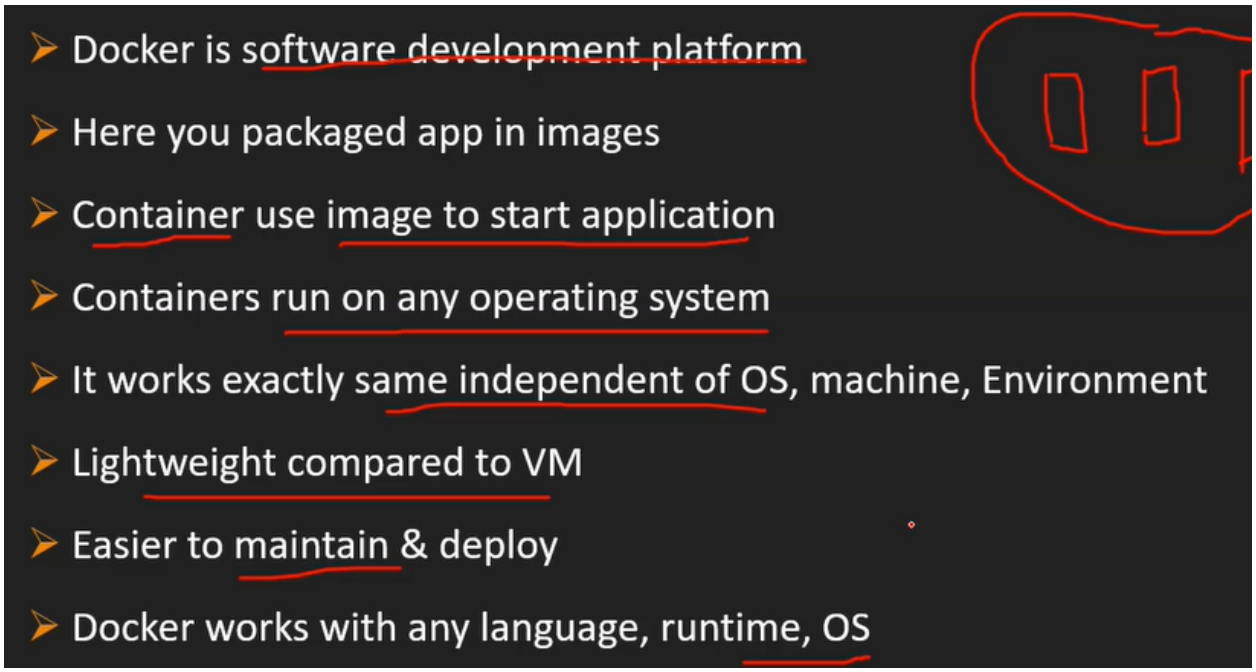
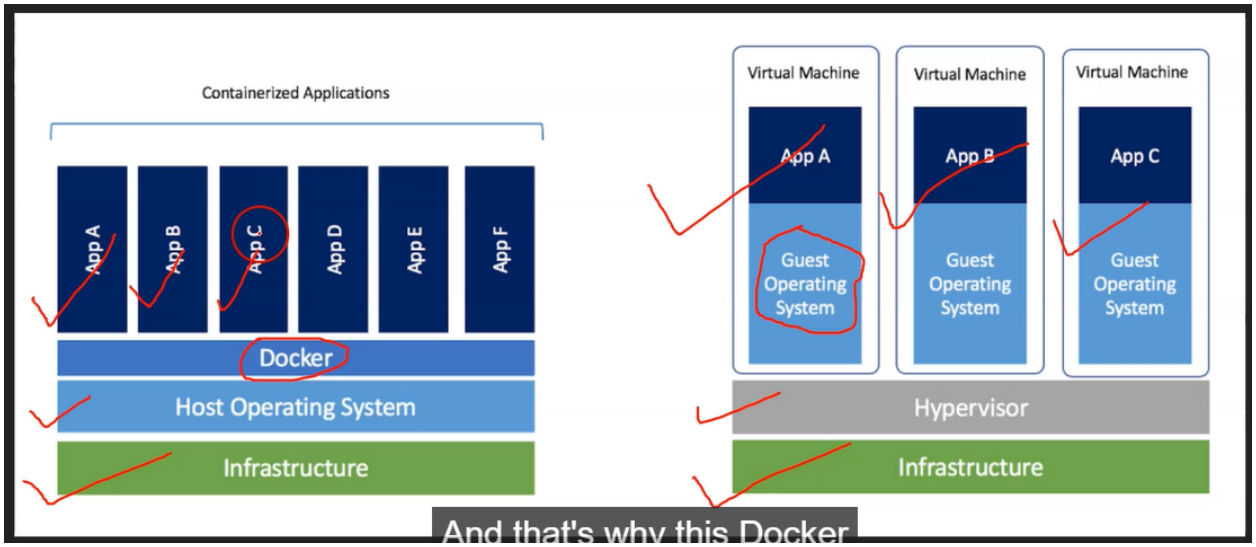
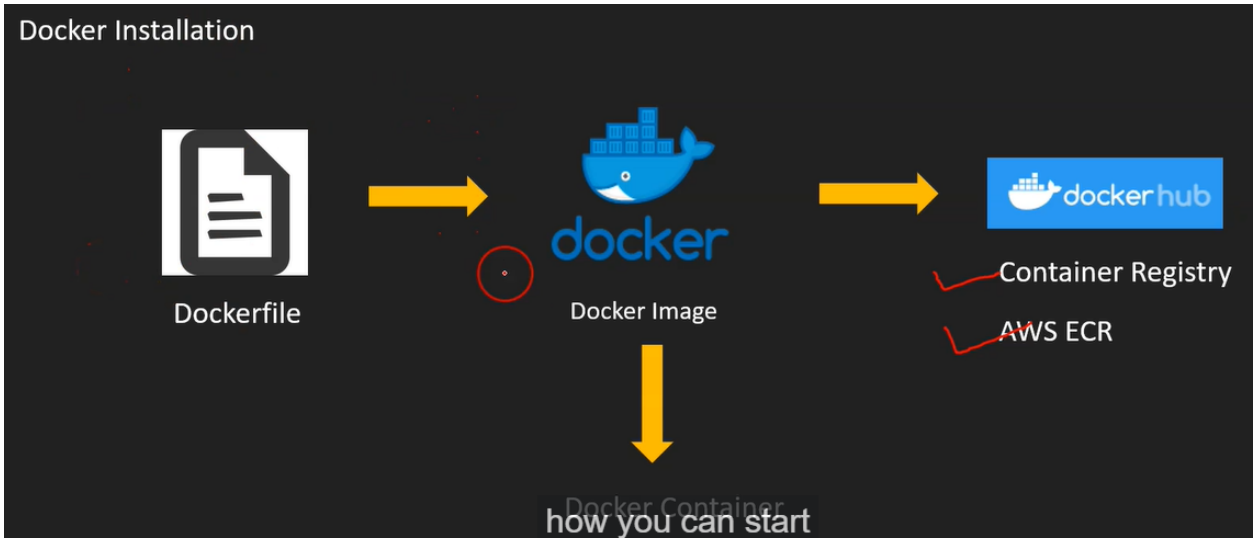
Docker :
Software development platform .



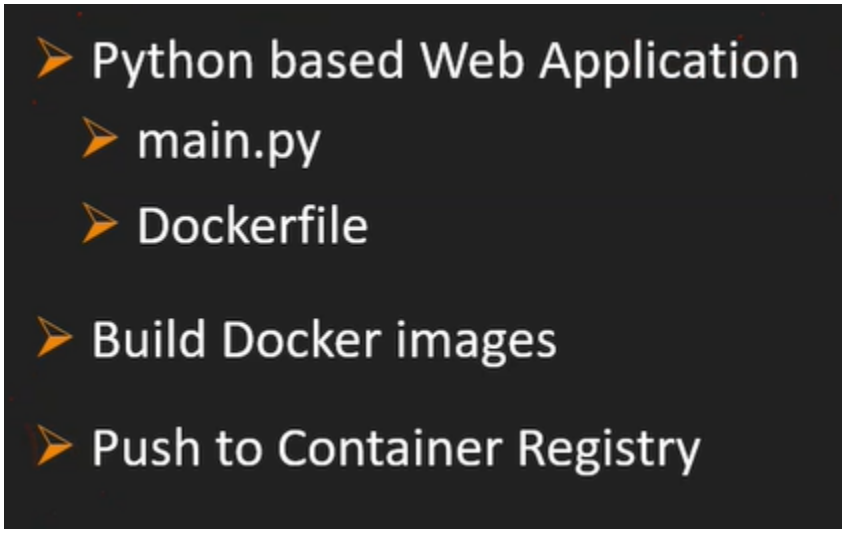
We install docker on any os and over that multiple containers can run .



Docker installation :
We are using docker in google cloud shell , where docker is already installed .
We need code - java , python etc . + docker file (instruction about how image will be built)
USing docker image to create a container . We can store containers in docker hub(public) / container registry .



Create a simple webapp - python based .
We will package and deploy applications as containers .



Open cloud shell
Check below tools :
python3 , flask

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ python
Python 3.9.2 (default, Feb 28 2021, 17:03:44)
[GCC 10.2.1 20210110] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> from flask import Flask
>>> exit()
```

Python and flask are installed in cloud shells .
Vi main.py

Create a simple flask application .

```
from flask import Flask

app = Flask(__name__)


app.route('/')
ef index():
    return 'Welcome to Python Flask World'


if __name__ == '__main__':
    app.run(host='0.0.0.0', port=8080)
```

Add this code to main.py

Python3 main.py - to run apps .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ python main.py
 * Serving Flask app 'main'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a productio
 * Running on all addresses (0.0.0.0)
 * Running on http://127.0.0.1:8080
 * Running on http://172.17.0.4:8080
Press CTRL+C to quit
127.0.0.1 - - [02/Jan/2023 14:52:48] "GET /?authuser=1&redirectedPreviously=true HTTP/1.1" 200 -
127.0.0.1 - - [02/Jan/2023 14:52:48] "GET /favicon.ico HTTP/1.1" 404 -
```

To run applications .
We tested the main.py application .
Lets package applications as docker images .

Create dockerfile for packaging application :
Check docker is installed in cloud shell > docker
Create a new directory and add the main.py file to the directory .

Creating DOCKERFILE :

When we package an application in dockerfile we have to add all steps .
In dockerfile : We need any linux image (fedora , centos , ubuntu etc .) ,
Search for python(version to be near similar as the one with which application is tested) images in docker hub .

DOCKERFILE :
FROM python:image_name - to download image
RUN pip install flask - to run command for installing flask
#now we have to add the main.py file to docker image env .
WORKDIR /myapp - this will create new directory inside our docker image
COPY main.py /myapp/main.py - this will copy the main.py application file to image .
CMD [“python”, “/myapp/main.py”] - cmd will run the service .

Build docker image from docker file .
Our python version is 3.9.2 so we will use docker python image similar to this version .
docker images - list all images present .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$
```

We can pull images from docker hub , lets pull hello world image .
docker pull hello-world .
It will use the latest tag , if we don't provide any tag then the latest tag will be applied .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ docker pull hello-world
Using default tag: latest
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:c77be1d3a47d0caf71a82dd893ee61ce01f32fc758031a6ec4cf1389248bb833
Status: Downloaded newer image for hello-world:latest
docker.io/library/hello-world:latest
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ docker images
REPOSITORY    TAG       IMAGE ID       CREATED         SIZE
hello-world   latest    feb5d9fea6a5   15 months ago   13.3kB
```

Now this hello-world image will be listed .
docker run image-name - to run image .

We created docker file

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ cat Dockerfile
FROM python:3.9.16-alpine3.16
RUN pip install flask
WORKDIR /myapp
COPY /home/student_00_e0786700983b/main.py /myapp/main.py
CMD ["python","/myapp/main.py"]
```

Got error : COPY failed: file not found in build context or excluded by .dockerignore: stat home/student_00_e0786700983b/main.py: file does not exist
With the above docker file .
Update docker file :

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ cat Dockerfile
FROM python:3.9.16-alpine3.16
RUN pip install flask
WORKDIR /myapp
COPY ./main.py /myapp/
CMD ["python","/myapp/main.py"]
```

Build docker image :
docker build -t gcr.io/project-id/image-name:tag-version . (location of dockerfile)

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ docker build -t gcr.io/qwiklabs-gcp-02-26437788c4e9/firstimage:v1.0 .
Sending build context to Docker daemon  26.11kB
Step 1/5 : FROM python:3.9-alpine
3.9-alpine: Pulling from library/python
c158987b0551: Pull complete
7ec3a91b66d9: Pull complete
a3a2c937b8a7: Pull complete
25083a7b8521: Pull complete
e2f7f5886088: Pull complete
Digest: sha256:8ea03bf88df73d21c72b3a941d1337c54357ee6386c2824f90b39a007792d1bb
Status: Downloaded newer image for python:3.9-alpine
 ---> d6d1ed462b20
Step 2/5 : RUN pip install flask
 ---> Running in f882cb24b5be
Collecting flask
  Downloading Flask-2.2.2-py3-none-any.whl (101 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 101.5/101.5 KB 4.5 MB/s eta 0:00:00
Collecting importlib-metadata>=3.6.0
  Downloading importlib_metadata-6.0.0-py3-none-any.whl (21 kB)
Collecting Werkzeug>=2.2.2
  Downloading Werkzeug-2.2.2-py3-none-any.whl (232 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 232.7/232.7 KB 24.1 MB/s eta 0:00:00
Collecting itsdangerous>=2.0
  Downloading itsdangerous-2.1.2-py3-none-any.whl (15 kB)
Collecting click>=8.0
  Downloading click-8.1.3-py3-none-any.whl (96 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 96.6/96.6 KB 14.4 MB/s eta 0:00:00
```

It will run all steps and create images .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-02-26437788c4e9)$ docker images
REPOSITORY                                          TAG       IMAGE ID       CREATED          SIZE
gcr.io/qwiklabs-gcp-02-26437788c4e9/firstimage      v1.0      e3282afb1dfe   44 seconds ago   60.3MB
python                                              3.9-alpine   d6d1ed462b20   3 weeks ago      48.8MB
hello-world                                         latest    feb5d9fea6a5   15 months ago    13.3kB
```

docker run

There are 2 ports .
hostport:containerport
Eventually our request will be sent to hostport not to the container port . It is the responsibility of the docker to direct traffic from the host to the container port . - we have to provide this flag in docker run

docker run -p 9090:8080 gcr.io/project-id/image-name:tag
Got site not reachable with above command .

```
Press CTRL+C to quit
^Cstudent_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker run -p 8080:8080 gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0
 * Serving Flask app 'main'
 * Debug mode: off
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://127.0.0.1:8080
 * Running on http://172.18.0.2:8080
Press CTRL+C to quit
172.18.0.1 - - [03/Jan/2023 14:36:33] "GET /?authuser=1 HTTP/1.1" 200 -
```

Use this command to check image running .
Our application will run on both 8080 and 9090 ports .
When we run the image it becomes a container .
docker ps -a - to check all containers running .

```
^Cstudent_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker ps -a
CONTAINER ID   IMAGE                                                COMMAND                  CREATED          STATUS                       PORTS     NAMES
f7e07b5e34cd   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   2 minutes ago    Exited (0) 19 seconds ago              reverent_solomon
7e8d74b274aa   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   3 minutes ago    Exited (0) 2 minutes ago               elegant_kare
ce9fa603dacb   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   4 minutes ago    Exited (0) 3 minutes ago               dazzling_herschel
```

We cannot remove the running container . first stop it .
docker stop container-id
docker rm container-id

Push docker image to container registry .
We will push the image to google cloud container registry .
docker push image-name:tag
In the container registry image will be added .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker push gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0
The push refers to repository [gcr.io/qwiklabs-gcp-04-1437425201d8/fimage]
976cfa7eb4f5: Pushed
0629985bd7c1: Pushed
08b0b1f28fde: Pushed
889b501db703: Layer already exists
eb33892ff2e6: Layer already exists
24316131c3c9: Layer already exists
f80ab90a8af0: Layer already exists
e5e13b0c77cb: Layer already exists
v1.0: digest: sha256:1e417883c63fbdff83931628becb781ef2189d8c6b7365bff6d38838fab4e7c6 size: 1993
```

We can update the main.py file and create a new version of the image and push it to the container registry .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ vi main.py
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker build -t  gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1 .
Sending build context to Docker daemon  18.43kB
Step 1/5 : FROM python:3.9.16-alpine3.16
 ---> 827d3c294622
Step 2/5 : RUN pip install flask
 ---> Using cache
 ---> bf7d7b231eea
Step 3/5 : WORKDIR /myapp
 ---> Using cache
 ---> cba06c68c6f2
Step 4/5 : COPY ./main.py /myapp/
 ---> 46334c000806
Step 5/5 : CMD ["python","/myapp/main.py"]
 ---> Running in e0c845c6ce17
Removing intermediate container e0c845c6ce17
 ---> 79badac246f7
Successfully built 79badac246f7
Successfully tagged gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1
```

Edit the main.py file and create a new version of the image .

```
Successfully tagged gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker run -p 8080:8080 gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1
 * Serving Flask app 'main'
 * Debug mode: off
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://127.0.0.1:8080
 * Running on http://172.18.0.2:8080
Press CTRL+C to quit
```

Run a new version of the image .

```
172.18.0.1 - - [03/Jan/2023 14:43:22] "GET /?authuser=1 HTTP/1.1" 200 -
^Cstudent_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker ps -a
CONTAINER ID   IMAGE                                                COMMAND                  CREATED              STATUS                          PORTS     NAMES
4a47aac2e9cd   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1   "python /myapp/main.…"   About a minute ago   Exited (0) 11 seconds ago                 agitated_elgamal
f7e07b5e34cd   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   8 minutes ago        Exited (0) 6 minutes ago                  reverent_solomon
7e8d74b274aa   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   9 minutes ago        Exited (0) 8 minutes ago                  elegant_kare
ce9fa603dacb   gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.0   "python /myapp/main.…"   10 minutes ago       Exited (0) 9 minutes ago                  dazzling_hersche
l
```

New version of the image is also running .

```
student_00_e0786700983b@cloudshell:~ (qwiklabs-gcp-04-1437425201d8)$ docker push gcr.io/qwiklabs-gcp-04-1437425201d8/fimage:v1.1
The push refers to repository [gcr.io/qwiklabs-gcp-04-1437425201d8/fimage]
6a5dca2f4cdb: Pushed
0629985bd7c1: Layer already exists
08b0b1f28fde: Layer already exists
889b501db703: Layer already exists
eb33892ff2e6: Layer already exists
24316131c3c9: Layer already exists
f80ab90a8af0: Layer already exists
e5e13b0c77cb: Layer already exists
v1.1: digest: sha256:c23ec19febb2f900dcdc76eadfcde43d9fc0725bb302110bb8f307118364f1ee size: 1993
```

Push the new version of the image to the container registry .

Both version of images will be pushed to container registry .