Requirement already satisfied: six==1.16.0 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 14)) (1.16.0)
Requirement already satisfied: sklearn==0.0 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 15)) (0.0)
Requirement already satisfied: threadpoolctl==3.1.0 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 16)) (3.1.0)
Requirement already satisfied: werkzeug==2.2.2 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 17)) (2.2.2)
Requirement already satisfied: gunicorn==20.0.4 in ./carpred/lib/python3.8/site-packages (from -r requirements.txt (line 18)) (20.0.4)
Requirement already satisfied: importlib-metadata==3.6.0; python_version < "3.10" in ./carpred/lib/python3.8/site-packages (from Flask==2.2.2->-r requirements.txt (line 3)) (6.8.0)
Requirement already satisfied: setuptools==3.0 in ./carpred/lib/python3.8/site-packages (from gunicorn==20.0.4->-r requirements.txt (line 18)) (44.0.0)
Requirement already satisfied: zipp==0.5 in ./carpred/lib/python3.8/site-packages (from importlib-metadata==3.6.0; python_version < "3.10"->Flask==2.2.2->-r requirements.txt (line 3)) (3.16.0)
(carpred) ubuntu@ip-172-31-24-177:~/car-prediction--new$
```

Run Flask Server → python app.py

Here, after running python app.py, it will generate Localhost IP Address. We can't access web app with that IP address

Then, here we wants to edit the file app.py with some details

- sudo vi app.py
- app.run(host='0.0.0.0', port=7000)

```
from flask import Flask, render_template, url_for, request, redirect
import numpy as np
import pandas as pd
import joblib
import pickle

app = Flask(__name__)

model = joblib.load('model.pkl')
onehot = joblib.load('OneHotEncoder.joblib')

@app.route('/')
@app.route('/home')
def main():
    return render_template("home.html")

@app.route('/predict', methods=['POST'])
def predict():
    int_features = [x for x in request.form.values()]
    c = ["Fuel_Type", "Seller_Type", "Transmission", "Present_Price", "Kms_Driven", "Owner", "No_year"]
    df = pd.DataFrame(int_features, columns=c)
    l = onehot.transform(df)
    l = onehot.get_feature_names_out()
    t = pd.DataFrame(l, columns=c)
    t2 = df.iloc[:, :3]
    final = pd.concat([t2, t], axis=1)
    result = model.predict(final)
    print("The Result is : ", result)

    print(int_features)
    return render_template("home.html", prediction_text="Car Price is : {}".format(result))

if __name__ == "__main__":
    app.debug=True
    app.run(host = '0.0.0.0', port =7000)
```

Now, again run the flask server by using below command

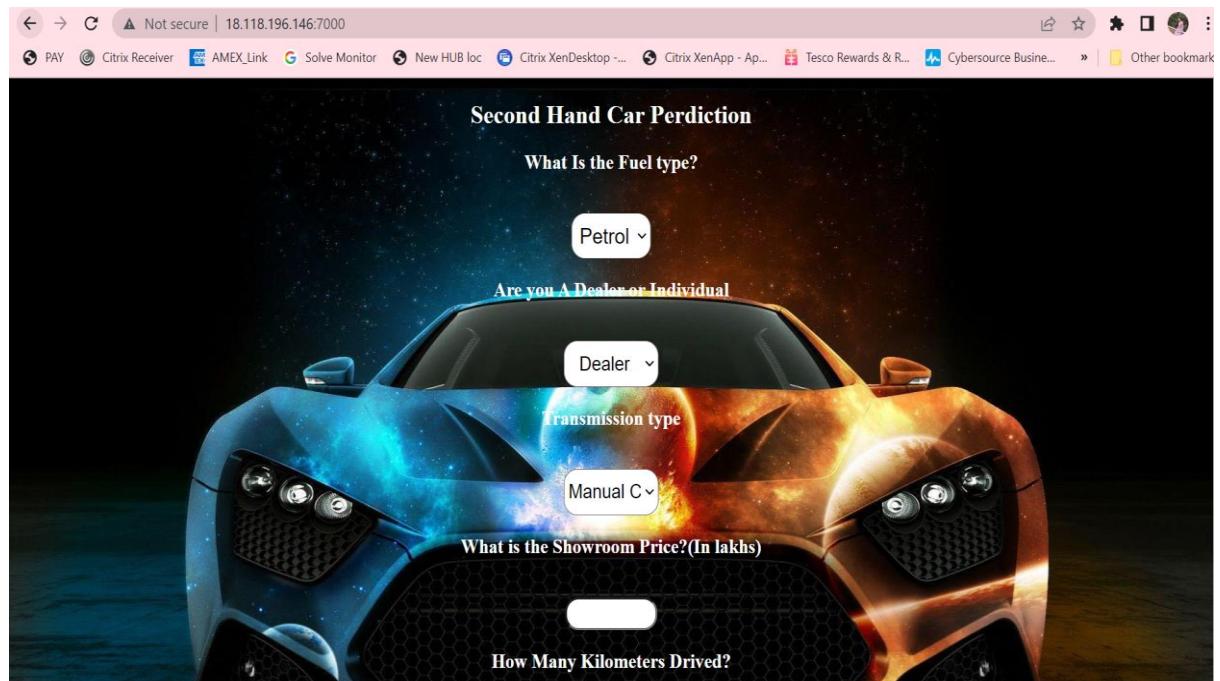
- `python3 app.py`

```
[Requirement already satisfied: zipp==0.5 in ./carpred/lib/python3.8/site-packages (from gunicorn<20.0.7> >= requirements.txt (line 1)) (0.5)
Requirement already satisfied: zipp==0.5 in ./carpred/lib/python3.8/site-packages (from importlib-metadata>=3.6.0; python_version < "3.10">->r requirements.txt (line 3)) (3.16.0)
(carpred) ubuntu@ip-172-31-24-177:~/car-prediction-new$ sudo vi app.py
(carpred) ubuntu@ip-172-31-24-177:~/car-prediction-new$ python3 app.py
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:7000
* Running on http://172.31.24.177:7000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 292-969-530
/C(carpred) ubuntu@ip-172-31-24-177:~/car-prediction-new$ screen -m -d python3 app.py
(carpred) ubuntu@ip-172-31-24-177:~/car-prediction-new$
```

In order to continuously monitor python application in detach mode we give the below command

- `screen -m -d python3 app.py`

Now copy EC2 instance public IP and give port number and search in web browser



PART 2 – Create user data, terraform files and browse the output of the python application

Step 1 : Create EC2 instance with default VPC

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with various navigation options like EC2 Dashboard, EC2 Global View, Events, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays two instances: 'python' (Instance ID: i-03a553c0f8b88634c) and 'Mypubec2' (Instance ID: i-04518ddb7cfb93220). Both instances are listed as 'Running' in the 'Instance state' column. The 'python' instance is highlighted with a blue checkmark. Below the table, a modal window titled 'Instance: i-03a553c0f8b88634c (python)' provides detailed information about the instance, including its Instance ID, Public IPv4 address (3.129.211.140), and Private IPv4 addresses (172.31.9.122).

Step 2: Create terraform-config.txt file, provide permission and execute the file

Commands present in the terraform-config.txt file

- sudo yum install -y yum-utils
- sudo yum-config-manager --add-repo
<https://rpm.releases.hashicorp.com/AmazonLinux/hashicorp.repo>
- sudo yum -y install terraform

```
[ec2-user@ip-172-31-9-122 ~]$ sudo vi terraform-config.txt
[ec2-user@ip-172-31-9-122 ~]$ sudo chmod +x terraform-config.txt
[ec2-user@ip-172-31-9-122 ~]$ sudo ./terraform-config.txt
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
0:00
Package yum-utils-1.1.31-46.amzn2.0.1.noarch already installed and latest version
Nothing to do
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
adding repo from: https://rpm.releases.hashicorp.com/AmazonLinux/hashicorp.repo
grabbing file https://rpm.releases.hashicorp.com/AmazonLinux/hashicorp.repo to /etc/yum.repos.d/hashicorp.repo
repo saved to /etc/yum.repos.d/hashicorp.repo
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
hashicorp
0:00
hashicorp/x86_64/primary
0:00
hashicorp
231/1231
Resolving Dependencies
--> Running transaction check
--> Package terraform.x86_64 0:1.5.3-1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
==== Package          Arch        Version       Repository
==== Package Size      Arch        Version       Repository
===== Installing:
```

Step 3 : Build AWS infrastructure using Terraform (.tf)

```
# creating 1st subnet
resource "aws_subnet" "mysub" {
  vpc_id      = aws_vpc.myvpc.id
  cidr_block  = "10.0.1.0/24"
  map_public_ip_on_launch = true
  availability_zone ="us-east-2a"
  tags = {
    Name = "My-sub"
  }
}

# creating 2nd subnet
resource "aws_subnet" "mysub1" {
  vpc_id      = aws_vpc.myvpc.id
  cidr_block  = "10.0.2.0/24"
  map_public_ip_on_launch = true
  availability_zone ="us-east-2b"
  tags = {
    Name = "My-sub1"
  }
}
```

- provider.tf

```
# Creating providers

provider "aws" {
  region      = "us-east-2"
  access_key  = "AKIA5JWS3PTN5AFIGJ42"
  secret_key  = "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"
}
```

- vpc.tf

```
# creating VPC
resource "aws_vpc" "myvpc" {
  cidr_block      = "10.0.0.0/16"
  instance_tenancy = "default"

  tags = {
    Name = "my-vpc"
  }
}
```

- igw.tf

```
# creating Internet Gateway
resource "aws_internet_gateway" "myigw" {
  vpc_id = aws_vpc.myvpc.id

  tags = {
    Name = "my-igw"
  }
}
```

- `subnet.tf`

```
# creating 1st subnet
resource "aws_subnet" "mysub" {
  vpc_id      = aws_vpc.myvpc.id
  cidr_block = "10.0.1.0/24"
  map_public_ip_on_launch = true
  availability_zone = "us-east-2a"
  tags = {
    Name = "My-sub"
  }
}

# creating 2nd subnet
resource "aws_subnet" "mysub1" {
  vpc_id      = aws_vpc.myvpc.id
  cidr_block = "10.0.2.0/24"
  map_public_ip_on_launch = true
  availability_zone = "us-east-2b"
  tags = {
    Name = "My-sub1"
  }
}
```

- `Route_table.tf`

```
# creating Route Table
resource "aws_route_table" "myrt" {
  vpc_id = aws_vpc.myvpc.id

  route {
    cidr_block = "0.0.0.0/0"
    gateway_id = aws_internet_gateway.myigw.id
  }

  tags = {
    Name = "my-rt"
  }
}

#Associating Route Table
resource "aws_route_table_association" "rt1" {
  subnet_id      = aws_subnet.mysub.id
  route_table_id = aws_route_table.myrt.id
}

#Associating Route Table
resource "aws_route_table_association" "rt2" {
  subnet_id      = aws_subnet.mysub1.id
  route_table_id = aws_route_table.myrt.id
}
```

- `Web_sg.tf`

```
# creating Security Group
resource "aws_security_group" "sg-web" {
  vpc_id      = aws_vpc.myvpc.id

# Inbound Rules
# HTTP access from anywhere
ingress {
  from_port      = 80
  to_port        = 80
  protocol       = "tcp"
  cidr_blocks   = ["0.0.0.0/0"]
}

# HTTPS access from anywhere
ingress {
  from_port      = 8000
  to_port        = 8000
  protocol       = "tcp"
  cidr_blocks   = ["0.0.0.0/0"]
}

# SSH access from anywhere
ingress {
  from_port      = 22
  to_port        = 22
  protocol       = "tcp"
  cidr_blocks   = ["0.0.0.0/0"]
}
```

- Ec2.tf

```
# creating 1st EC2 instance in Public Subnet
resource "aws_instance" "ins1" {
  ami                         = "ami-0d1c47ab964ae2b87"
  instance_type                = "t2.micro"
  key_name                     = "ohio"
  vpc_security_group_ids       = [aws_security_group.sg-web.id]
  subnet_id                    = aws_subnet.mysub.id
  associate_public_ip_address = true
  user_data                    = file("data.sh")
  tags = {
    Name = "Mypubec2"
  }
}
```

- Data.sh

```
#!/bin/bash
sudo yum update -y
sudo yum install python3 -y
sudo yum install python3-pip -y
sudo yum install git -y
git clone https://github.com/satishyekula548/Abalone-Age-Prediction-pyhton.git
cd /
cd Abalone-Age-Prediction-pyhton/
pip3 install -r requirements.txt
python3 app.py
screen -d -m python3 app.py
```

Applying terraform commands

- Terraform init
- Terraform validate
- Terraform plan
- Terraform apply –auto-approve

```
[ec2-user@ip-172-31-9-122 Terraform-python-TF]$ sudo terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v5.7.0...
- Installed hashicorp/aws v5.7.0 (signed by HashiCorp)

Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
```

```
[ec2-user@ip-172-31-9-122 Terraform-pyton-TF]$ sudo terraform apply --auto-approve

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated by the symbols:
+ create

Terraform will perform the following actions:

# aws_instance.ins1 will be created
+ resource "aws_instance" "ins1" {
    + ami                                = "ami-0d1c47ab964ae2b87"
    + arn                                = (known after apply)
    + associate_public_ip_address        = true
    + availability_zone                  = (known after apply)
    + cpu_core_count                     = (known after apply)
    + cpu_threads_per_core              = (known after apply)
    + disable_api_stop                 = (known after apply)
    + disable_api_termination          = (known after apply)
    + ebs_optimized                     = (known after apply)
    + get_password_data                = false
    + host_id                            = (known after apply)
    + host_resource_group_arn           = (known after apply)
    + iam_instance_profile              = (known after apply)
    + id                                 = (known after apply)
    + instance_initiated_shutdown_behavior = (known after apply)
    + instance_lifecycle               = (known after apply)
    + instance_state                   = (known after apply)
    + instance_type                     = "t2.micro"
    + ipv6_address_count               = (known after apply)
    + ipv6_addresses                   = (known after apply)
```

```
aws_route_table.myrt: Creation complete after 1s [id=rtb-0ef99c20b87dd1f06]
aws_security_group.sg-web: Creation complete after 2s [id=sg-098ecd29a7b78de59]
aws_subnet.appsub1: Still creating... [10s elapsed]
aws_subnet.dbsub1: Still creating... [10s elapsed]
aws_subnet.mysub1: Still creating... [10s elapsed]
aws_subnet.appsub: Still creating... [10s elapsed]
aws_subnet.dbsub: Still creating... [10s elapsed]
aws_subnet.mysub: Still creating... [10s elapsed]
aws_subnet.mysub1: Creation complete after 11s [id=subnet-0d6e49360205fd078]
aws_route_table_association.rt2: Creating...
aws_subnet.appsub: Creation complete after 11s [id=subnet-0fcfd174a27dce298c]
aws_subnet.dbsub: Creation complete after 11s [id=subnet-0139d99496700234e]
aws_subnet.appsub1: Creation complete after 11s [id=subnet-0f0e2fb24a48e00f8]
aws_subnet.mysub: Creation complete after 11s [id=subnet-0133e3f8ffe2b64fb]
aws_subnet.dbsub1: Creation complete after 11s [id=subnet-0fba1d55f4b31df82]
aws_instance.ins1: Creating...
aws_route_table_association.rt1: Creating...
aws_route_table_association.rt2: Creation complete after 0s [id=rtbassoc-0df959b1c2d60a647]
aws_route_table_association.rt1: Creation complete after 0s [id=rtbassoc-0a93bc514b4f5445d]
aws_instance.ins1: Still creating... [10s elapsed]
aws_instance.ins1: Still creating... [20s elapsed]
aws_instance.ins1: Still creating... [30s elapsed]
aws_instance.ins1: Still creating... [40s elapsed]
aws_instance.ins1: Creation complete after 41s [id=i-04518ddb7cfb93220]

Apply complete! Resources: 13 added, 0 changed, 0 destroyed.
```

Step 4 : Check the infrastructure created

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with navigation links like EC2 Dashboard, EC2 Global View, Events, Instances (with 'Instances' selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays 'Instances (1/2) Info' with a search bar and filters. Two instances are listed: 'python' (Instance ID: i-03a553c0f8b88634c) and 'Mypubec2' (Instance ID: i-04518ddb7cfb93220). Both are shown as 'Running' with 't2.micro' instance type. A status check table indicates '2/2 checks passed' for both. Below the table, the details for 'Instance: i-04518ddb7cfb93220 (Mypubec2)' are shown, including Public IPv4 address (3.15.7.52), Private IP4 addresses (10.0.1.125), and Public IPv4 DNS.

Step 5 : Copy the EC2 instance of public IP address and use the assigned port number to search in the web browser.

The screenshot shows a web browser window. The address bar says 'Not secure | 3.15.7.52:8000'. The page title is 'Abalone-Age-Prediction-Yshu'. On the left, there's a video player for a YouTube video titled 'What is abalone?'. The video thumbnail shows a question mark and a shell. On the right, there's a section titled 'Sample Image Of Abalone' with a large image of a colorful abalone shell and some descriptive text.

What is an Abalone:

What is abalone?

Watch Later Share

What is abalone?

0:00 / 1:28

Sample Image Of Abalone

abalone Shell

The believed abalone healing properties of today are very similar to ancient beliefs of the shell. Abalone healing carries energies of protection and emotional balance. It brings with it a natural shielding that blesses the person holding it with tranquility.

... 1/1 ...

PART 3 – Create and install Jenkins test, build and deploy application, browse the same in the browser.

1. Create EC2 instance and install Jenkins to test, build and deploy the application.

The screenshot shows the AWS Management Console with the Instances page open. There are two instances listed:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Available
Mypubec2	i-061643fd1f447a422	Running	t2.micro	Initializing	No alarms	us-east-2
python-manual	i-0c5cc8ce079aeab68	Running	t2.medium	2/2 checks passed	No alarms	us-east-2

The 'python-manual' instance is selected. The details pane shows:

- Instance ID: i-0c5cc8ce079aeab68 (python-manual)
- Public IPv4 address: 3.137.180.80 | [open address](#)
- Private IPv4 addresses: 172.31.5.100
- Public IPv4 DNS: ec2-3-137-180-80.us-east-
- Instance state: Running

2. Install Java, Jenkins and Git

```
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\sutir> cd .\Downloads\
PS C:\Users\sutir\Downloads> ssh -i "ohio.pem" ec2-user@ec2-3-137-180-80.us-east-2.compute.amazonaws.com
The authenticity of host 'ec2-3-137-180-80.us-east-2.compute.amazonaws.com (3.137.180.80)' can't be established.
ED25519 key fingerprint is SHA256:+3wXA7w3g1FAXALce7EVGKn6+JiimndVucaMjr11jPQQ.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-3-137-180-80.us-east-2.compute.amazonaws.com' (ED25519) to the list of known hosts.

  _|_ _|_
 _|(_ /  Amazon Linux 2 AMI
 ___\_\_\_|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-5-100 ~]$ sudo yummm -y install git
sudo: yummm: command not found
[ec2-user@ip-172-31-5-100 ~]$ sudo yum -y install git
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
Resolving Dependencies
--> Running transaction check
--> Package git.x86_64 0:2.40.1-1.amzn2.0.1 will be installed
--> Processing Dependency: perl-Git = 2.40.1-1.amzn2.0.1 for package: git-2.40.1-1.amzn2.0.1.x86_64
--> Processing Dependency: git-core-doc = 2.40.1-1.amzn2.0.1 for package: git-2.40.1-1.amzn2.0.1.x86_64
--> Processing Dependency: git-core = 2.40.1-1.amzn2.0.1 for package: git-2.40.1-1.amzn2.0.1.x86_64
--> Processing Dependency: perl(Term::ReadKey) for package: git-2.40.1-1.amzn2.0.1.x86_64
--> Processing Dependency: perl(Git) for package: git-2.40.1-1.amzn2.0.1.x86_64
--> Running transaction check
--> Package git-core.x86_64 0:2.40.1-1.amzn2.0.1 will be installed
--> Package git-core-doc.noarch 0:2.40.1-1.amzn2.0.1 will be installed
--> Package perl-TermReadKey.x86_64 0:2.30-20.amzn2.0.2 will be installed
--> Running transaction check
```

3. Provide the update and upgrade commands.

```
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
No Match for argument: -y
No packages marked for update
[ec2-user@ip-172-31-5-100 ~]$ sudo wget -O /etc/yum.repos.d/jenkins.repo \
> https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2023-07-13 03:23:07-- https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 151.101.146.133, 2a04:4e42:22::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|151.101.146.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: '/etc/yum.repos.d/jenkins.repo'

100%[=====] 85      --.-K/s   in 0s

2023-07-13 03:23:07 (6.03 MB/s) - '/etc/yum.repos.d/jenkins.repo' saved [85/85]

[ec2-user@ip-172-31-5-100 ~]$ sudo rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key
[ec2-user@ip-172-31-5-100 ~]$ sudo yum upgrade
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
jenkins
jenkins/primary_db
No packages marked for update
[ec2-user@ip-172-31-5-100 ~]$ sudo amazon-linux-extras install java-openjdk11 -y
Installing java-11-openjdk
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
Cleaning repos: amzn2-core amzn2extra-docker amzn2extra-java-openjdk11 amzn2extra-kernel-5.10 jenkins
19 metadata files removed
8 sqlite files removed
0 metadata files removed
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
amzn2extra-docker
amzn2extra-java-openjdk11
amzn2extra-kernel-5.10
jenkins
| 3.7 kB  00:00:00
| 3.0 kB  00:00:00
| 3.0 kB  00:00:00
| 3.0 kB  00:00:00
| 2.9 kB  00:00:00
```

4. Start and enable Jenkins

- sudo systemctl enable Jenkins
- sudo systemctl start Jenkins
- sudo systemctl status jenkins

```
jenkins.noarch 0:2.401.2-1.1

Complete!
[ec2-user@ip-172-31-5-100 ~]$ sudo systemctl enable jenkins
Created symlink from /etc/systemd/system/multi-user.target.wants/jenkins.service to /usr/lib/systemd/system/jenkins.service.
[ec2-user@ip-172-31-5-100 ~]$ sudo systemctl start jenkins
[ec2-user@ip-172-31-5-100 ~]$ sudo systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; vendor preset: disabled)
     Active: active (running) since Thu 2023-07-13 03:24:11 UTC; 15ms ago
       Main PID: 3818 (java)
          CGroup: /system.slice/jenkins.service
                  └─3818 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=%C/jenkins/war --httpPort=8080...
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: Jenkins initial setup is required. An admin user has ...ed.
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: Please use the following password to proceed to insta...on:
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: 17df70d818bf4e3afe09ad94bcf1e49
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: This may also be found at: /var/lib/jenkins/secrets/i...ord
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: ****
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: ****
Jul 13 03:23:52 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: ****
Jul 13 03:24:11 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: 2023-07-13 03:24:11.886+0000 [id=31]      INFO      ...
Jul 13 03:24:11 ip-172-31-5-100.us-east-2.compute.internal jenkins[3818]: 2023-07-13 03:24:11.914+0000 [id=22]      INFO      ...
Jul 13 03:24:11 ip-172-31-5-100.us-east-2.compute.internal systemd[1]: Started Jenkins Continuous Integration Server.
Hint: Some lines were ellipsized, use -l to show in full.
[ec2-user@ip-172-31-5-100 ~]$ 
[ec2-user@ip-172-31-5-100 ~]$ cd /etc
[ec2-user@ip-172-31-5-100 etc]$ sudo vi sudoers
[ec2-user@ip-172-31-5-100 etc]$ cd /var/lib/jenkins/
[ec2-user@ip-172-31-5-100 jenkins]$ ls
identity.key.enc          jobs          secret.key.not-so-secret
config.xml                 jenkins.install.InstallUtil.lastExecVersion    nodeMonitors.xml  secrets
credentials.xml            jenkins.install.UpgradeWizard.state    nodes          updates
hudson.model.UpdateCenter.xml jenkins.model.JenkinsLocationConfiguration.xml  plugins        userContent
hudson.plugins.git.GitTool.xml jenkins.telemetry.Correlator.xml      secret.key      users
[ec2-user@ip-172-31-5-100 jenkins]$ ls
```

5. Browse IP, provide the password and install Jenkins page
6. Provide Jenkins password permissions in terminal and use cd /etc
7. Open vi sudoers and give permissions
8. Now open Jenkins and create a new job “python-automation”

The screenshot shows the Jenkins dashboard. The URL bar indicates a non-secure connection to port 8080. The dashboard features a search bar and a user dropdown for 'admin'. Key sections include:

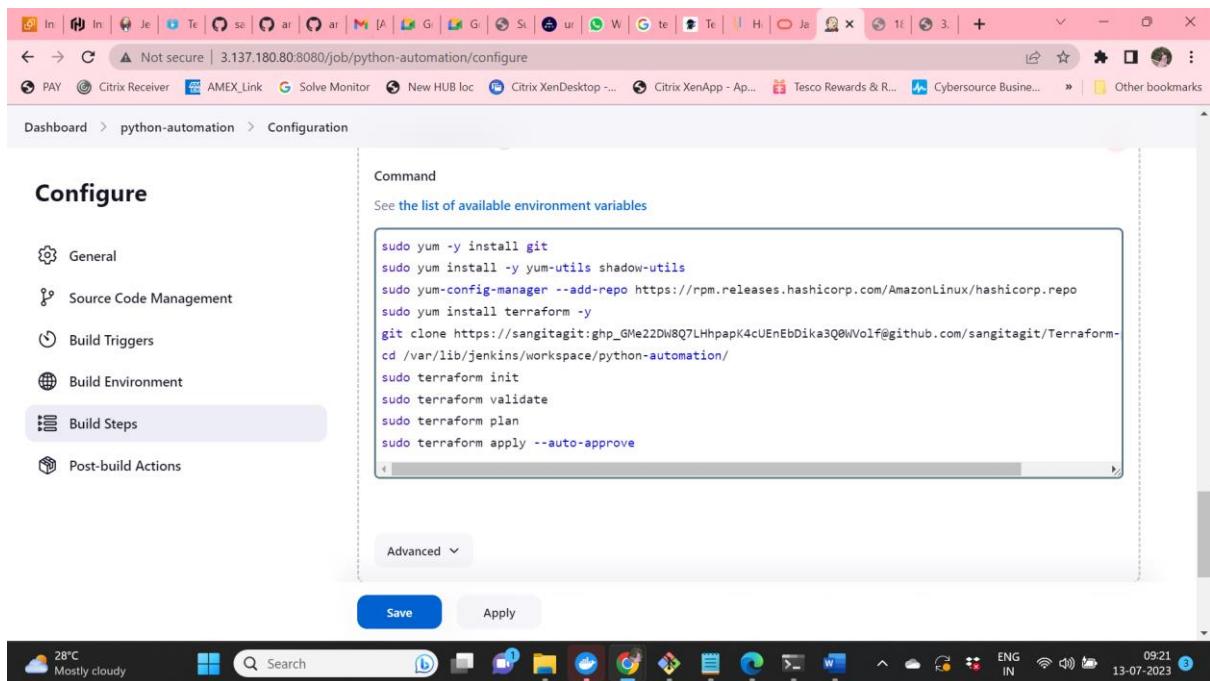
- New Item**: A button to start creating a new Jenkins job.
- People**: A section for managing users.
- Build History**: A table showing build logs for various projects, with the 'python-automation' project highlighted.
- Project Relationship**: A section for managing dependencies between projects.
- Check File Fingerprint**: A feature for tracking file changes.
- Manage Jenkins**: Options for configuring the Jenkins instance.
- My Views**: A section for managing custom views.
- Build Queue**: A summary stating "No builds in the queue."
- Build Executor Status**: A system status bar showing weather (28°C, Mostly cloudy), system icons, and the date/time (13-07-2023).

9. Add repo and credentials , also give commands in execute shell

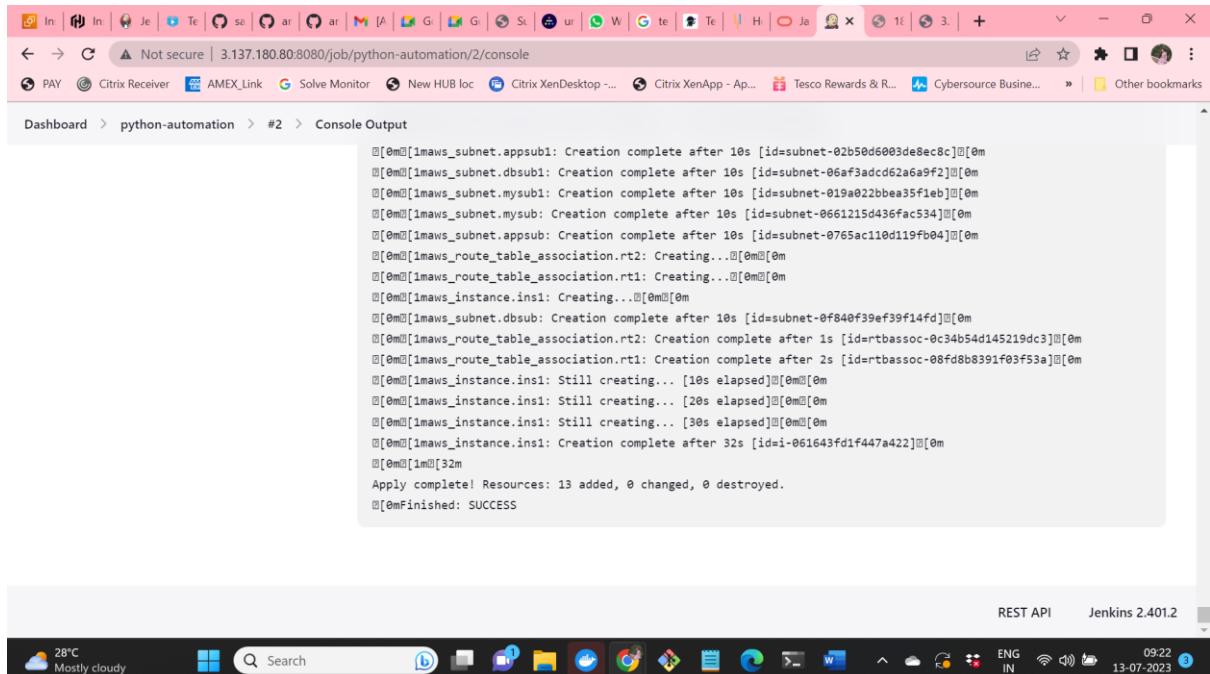
The screenshot shows the Jenkins configuration interface for the 'python-automation' job. The 'Source Code Management' tab is active, set to 'Git'. The configuration includes:

- Repository URL**: https://github.com/sangitagit/Terraform-python-TF.git
- Credentials**: sangitagit*****

At the bottom are 'Save' and 'Apply' buttons. The bottom of the screen shows a Windows taskbar with various icons and the date/time (13-07-2023).



10. Build the job and complete for the success.



11. Copy the EC2 instance of public IP address and use the assigned port number to search in the web browser

The screenshot shows the AWS EC2 Instances page. On the left, a sidebar lists various services like EC2 Dashboard, EC2 Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays a table of instances:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Available
Mypubec2	i-061643fd1f447a422	Running	t2.micro	Initializing	No alarms	us-east-2
python-manual	i-0e5cc8ce079aeab68	Running	t2.medium	2/2 checks passed	No alarms	us-east-2
Myubuntu2	i-0777d702104177607	Running	t2.micro	2/2 checks passed	No alarms	us-east-2

Details for the selected instance (i-061643fd1f447a422) are shown in the modal:

- Instance ID: i-061643fd1f447a422 (Mypubec2)
- Public IPv4 address: 3.144.46.55 | [open address](#)
- Private IPv4 addresses: 10.0.1.247
- Instance state: Running
- Public IPv4 DNS: -

The system tray at the bottom shows it's 28°C, mostly cloudy, and the date is 13-07-2023.

The screenshot shows a web browser window. The title bar indicates the page is not secure and shows the URL 3.144.46.55:8000. The main content area displays a video player with the title "Abalone-Age-Prediction-Yshu". The video thumbnail shows a green abalone shell and a large question mark. Below the video, the text "What is an Abalone:" is visible. To the right, there is a section titled "Sample Image Of Abalone" featuring a close-up image of a colorful abalone shell with the text "abalone Shell" written above it. The system tray at the bottom shows it's 28°C, mostly cloudy, and the date is 13-07-2023.

PART 4 – Create and install Jenkins. Use terraform file to test, build and deploy application, browse the same in the browser.

1. Create EC2 instance and install Jenkins to test, build and deploy the application.

The screenshot shows the AWS EC2 Instances page. On the left, there's a sidebar with options like EC2 Dashboard, EC2 Global View, Events, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays a table titled 'Instances (1/3) Info' with three rows:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Ava
Mypubec2	i-05f1c76481c62b844	Running	t2.micro	2/2 checks passed	No alarms	us-e
terraform-py...	i-054fe8fa8fb49697	Running	t2.micro	2/2 checks passed	No alarms	us-e
jenkins	i-0b7fc0645fe3e8bc1	Running	t2.medium	2/2 checks passed	No alarms	us-e

Below the table, there's a detailed view for the first instance (i-05f1c76481c62b844):

- Instance ID: i-05f1c76481c62b844 (Mypubec2)
- Public IPv4 address: 3.141.7.95 | [open address](#)
- Private IPv4 addresses: 10.0.1.80
- IPv6 address: -
- Instance state: Running
- Public IPv4 DNS: -
- Hostname type: IP name: ip-10-0-1-80.us-east-2.compute.internal
- Private IP DNS name (IPv4 only): ip-10-0-1-80.us-east-2.compute.internal

The bottom of the screen shows the AWS navigation bar and a taskbar with various icons.

2. Create data.sh file and push it in a private repo

The screenshot shows a GitHub repository page for 'sangitagit/Data'. The 'Data' folder is selected. The 'main' branch is active, showing a file named 'data.sh'. The file content is:

```
1 sudo yum -y install git
2 sudo yum install -y yum-utils shadow-utils
3 sudo yum-config-manager --add-repo https://rpm.releases.hashicorp.com/AmazonLinux/hashicorp.repo
4 sudo yum install terraform -y
5 git clone https://sangitagit:ghp_GMe220W0Q7LHhpapK4cUEnEbDika3Q0wvolf@github.com/sangitagit/Terraform-python-TF.git
6 cd /var/lib/jenkins/workspace/test/Terraform-python-TF
7 sudo terraform init
8 sudo terraform validate
9 sudo terraform plan
10 sudo terraform apply --auto-approve
```

The GitHub interface includes a search bar, code editor, blame history, and raw file download options. The bottom of the screen shows the Windows taskbar.

3. Creating Jenkins Job to test, build and deploy.

The screenshot shows the Jenkins dashboard. At the top, there is a navigation bar with links like PAY, Citrix Receiver, AMEX_Link, Solve Monitor, New HUB loc, Citrix XenDesktop ..., Citrix XenApp - Ap..., Tesco Rewards & R..., Cybersource Busine..., and Other bookmarks. The main header says "Jenkins" with a user icon. Below the header, there is a search bar with "Search (CTRL+K)" and a "Dashboard" link. A "New Item" button is visible. On the left, there are links for People, Build History, Project Relationship, Check File Fingerprint, Manage Jenkins, and My Views. In the center, there is a table for the "test" job, showing its status (green checkmark), last success (46 min ago), last failure (50 min ago), and duration (1 min 12 sec). Below the table, there are options for Atom feed. At the bottom, it says "Build Queue" with a note "No builds in the queue." The taskbar at the bottom shows various application icons and the system tray with the date and time (13-07-2023).

4. Provide the Git repo with the userdata along with the GIT credentials.

The screenshot shows the configuration page for the "test" job. The left sidebar has tabs for General, Source Code Management (which is selected), Build Triggers, Build Environment, Build Steps, and Post-build Actions. The main area is titled "Configure" and shows the "Source Code Management" section. It includes fields for "Repository URL" (set to "https://github.com/sangitagit/Data.git") and "Credentials" (set to "sangitagit/********"). There is also an "Advanced" dropdown and a "Save" button at the bottom. The taskbar at the bottom shows various application icons and the system tray with the date and time (13-07-2023).

5. Provide the shell script along with the permissions

The screenshot shows a web-based interface for configuring a build step. On the left, there's a sidebar with options like General, Source Code Management, Build Triggers, Build Environment, Build Steps (which is selected), and Post-build Actions. The main area is titled 'Configure' and contains a 'Execute shell' section. It has a 'Command' field with the following content:

```
sudo chmod +x data.sh
sudo ./data.sh
```

Below the command field is an 'Advanced' dropdown and a 'Save' button.

6. Validate the console output till we get SUCCESS.

The screenshot shows a web-based interface displaying the 'Console Output' for a build step. The log output is as follows:

```
[[0m[[1maws_subnet.mysub1: Still creating... [10s elapsed]@[0m@[0m
[[0m[[1maws_subnet.mysub1: Creation complete after 10s [id=subnet-05efa6033874da828]@[0m
[[0m[[1maws_route_table_association.rt2: Creating...@[0m@[0m
[[0m[[1maws_subnet.mysub: Creation complete after 10s [id=subnet-0ff3ae1bc229268d5]@[0m
[[0m[[1maws_subnet.appsub: Creation complete after 10s [id=subnet-02aef6f806accb684]@[0m
[[0m[[1maws_instance.ins1: Creating...@[0m@[0m
[[0m[[1maws_route_table_association.rt1: Creating...@[0m@[0m
[[0m[[1maws_subnet.dbsub: Creation complete after 10s [id=subnet-0d34f0fa3bedffb85]@[0m
[[0m[[1maws_subnet.dbsub1: Creation complete after 10s [id=subnet-0d1e269128bd9bc78]@[0m
[[0m[[1maws_subnet.appsub1: Creation complete after 10s [id=subnet-01c8ee7ef2e1bd58f]@[0m
[[0m[[1maws_route_table_association.rt2: Creation complete after 1s [id=rtbassoc-062f7ef086d5ba794]@[0m
[[0m[[1maws_route_table_association.rt1: Creation complete after 1s [id=rtbassoc-0683f40f028072407]@[0m
[[0m[[1maws_instance.ins1: Still creating... [10s elapsed]@[0m@[0m
[[0m[[1maws_instance.ins1: Still creating... [20s elapsed]@[0m@[0m
[[0m[[1maws_instance.ins1: Still creating... [30s elapsed]@[0m@[0m
[[0m[[1maws_instance.ins1: Creation complete after 33s [id=i-05fic76481c62b844]@[0m
[[0m@[32m
Apply complete! Resources: 13 added, 0 changed, 0 destroyed.
@[0mFinished: SUCCESS
```

7. Copy the EC2 instance of public IP address and use the assigned port number to search in the web browser

Instances (1/3) Info

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Ava
Mypubec2	i-05f1c76481c62b844	Running	t2.micro	2/2 checks passed	No alarms	us-e
terraform-py...	i-054fefa8fafb49697	Running	t2.micro	2/2 checks passed	No alarms	us-e
jenkins	i-0b7fc0645fe3e8bc1	Running	t2.medium	2/2 checks passed	No alarms	us-e

Instance: i-05f1c76481c62b844 (Mypubec2)

Instance ID i-05f1c76481c62b844 (Mypubec2)	Public IPv4 address 3.141.7.95 open address	Private IPv4 addresses 10.0.1.80
IPv6 address -	Instance state Running	Public IPv4 DNS -
Hostname type IP name: ip-10-0-1-80.us-east-2.compute.internal	Private IP DNS name (IPv4 only) ip-10-0-1-80.us-east-2.compute.internal	

https://3.141.7.95

What is an Abalone:

What is abalone?

Watch later Share

What is abalone?

0:00 / 1:28

YouTube

Abalone Shell

The believed abalone healing properties of today are very similar to ancient beliefs of the shell. Abalone healing carries energies of protection and emotional balance. It brings with it a natural shielding that blesses the person holding it with tranquility.

28°C Mostly cloudy

PART 5 – Automation procedure using Webhooks , PollSCM and Build

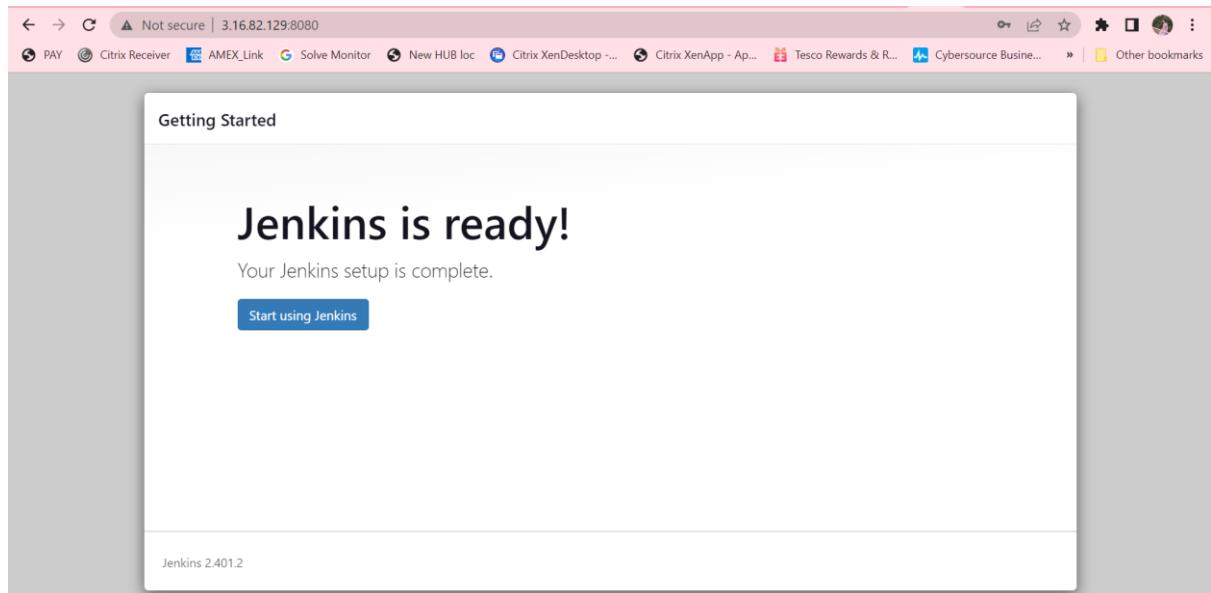
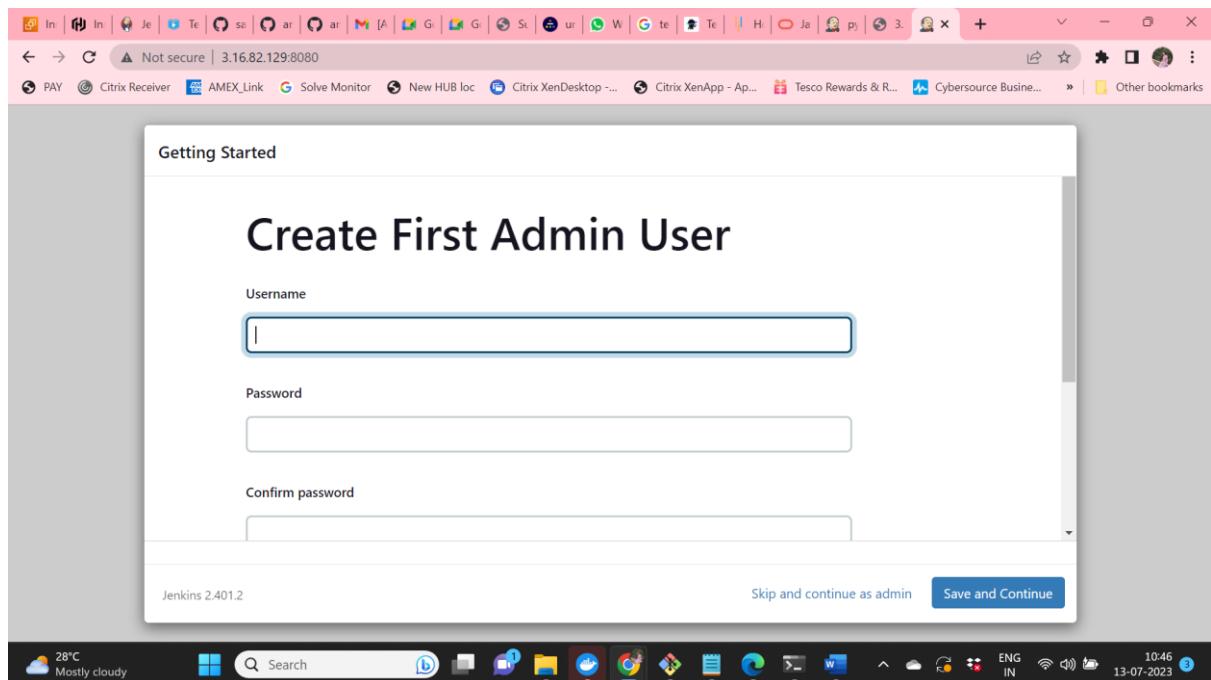
Periodically and validate the Jenkins job is triggering or not.

1. Create EC2 instance and install Jenkins to test, build and deploy the application.

The screenshot shows the AWS Management Console EC2 Instances page. On the left, there's a sidebar with various navigation options like EC2 Dashboard, EC2 Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays a table of instances with columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, and Availability zone. One instance, 'jenkins' (Instance ID: i-038b3419d363bde6e), is selected and highlighted in blue. Below the table, a detailed view for the 'jenkins' instance is shown, including its instance ID, public and private IP addresses, and current state (Running).

2. Install Jenkins and Create Job

The screenshot shows the Jenkins 'Getting Started' page. It features a large 'Getting Started' heading and a table of Jenkins modules. A tooltip is displayed over the 'GitHub Branch Source' module, providing its description and listing required dependencies such as GitHub, Pipeline: GitHub Groovy Libraries, Pipeline: Stage View, Git, SSH Build Agents, Matrix Authorization Strategy, PAM Authentication, and Mailer.



Not secure | 3.16.82.129:8080

PAY Citrix Receiver AMEX_Link Solve Monitor New HUB loc Citrix XenDesktop ... Citrix XenApp - Ap... Tesco Rewards & R... Cybersource Busine... Other bookmarks

Jenkins

Dashboard >

+ New Item Add description

People

Build History

Manage Jenkins

My Views

Welcome to Jenkins!

This page is where your Jenkins jobs will be displayed. To get started, you can set up distributed builds or start building a software project.

Start building your software project

Build Queue Create a job →
No builds in the queue.

Build Executor Status Set up a distributed build →
1 Idle
2 Idle

Not secure | 3.16.82.129:8080/newJob

PAY Citrix Receiver AMEX_Link Solve Monitor New HUB loc Citrix XenDesktop ... Citrix XenApp - Ap... Tesco Rewards & R... Cybersource Busine... Other bookmarks

Jenkins

Dashboard >

Enter an item name

python-deploy » Required field

Freestyle project This is the central feature of Jenkins. Jenkins will build your project, combining any SCM with any build system, and this can be even used for something other than software build.

Pipeline Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.

OK -configuration project

Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific

3. Provide the Git repo with the userdata along with the GIT credentials.

The screenshot shows a configuration page for a build job. In the 'Source Code Management' section, the 'Repository URL' is set to `https://github.com/sangitagit/Data.git` and the 'Credentials' dropdown contains the value `sangitagit/*****`. There is also an 'Add' button and an 'Advanced' dropdown. At the bottom are 'Save' and 'Apply' buttons.

4. GitHub hook trigger for GITSCM pooling

The screenshot shows a configuration page for a build job. In the 'Build Triggers' section, the 'GitHub hook trigger for GITScm polling' checkbox is checked. Other options like 'Trigger builds remotely' and 'Build after other projects are built' are unchecked. Below this, the 'Build Environment' section has the 'Delete workspace before build starts' checkbox checked. At the bottom are 'Save' and 'Apply' buttons.

5. Provide the shell script along with the permissions

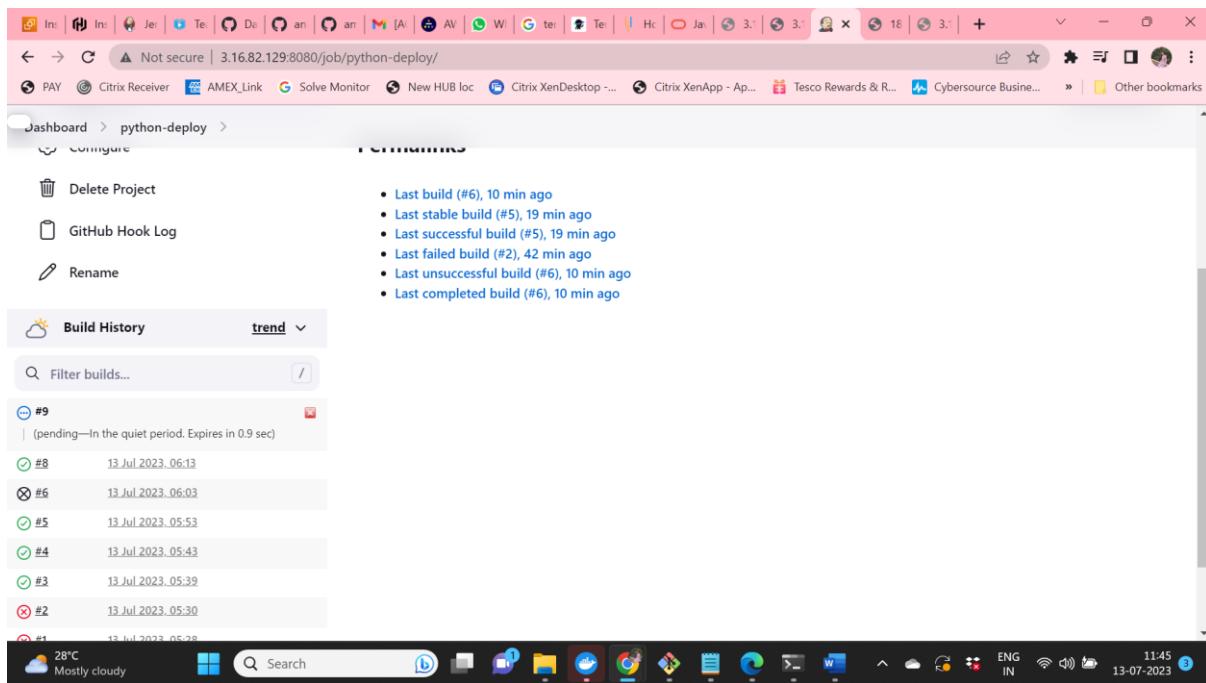
The screenshot shows the Jenkins job configuration interface. On the left, there's a sidebar with options: General, Source Code Management, Build Triggers, Build Environment, Build Steps (which is selected and highlighted in grey), and Post-build Actions. The main area is titled "Execute shell" and contains a command box with the following content:

```
sudo chmod +x data.sh  
sudo ./data.sh
```

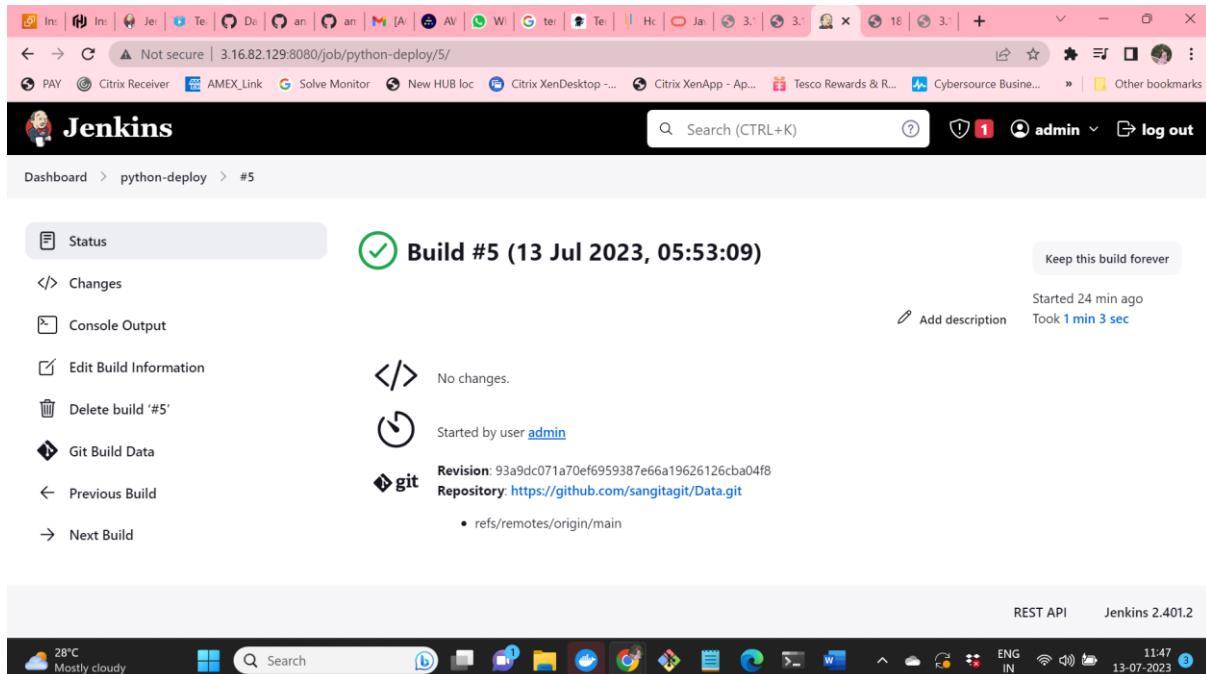
Below the command box is an "Advanced" dropdown and a "Save" button at the bottom.

6. Job execution using WebHook

The screenshot shows the Jenkins job details page for "python-deploy #9". The top bar indicates the build status as "Build #9 (13 Jul 2023, 06:15:45)" with a green checkmark icon. To the right, there are buttons for "Keep this build forever", "Add description", and a note that it started 1 min 19 sec ago and took 1 min 12 sec. The main content area includes sections for "Changes", "Console Output", "Edit Build Information", "Delete build '#9'", "Polling Log", "Git Build Data", and "Previous Build". The "Changes" section lists "1. Update README.md (details / githubweb)". The "Git Build Data" section shows the revision as 9ace4fe219da4457a5392dfd678949a7611dbebf and the repository as <https://github.com/sangitagit/Data.git>. At the bottom, there's a navigation bar with icons for weather, search, and various applications, along with system status information like "ENG IN", "11:47", and the date "13-07-2023".



7. Job execution initiated by the admin for time span of 2 mins



The screenshot shows the Jenkins configuration interface for a job named "python-deploy". The left sidebar lists several categories: General, Source Code Management, Build Triggers, Build Environment, Build Steps, and Post-build Actions. The "Build Triggers" section is currently selected and expanded, showing four trigger options: "Trigger builds remotely (e.g., from scripts)", "Build after other projects are built", "Build periodically", and "GitHub hook trigger for GITScm polling". The "GitHub hook trigger for GITScm polling" option is checked. Below this is a "Schedule" field containing the cron expression "H/2 * * * *". A note below the schedule states: "Would last have run at Thursday, July 13, 2023 at 6:23:07 AM Coordinated Universal Time; would next run at Thursday, July 13, 2023 at 6:23:07 AM Coordinated Universal Time." There is also a checked checkbox for "Ignore post-commit hooks". At the bottom are "Save" and "Apply" buttons. The system tray at the bottom shows the date as 13-07-2023 and the time as 11:53.

The screenshot shows the Jenkins Permalinks page for the same "python-deploy" job. The left sidebar has links for "Configure", "Delete Project", "Git Polling Log", and "Rename". The "Git Polling Log" link is selected. The main content area is titled "Permalinks" and lists the following build history:

- Last build (#11), 3 min 18 sec ago
- Last stable build (#10), 9 min 8 sec ago
- Last successful build (#10), 9 min 8 sec ago
- Last failed build (#11), 3 min 18 sec ago
- Last unsuccessful build (#11), 3 min 18 sec ago
- Last completed build (#11), 3 min 18 sec ago

Below this is a "Build History" section with a "trend" dropdown set to "▼". It includes a "Filter builds..." input field and a list of builds:

- #11 (pending—In the quiet period. Expires in 4.7 sec)
- #10 13 Jul 2023, 06:27
- #9 13 Jul 2023, 06:15
- #8 13 Jul 2023, 06:13
- #6 13 Jul 2023, 06:03

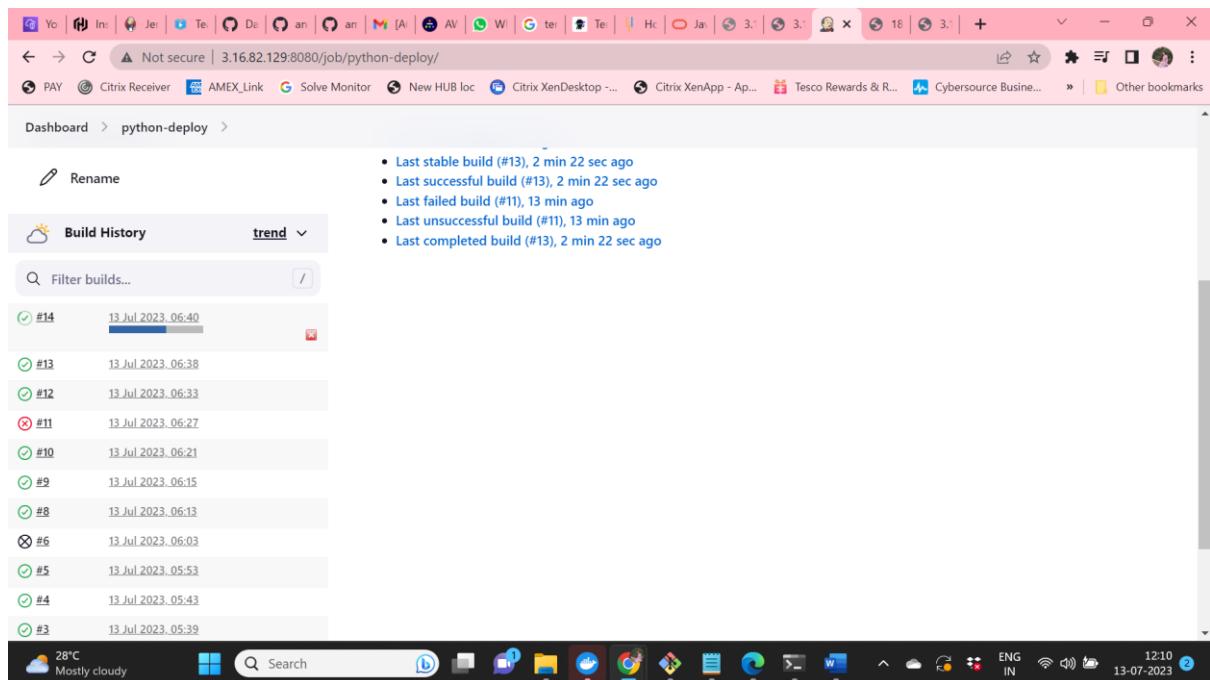
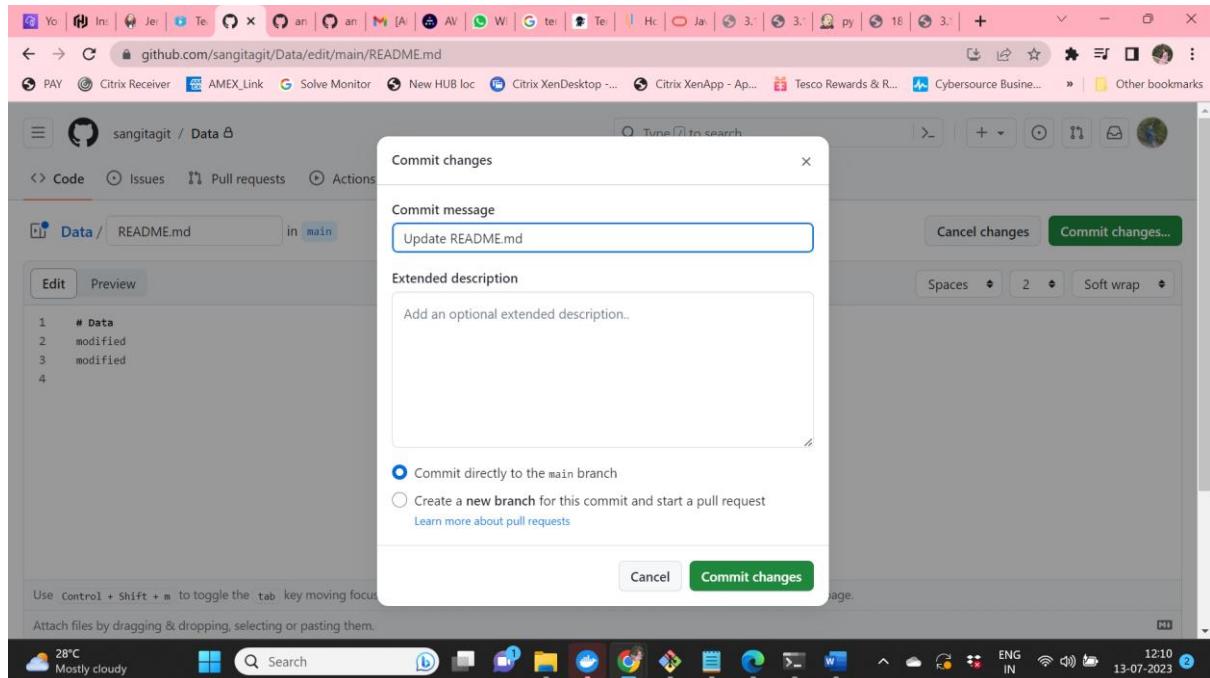
The system tray at the bottom shows the date as 13-07-2023 and the time as 12:03.

8. Job execution executed using SCM change

The screenshot shows the Jenkins interface for a job named "python-deploy". The build number is #12, which was triggered on 13 Jul 2023 at 06:33:10. The status is green with a checkmark. On the right, there are options to "Keep this build forever", "Add description", and "log out". Below the main status, it says "Started 1 min 43 sec ago" and "Took 1 min 13 sec". A "Changes" section lists "1. Update README.md" with links to "details / githubweb". A "git" section shows the revision "dc624c911083349fa60758f81712e4c1a8f0629" and the repository "https://github.com/sangitagit/Data.git". It also lists "refs/remotes/origin/main". On the left, there are links for "Status", "Changes", "Console Output", "Edit Build Information", "Delete build '#12'", "Polling Log", "Git Build Data", and "Previous Build". The bottom of the screen shows a Windows taskbar with various icons and a system tray indicating the date and time.

The screenshot shows the Jenkins configuration page for the "python-deploy" job. Under the "Configure" section, the "Build Triggers" tab is selected. It contains several trigger options: "Trigger builds remotely (e.g., from scripts)", "Build after other projects are built", "Build periodically" (which is checked), and "GitHub hook trigger for GITScm polling". The "Build periodically" section includes a "Schedule" field with the cron expression "H/3 * * * *". A note below states: "Would last have run at Thursday, July 13, 2023 at 6:37:29 AM Coordinated Universal Time; would next run at Thursday, July 13, 2023 at 6:37:29 AM Coordinated Universal Time." At the bottom, there are "Save" and "Apply" buttons. On the left sidebar, other configuration tabs are visible: General, Source Code Management, Build Environment, Build Steps, and Post-build Actions.

9. Modified Readme file for auto execution of Jenkins Job



Not secure | 3.16.82.129:8080/job/python-deploy/13/

PAY Citrix Receiver AMEX_Link Solve Monitor New HUB loc Citrix XenDesktop ... Citrix XenApp - Ap... Tesco Rewards & R... Cybersource Busine... Other bookmarks

Jenkins

Dashboard > python-deploy > #13

Status Build #13 (13 Jul 2023, 06:38:18)

Changes (No changes)

Console Output (Started 3 min 21 sec ago, Took 1 min 22 sec)

Edit Build Information (Add description)

Delete build '#13'

Git Build Data (Started by user admin)

Previous Build (Revision: dcba624c911083349fa60758f81712e4c1a8f0629, Repository: https://github.com/sangitagit/Data.git, refs/remotes/origin/main)

Next Build

REST API Jenkins 2.401.2

Not secure | 3.16.82.129:8080/job/python-deploy/14/

PAY Citrix Receiver AMEX_Link Solve Monitor New HUB loc Citrix XenDesktop ... Citrix XenApp - Ap... Tesco Rewards & R... Cybersource Busine... Other bookmarks

Jenkins

Dashboard > python-deploy > #14

Status Build #14 (13 Jul 2023, 06:40:00)

Changes (No changes)

Console Output (Started 3 min 45 sec ago, Took 1 min 13 sec)

Edit Build Information (Add description)

Delete build '#14'

Git Build Data (Started by timer)

Previous Build (Revision: dcba624c911083349fa60758f81712e4c1a8f0629, Repository: https://github.com/sangitagit/Data.git, refs/remotes/origin/main)

Next Build

REST API Jenkins 2.401.2

10. Copy the EC2 instance of public IP address and use the assigned port number to search in the web browser

The screenshot shows the AWS CloudWatch Metrics interface. On the left, there's a sidebar with navigation links like EC2 Dashboard, EC2 Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, and Images. The main area displays a table titled 'Instances (1/5) Info' with columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, and Availability zone. One instance, 'Mypubec2' (i-02dc9c62cb7962fbb), is selected and highlighted with a blue border. At the bottom, a detailed view for the selected instance is provided, showing its Instance ID, Public IPv4 address (18.188.198.20), Private IPv4 addresses (10.0.1.9), Instance state (Running), and Public IPv4 DNS.

The screenshot shows a web browser window with a YouTube video player. The video title is 'Abalone-Age-Prediction-Yshu'. The video player interface includes a play button, a progress bar showing 0.00 / 1:28, and other standard video controls. To the right of the video player, there's a section titled 'Sample Image Of Abalone' which features a large, close-up image of a vibrant, iridescent abalone shell. Below the image, there's some descriptive text about the shell's healing properties.

us-east-2.console.aws.amazon.com/ec2/home?region=us-east-2#Instances:instanceState=running;v=3;\$case=true%5C;client=false;\$regex=...

New EC2 Experience Tell us what you think

EC2 Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images

Instances (1/5) Info

Find instance by attribute or tag (case-sensitive)

Instance state = running

Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Ava...
jenkins	i-038b3419d363bde6e	Running	t2.medium	2/2 checks passed	No alarms	us-e...
Mypubec2	i-02dc9c62cb7962fb	Running	t2.micro	2/2 checks passed	No alarms	us-e...
Mypubec2	i-09c68f1790aa8b778	Running	t2.micro	2/2 checks passed	No alarms	us-e...
Mypubec2	i-053f82d4ff409bc90	Running	t2.micro	2/2 checks passed	No alarms	us-e...

Instance: i-09c68f1790aa8b778 (Mypubec2)

Instance summary

Instance ID i-09c68f1790aa8b778 (Mypubec2)	Public IPv4 address 3.15.144.44 open address	Private IPv4 addresses 10.0.1.233
IPv6 address -	Instance state Running	Public IPv4 DNS -

Not secure | 3.15.144.44:8000

What is abalone?

What is abalone?

What is abalone?

Abalone-Age-Prediction-Yshu

Sample Image Of Abalone

abalone shell

The believed abalone healing properties of today are very similar to ancient beliefs of the shell. Abalone healing carries energies of protection and emotional balance. It brings with it a natural shielding that blesses the person holding it with tranquility.