



# **SRI RAMAKRISHNA ENGINEERING COLLEGE**

[Educational Service: SNR Sons Charitable Trust]

[Autonomous Institution, Reaccredited by NAAC with 'A+' Grade]

[Approved by AICTE and Permanently Affiliated to Anna University, Chennai]

[ISO 9001-2015 Certified and all eligible programmes Accredited by NBA]

VATTAMALAIPALAYAM, N.G.G.O. COLONY POST,

COIMBATORE – 641 022



## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

### **20CS281– CLOUD COMPUTING LABORATORY**

### **LAB RECORD**

**ACADEMIC YEAR: 2022-2023**

**BATCH: 2020-2024**

**APRIL 2023**



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## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

### **BONAFIDE CERTIFICATE**

**Certified that this is the bonafide record of works done by Mr./Ms.**  
\_\_\_\_\_ **in 20CS281 - CLOUD COMPUTING**  
**LABORATORY of this Institution for VI Semester during the Academic Year**  
**2022 – 2023.**

#### **Faculty In-Charge**

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#### **HOD – CSE**

Dr. A. GRACE SELVARANI, Prof/Head

**Date:**

**Register Number:** \_\_\_\_\_

**Submitted for the VI Semester B.E.-CSE Practical Examination held on** \_\_\_\_\_  
**during the Academic Year 2022 – 2023.**

**Internal Examiner**

**Subject Expert**

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|-----------------|------------------------------------|
| <b>EX.NO: 1</b> | <b>DEPLOY A WEBSITE IN A CLOUD</b> |
| <b>DATE:</b>    |                                    |

**Aim:**

To create a website and deploy it in a cloud.

**Procedure:**

Step 1: Create a website using Html and CSS.

Step 2: Login in to the GitHub and create a new public repository named username.github.io, where username is your username (or organization name).

Step 3: After that upload your webpage files to the repository (Note the first page should be named as index.html).

Step 4: Then go to the browser and type the URL name as <https://username.github.io/> and the webpage will be displayed.

**Output:**


Create a new repository


A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

Owner \* Raghavendar-S / Repository name \* https://raghavendar-s.github.io/ ✓

Great repository names are short and unique. Your new repository will be created as <https://raghavendar-s.github.io/>. [tick?](#)

Description (optional)

☒  **Public**  
Anyone on the internet can see this repository. You choose who can commit.

☐  **Private**  
You choose who can see and commit to this repository.

Initialize this repository with:

Skip this step if you're importing an existing repository.

☒ **Add a README file**  
This is where you can write a long description for your project. [Learn more.](#)



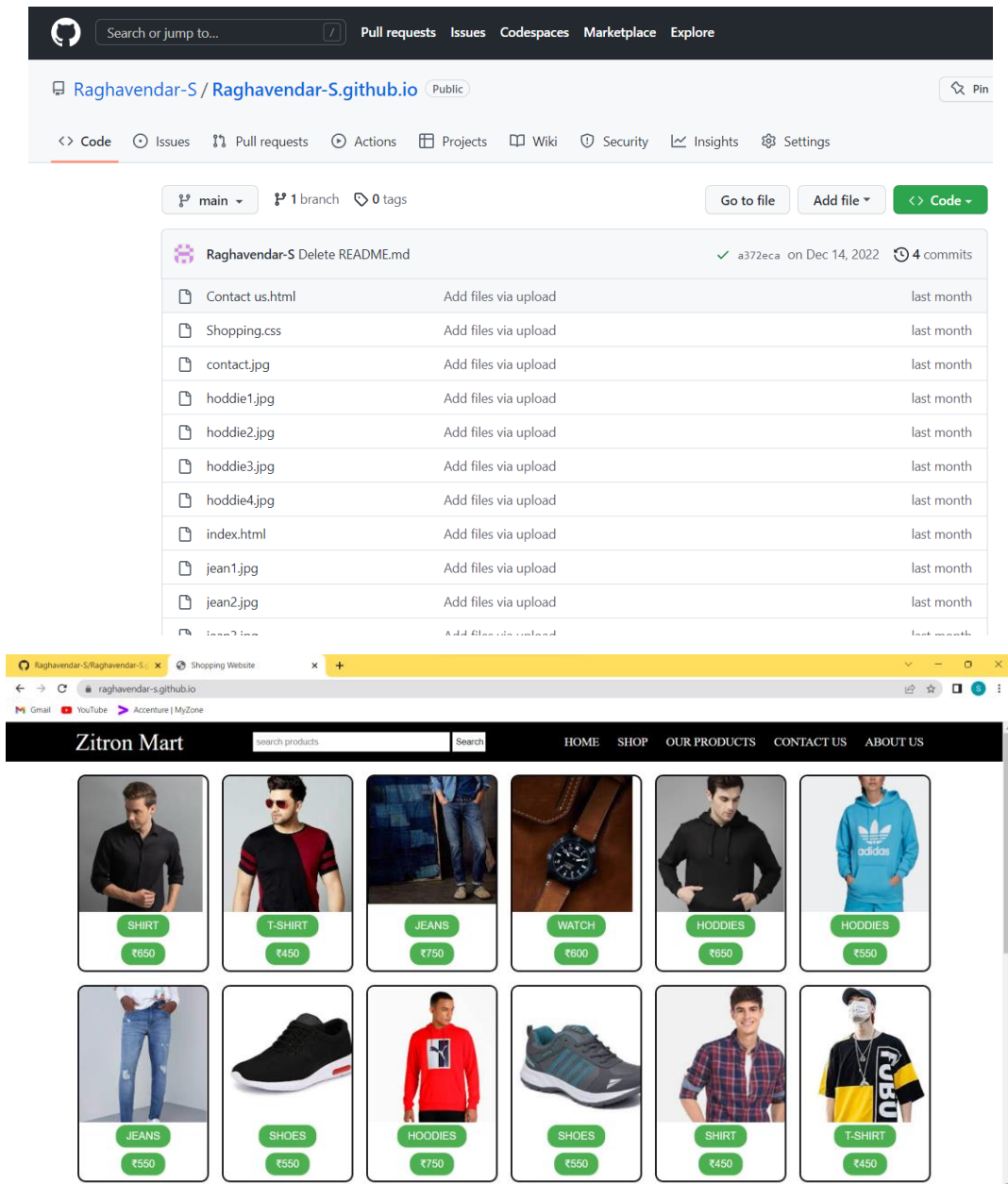
Sign in to GitHub

Username or email address

Password [Forgot password?](#)

**Sign in**

New to GitHub? [Create an account.](#)



**Result:**

Thus, a webpage is created and deployed it in the cloud.

|                 |  |
|-----------------|--|
| <b>EX.NO: 2</b> | <b>CREATION OF VIRTUAL MACHINE AND CHECK<br/>WHETHER IT HOLDS THE DATA EVEN AFTER RELEASE<br/>OF VIRTUAL MACHINE</b> |
| <b>DATE:</b>    |  |

***Aim:***

To create a Virtual machine and attach a Virtual Block to check whether it holds the data even after the release of virtual machine.

***Requirements:***

- Oracle virtual box
- Ubuntu ISO file

***Procedure:***

Step 1: Open the virtual box and install the Ubuntu OS in it.

Step 2: Power off the VM which you want to add virtual box

Step 3: Then right click on that VM, select settings.

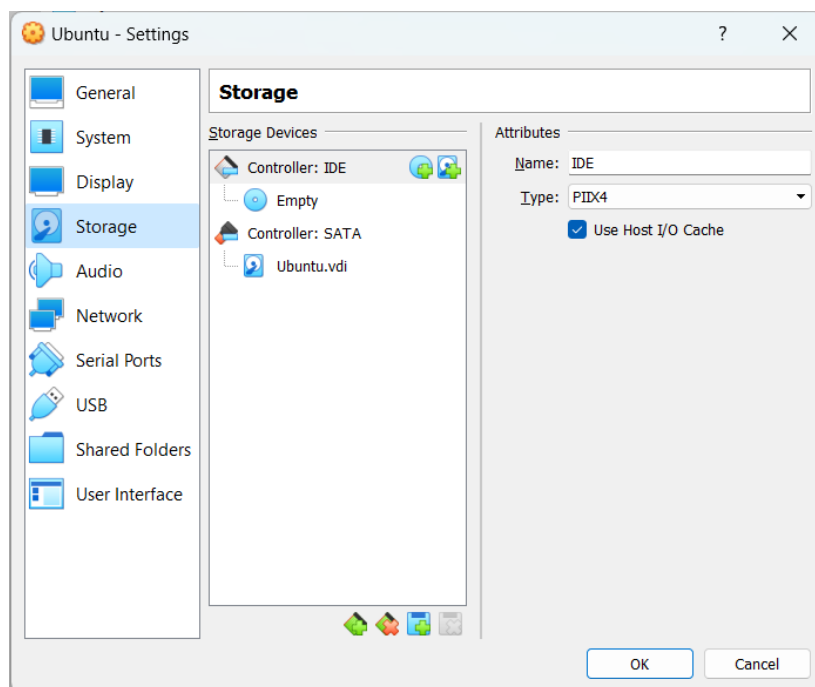
Step 4: Then click on storage, find controller IDE.

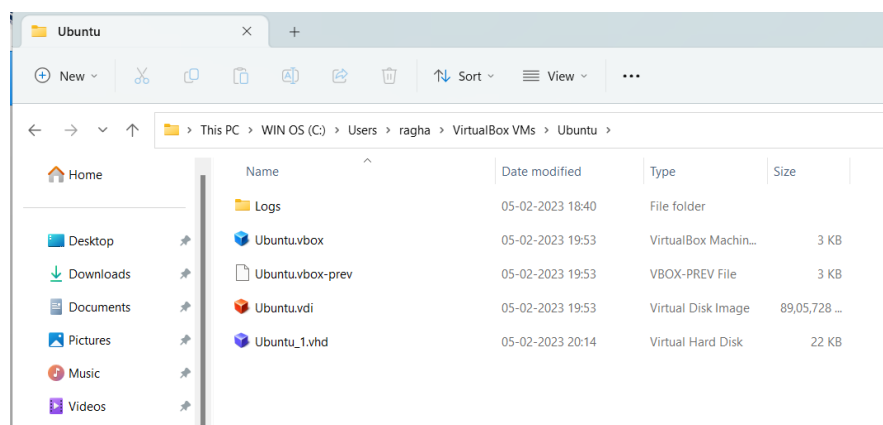
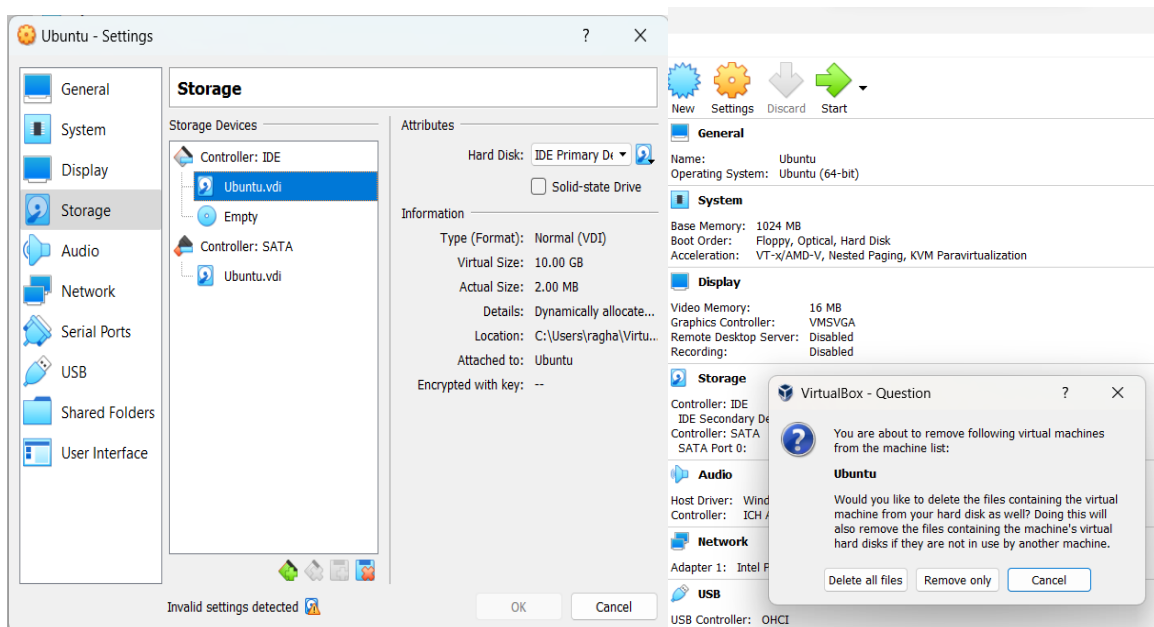
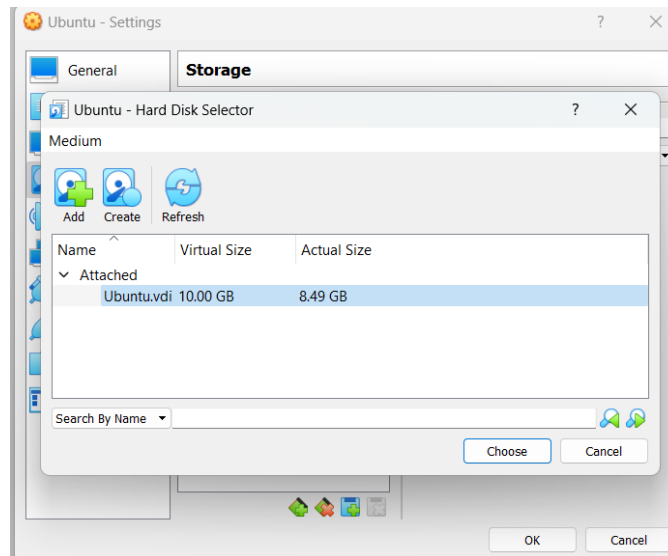
Step 5: In the top right find add hard disk icon, the pop-up window display

Step 6: On that window select create new disk, and then click next and next then finish.

Step 7: Then find attributes icon, hard disk as IDE secondary slave.

***Output:***





### Result:

Thus, a Virtual Block is attached to a Virtual Machine and checked whether it holds the data even after the release of virtual machine.

|                 |  |
|-----------------|--|
| <b>EX.NO: 3</b> | <b>INSTALLATION OF COMPILER IN A<br/>VIRTUAL MACHINE</b> |
| <b>DATE:</b>    |  |

**Aim:**

To install a compiler in the virtual Machine and execute a sample program in it.

**Requirements:**

- VMware Workstation Pro
- Ubuntu ISO file

**Procedure:**

Step 1: Login to the ubuntu OS and open the terminal.

Step 2: To check whether the gcc compiler is already installed or not use the command:

`gcc --version`

This command shows the version if gcc is installed or shows error if it is not installed.

Step 3: To install the gcc compiler use the command:

`sudo apt-get install gcc`  
`sudo apt-get install build-essential`

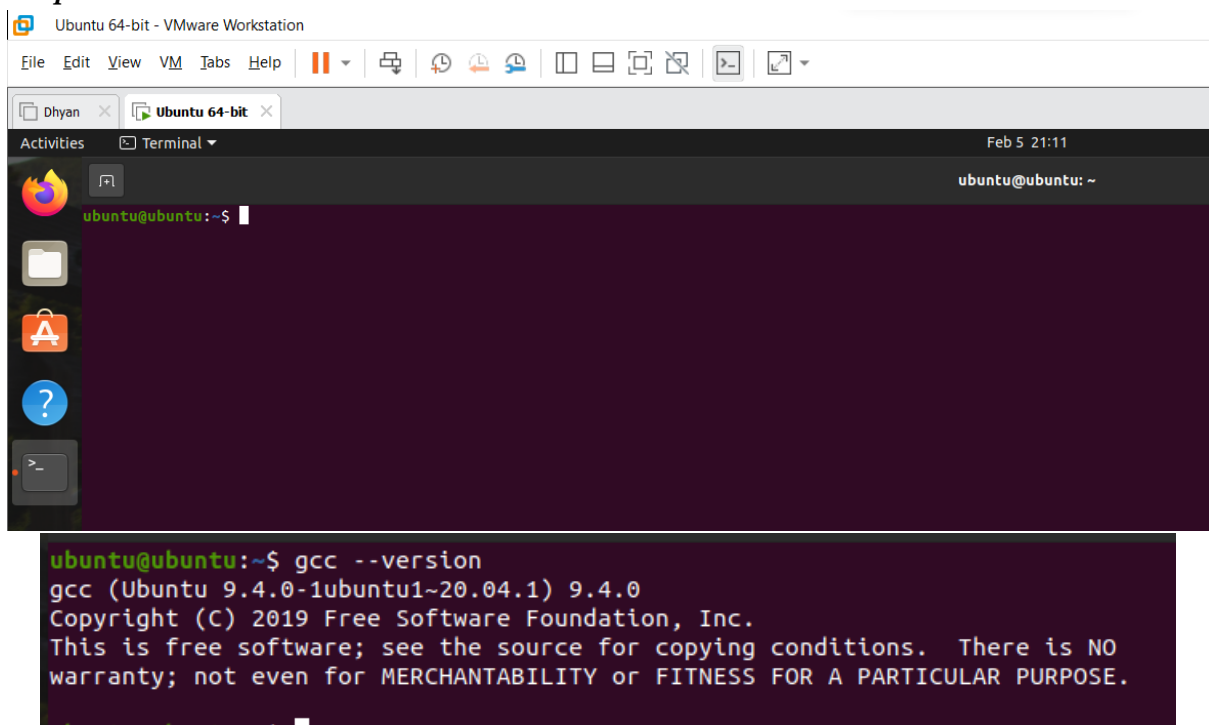
Step 4: To create a C program file then create a text file with extension .c using the command

`gedit hello.c`

Step 5: After creating the c program compile and run the program using the command:

`gcc hello.c`  
`./a.out`

**Output:**



```

ubuntu@ubuntu:~$ gcc --version
gcc (Ubuntu 9.4.0-1ubuntu1~20.04.1) 9.4.0
Copyright (C) 2019 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

```



```
ubuntu@ubuntu:~$ sudo apt-get install gcc
[sudo] password for ubuntu:
Reading package lists... Done
Building dependency tree
Reading state information... Done
gcc is already the newest version (4:9.3.0-1ubuntu2).
gcc set to manually installed.
The following packages were automatically installed and are no longer required:
  linux-headers-5.13.0-30-generic linux-hwe-5.13-headers-5.13.0-30 linux-image-5.13.0-30-generic linux-modules-5.13.0-30-generic linux-modules-extra-5.13.0-30-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 92 not upgraded.

ubuntu@ubuntu:~$ sudo apt-get install build-essential
Reading package lists... Done
Building dependency tree
Reading state information... Done
build-essential is already the newest version (12.8ubuntu1.1).
The following packages were automatically installed and are no longer required:
  linux-headers-5.13.0-30-generic linux-hwe-5.13-headers-5.13.0-30 linux-image-5.13.0-30-generic linux-modules-5.13.0-30-generic linux-modules-extra-5.13.0-30-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 92 not upgraded.
```

```
Open  hello.c
1 #include<stdio.h>
2 int main()
3 {
4     printf("Hello world");
5     return 0;
6 }
```

```
ubuntu@ubuntu:~$ gedit hello.c
^C
ubuntu@ubuntu:~$ gcc hello.c
ubuntu@ubuntu:~$ ./a.out
Hello worldubuntu@ubuntu:~$
```

### **Result:**

Thus, the C Compiler in the Virtual Machine is installed and a sample program is executed successfully.

|                 |  |
|-----------------|--|
| <b>EX.NO: 4</b> | <b>INSTALLATION OF DOCKER ENGINE AND COMPOSE</b> |
| <b>DATE:</b>    |  |

***Aim:***

To install a Docker Engine and compose it.

***Requirements:***

- Docker Desktop and Compose
- Docker Hub

***Description:***

***Docker:***

- Docker is a software platform that allows you to build, test, and deploy applications quickly.
- Docker packages software into standardized units called containers that have everything the software needs to run including libraries, system tools, code, and runtime.

***Docker compose:***

- Compose is a tool for defining and running multi-container Docker applications.
- With Compose, you use a YAML file to configure your application's services.
- Then, with a single command, you create and start all the services from your configuration.
- Compose works in all environments: production, staging, development, testing, as well as CI workflows.

***Procedure:***

***Docker Desktop Installation:***

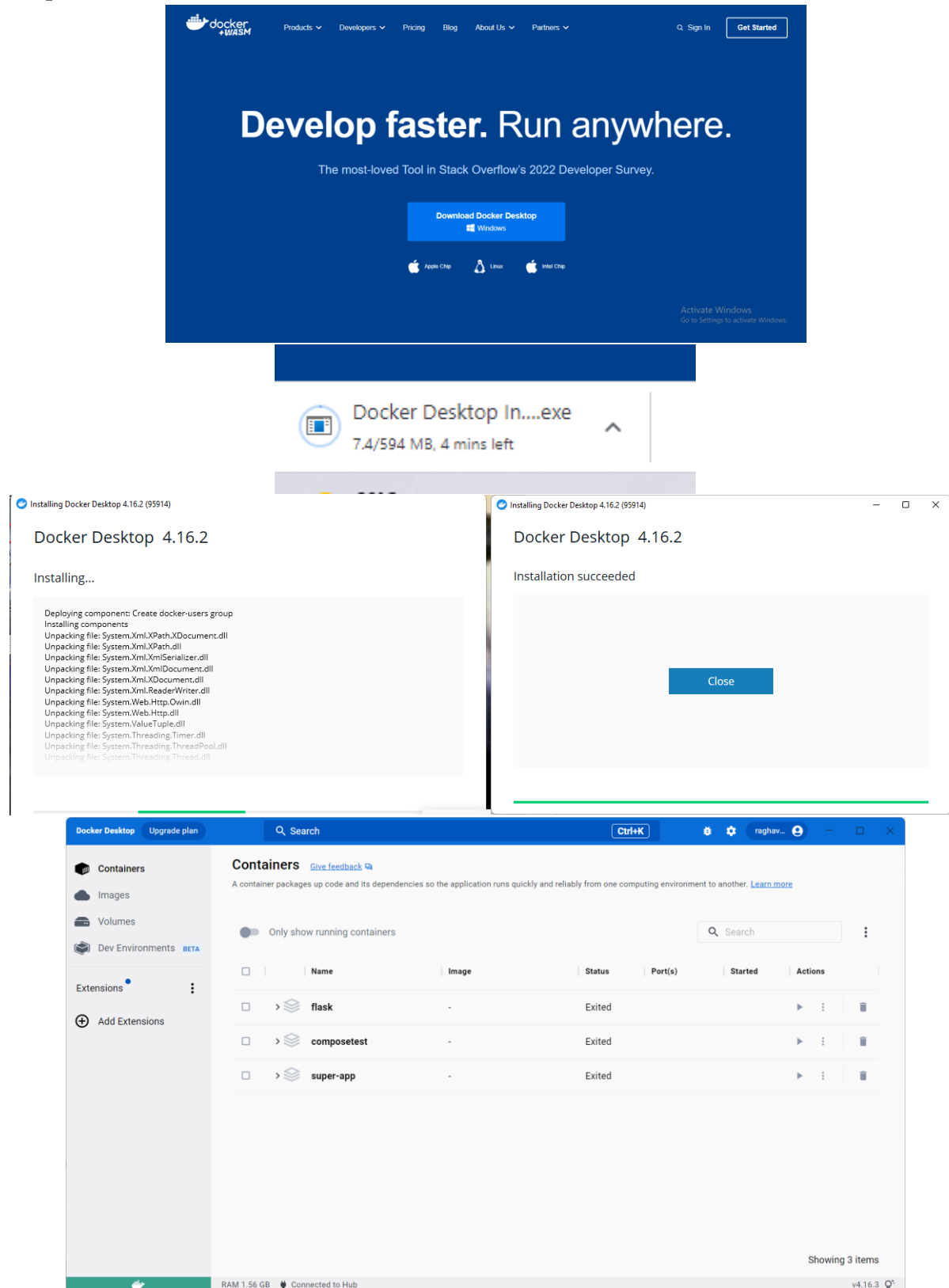
Step 1: Go to the website <https://www.docker.com/products/docker-desktop/> and download the docker desktop application for your operating system.

Step 2: Then click on the docker desktop installer and start installing it.

Step 3: After installing, click on Finish Button.

Step 4: Then go to the docker desktop application and accept the terms and conditions and finally your docker desktop is ready to use.

## Output:



## Result:

Thus, the docker desktop has been installed successfully.

|                 |   |
|-----------------|---|
| <b>EX.NO: 5</b> | <b>WRITING DOCKER FILE FOR SIMPLE APPLICATION DEVELOPMENT</b> |
| <b>DATE:</b>    |   |

***Aim:***

To write a Docker file to develop a simple application.

***Requirements:***

- Docker Desktop and Compose
- Docker Hub

***Procedure:***

Step 1: Define the application dependencies

1. Create a directory for the project:

```
$ mkdir composetest
```

```
$ cd composetest
```

2. Create a file called app.py in your project directory and paste the following code in:

```
import time
import redis
from flask import Flask
app = Flask(__name__)
cache = redis.Redis(host='redis', port=6379)
def get_hit_count():
    retries = 5
    while True:
        try:
            return cache.incr('hits')
        except redis.exceptions.ConnectionError as exc:
            if retries == 0:
                raise exc
            retries -= 1
            time.sleep(0.5)
```

```
@app.route('/')
def hello():
    count = get_hit_count()
    return 'Hello World! I have been seen { } times.\n'.format(count)
```

In this example, redis is the hostname of the redis container on the application's network. We use the default port for Redis, 6379.

3. Create another file called requirements.txt in your project directory and paste the following code in:

- flask

- redis

## Step 2: Create a Dockerfile

- The Dockerfile is used to build a Docker image. The image contains all the dependencies the Python application requires, including Python itself.
- In your project directory, create a file named Dockerfile and paste the following code in:

```
# syntax=docker/dockerfile:1
FROM python:3.7-alpine
WORKDIR /code
ENV FLASK_APP=app.py
ENV FLASK_RUN_HOST=0.0.0.0
RUN apk add --no-cache gcc musl-dev linux-headers
COPY requirements.txt requirements.txt
RUN pip install -r requirements.txt
EXPOSE 5000
COPY . .
CMD ["flask", "run"]
```

This tells Docker to:

- Build an image starting with the Python 3.7 image.
- Set the working directory to /code.
- Set environment variables used by the flask command.
- Install gcc and other dependencies
- Copy requirements.txt and install the Python dependencies.
- Add metadata to the image to describe that the container is listening on port 5000
- Copy the current directory. in the project to the workdir. in the image.
- Set the default command for the container to flask run.

## Step 3: Define services in a Compose file

- Create a file called docker-compose.yml in your project directory and paste the following:

```
version: "3.9"
services:
  web:
    build: .
    ports:
      - "8000:5000"
  redis:
    image: "redis:alpine"
```

- This Compose file defines two services: web and redis.
- The web service uses an image that's built from the Dockerfile in the current directory. It then binds the container and the host machine to the exposed port, 8000. This example service uses the default port for the Flask web server, 5000.
- The redis service uses a public [Redis](#) image pulled from the Docker Hub registry.

## Step 4: Build and run your app with Compose

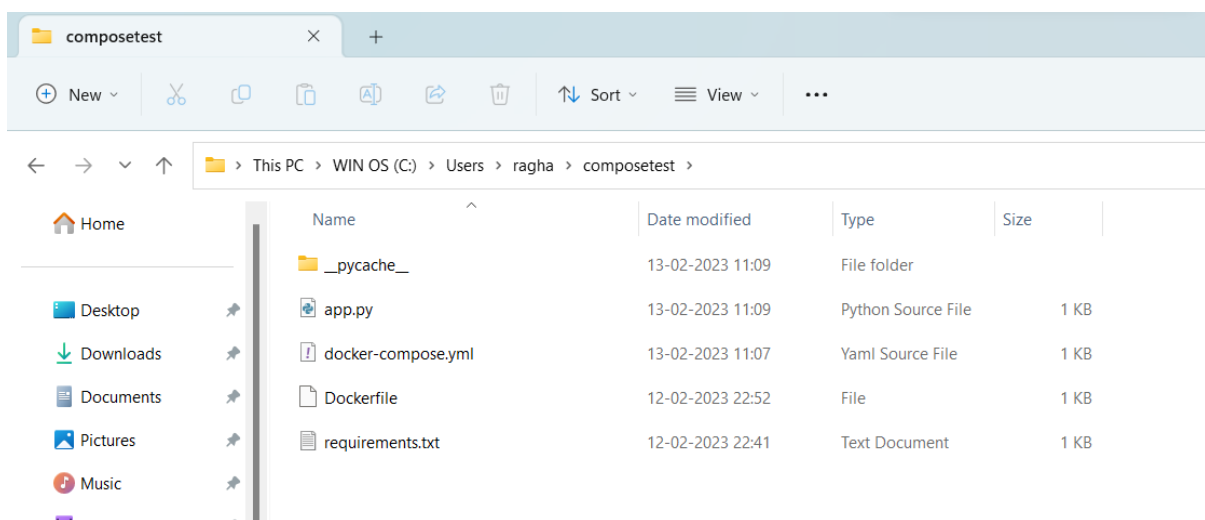
- From your project directory, start up your application by running docker compose up.

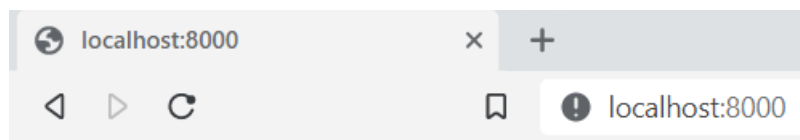
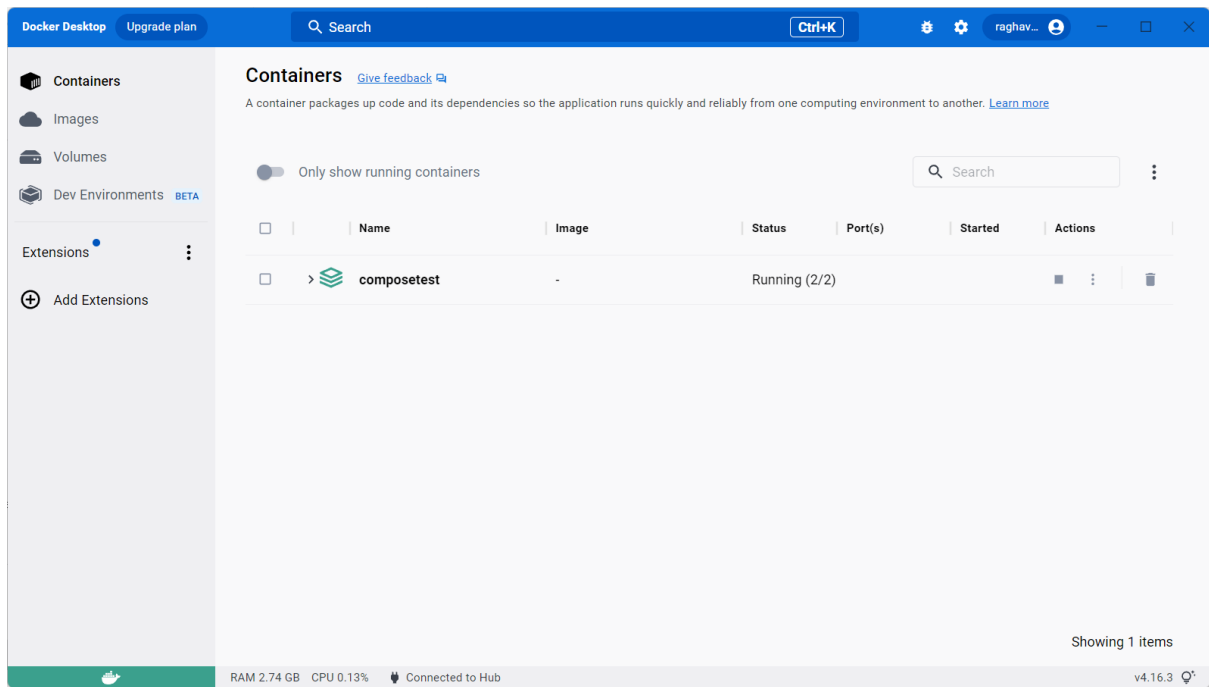
\$ docker compose up

- Compose pulls a Redis image, builds an image for your code, and starts the services you defined. In this case, the code is statically copied into the image at build time.
- Enter `http://localhost:8000/` in a browser to see the application running.
- If this doesn't resolve, you can also try `http://127.0.0.1:8000`.
- You should see a message in your browser saying:  
Hello World! I have been seen 1 time.
- Refresh the page. The number should increment.  
Hello World! I have been seen 2 times.

### Output:

```
C:\Windows\System32\cmd.exe X + v
C:\Users\ragha>mkdir composetest1
C:\Users\ragha>cd composetest
C:\Users\ragha\composetest>docker compose up
[+] Running 2/0
 - Container composetest-redis-1 Created 0.0s
 - Container composetest-web-1 Created 0.0s
Attaching to composetest-redis-1, composetest-web-1
composetest-redis-1 | 1:C 12 Feb 2023 17:35:45.830 # o000o000o000o Redis is starting o000o000o000o
composetest-redis-1 | 1:C 12 Feb 2023 17:35:45.830 # Redis version=7.0.8, bits=64, commit=00000000, modified=0, pid=1, just started
composetest-redis-1 | 1:C 12 Feb 2023 17:35:45.830 # Warning: no config file specified, using the default config. In order to specify a config file use red
is-server /path/to/redis.conf
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.831 * monotonic clock: POSIX clock_gettime
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.831 * Running mode=standalone, port=6379.
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.831 # Server initialized
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.831 # WARNING Memory overcommit must be enabled! Without it, a background save or replication may fail under
low memory condition. Being disabled, it can can also cause failures without low memory condition, see https://github.com/jemalloc/jemalloc/issues/1328. To
fix this issue add 'vm.overcommit_memory = 1' to /etc/sysctl.conf and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effec
t.
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * Loading RDB produced by version 7.0.8
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * RDB age 194 seconds
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * RDB memory usage when created 0.85 Mb
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * Done loading RDB, keys loaded: 1, keys expired: 0.
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * DB loaded from disk: 0.000 seconds
composetest-redis-1 | 1:M 12 Feb 2023 17:35:45.832 * Ready to accept connections
composetest-web-1 | * Serving Flask app 'app.py'
composetest-web-1 | * Debug mode: off
composetest-web-1 | WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
composetest-web-1 | * Running on all addresses (0.0.0.0)
composetest-web-1 | * Running on http://127.0.0.1:5000
composetest-web-1 | * Running on http://172.18.0.3:5000
composetest-web-1 | Press CTRL+C to quit
```





**Result:**

Thus, a simple application is developed with the help of docker file.

|                 |   |
|-----------------|---|
| <b>EX.NO: 6</b> | <b>PUSH AND PULL FROM/TO DOCKER HUB</b> |
| <b>DATE:</b>    |   |

**Aim:**

To perform a pull and push commands to Docker Hub.

**Requirements:**

- Docker Desktop and Compose
- Docker Hub

**Procedure:**

Step 1: First login to your Docker Hub and create a repository named as docker-demo.

Step 2: After that a new repository is created in your docker hub.

Step 3: Create a DockerFile and necessary packages. Start build the docker image using the command

`docker build -t your_directory_name:tag_name .`

Step 4: Then type the command `docker images` to check whether the image is successfully created or not.

Step 5: Then create a tag using the following command

`docker tag image_id docker_hub_username/repository_name:tag_name`

Step 6: Then type the command `docker images` to check whether the image is successfully created or not.

Step 7: Then push the image, use the following command

`docker push docker_hub_username/repository_name`

Step 8: To pull the image from repository, use the following command

`docker pull docker_hub_username/repository_name:tag_name`

**Output:**

The screenshot shows the Docker Hub 'Create repository' interface. The username 'raghav3322' is selected, and the repository name 'docker-demo' is entered. A description is provided: 'This repository is about a simple Hello World Page using Flask'. The visibility is set to 'Public'. A 'Pro tip' box displays the following CLI commands:

```
docker tag local-image:tagname new-repo:tagname
docker push new-repo:tagname
```

At the bottom, there are 'Cancel' and 'Create' buttons.



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raghav3322 / docker-demo

**Description**

This repository is about a simple Hello World Page using Flask

Last pushed: a few seconds ago

**Docker commands**

To push a new tag to this repository,

```
docker push raghav3322/docker-demo:tagname
```

**Tags**

VULNERABILITY SCANNING - DISABLED [Enable](#)

This repository is empty. When it's not empty, you'll see a list of the most recent tags here.

**Automated Builds**

Manually pushing images to Hub? Connect your account to GitHub or Bitbucket to automatically build and tag new images whenever your code is updated, so you can focus your time on creating.

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```
C:\Users\ragha\composetest>docker login
Authenticating with existing credentials...
Login Succeeded
```

```
C:\Users\ragha\composetest>docker build -t composetest:latest .
[+] Building 3.4s (17/17) FINISHED
=> [internal] load build definition from Dockerfile                                0.0s
=> => transferring dockerfile: 32B                                              0.0s
=> [internal] load .dockerignore                                                0.0s
=> => transferring context: 2B                                                  0.0s
=> resolve image config for docker.io/docker/dockerfile:1                    1.9s
=> [auth] docker/dockerfile:pull token for registry-1.docker.io              0.0s
=> CACHED docker-image://docker.io/docker/dockerfile:1@sha256:39b85bbfa7536a5feceb7372a0817649ecb2724562a38360f4 0.0s
=> [internal] load build definition from Dockerfile                                0.0s
=> [internal] load .dockerignore                                                0.0s
=> [internal] load metadata for docker.io/library/python:3.7-alpine          1.3s
=> [auth] library/python:pull token for registry-1.docker.io                 0.0s
=> [1/6] FROM docker.io/library/python:3.7-alpine@sha256:962a81cc5763f49326a48b5d36be1c3e824a53c05d9f57f054dcd8d 0.0s
=> [internal] load build context                                                0.0s
=> => transferring context: 212B                                               0.0s
=> CACHED [2/6] WORKDIR /code                                                  0.0s
=> CACHED [3/6] RUN apk add --no-cache gcc musl-dev linux-headers             0.0s
=> CACHED [4/6] COPY requirements.txt requirements.txt                        0.0s
=> CACHED [5/6] RUN pip install -r requirements.txt                          0.0s
=> CACHED [6/6] COPY . .                                                       0.0s
=> exporting to image                                                         0.0s
=> => exporting layers                                                         0.0s
=> writing image sha256:392257fb07a1888b90f81886b6fe8960530b1213a89c6b8987c14dfe55d92884 0.0s
=> naming to docker.io/library/composetest:latest                             0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them

C:\Users\ragha\composetest>docker images
REPOSITORY          TAG          IMAGE ID          CREATED          SIZE
composetest         latest      392257fb07a1     38 minutes ago  215MB
```

```
C:\Users\ragha\composetest>docker tag 392257fb07a1 raghav3322/docker-demo:latest
```

```
C:\Users\ragha\composetest>docker images
REPOSITORY          TAG          IMAGE ID          CREATED          SIZE
composetest         latest      392257fb07a1     39 minutes ago  215MB
raghav3322/docker-demo latest      392257fb07a1     39 minutes ago  215MB
```

```
C:\Users\ragha\composetest>docker push raghav3322/docker-demo
Using default tag: latest
The push refers to repository [docker.io/raghav3322/docker-demo]
c5bf3ddeac9a: Layer already exists
fc124490f06e: Layer already exists
9e689f319f4a: Layer already exists
9610745e2833: Pushed
1d06a5ea0a00: Layer already exists
157fa08f39ef: Layer already exists
0eb3a89ef0fe: Layer already exists
c9e377358a79: Layer already exists
f7cd9720fc7e: Layer already exists
7cd52847ad77: Layer already exists
latest: digest: sha256:710aac2ed70229be8da28e91a3b6d575989ce2f42ccd0efaa6331b6bf088e4d size: 2413
```

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**raghav3322 / docker-demo**

Description

This repository is about a simple Hello World Page using Flask

Last pushed: a few seconds ago

Docker commands

To push a new tag to this repository,

`docker push raghav3322/docker-demo:tagname`

[Public View](#)

Tags

VULNERABILITY SCANNING - DISABLED [Enable](#)

This repository contains 1 tag(s).

| Tag    | OS | Type  | Pulled | Pushed            |
|--------|----|-------|--------|-------------------|
| latest |    | Image | ---    | a few seconds ago |

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```

C:\Users\ragha>docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
composetest         latest             392257fb07a1       42 minutes ago     215MB
raghav3322/docker-demo latest             392257fb07a1       42 minutes ago     215MB
flask-web           latest             52bdd8b82ca7       4 days ago         60.4MB
composetest-web     latest             e263079e4ffa       4 days ago         215MB
super-app-super-app-php latest           3bece0924f89       4 days ago         455MB
super-app-super-app-dotnet latest          e412b7ee8401       5 days ago         217MB
super-app-super-app-python latest          6a7d3411b7af       5 days ago         436MB
super-app-super-app-node latest           43afee1c1ccf       5 days ago         248MB
<none>              <none>            9482071cf9d5       8 days ago         215MB
redis               alpine            aeeb92ae6202       9 days ago         29.9MB
mysql               8.0.28            f2ad9f23df82       10 months ago     521MB

C:\Users\ragha>docker rmi raghav3322/docker-demo
Untagged: raghav3322/docker-demo:latest
Untagged: raghav3322/docker-demo@sha256:710aac2ed70229be8da28e91a3b6d575989ce2f42ccd0efaaaf6331b6bf088e4d

C:\Users\ragha>docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
composetest         latest             392257fb07a1       43 minutes ago     215MB
flask-web           latest             52bdd8b82ca7       4 days ago         60.4MB
composetest-web     latest             e263079e4ffa       4 days ago         215MB
super-app-super-app-php latest           3bece0924f89       4 days ago         455MB
super-app-super-app-dotnet latest          e412b7ee8401       5 days ago         217MB
super-app-super-app-python latest          6a7d3411b7af       5 days ago         436MB
super-app-super-app-node latest           43afee1c1ccf       5 days ago         248MB
<none>              <none>            9482071cf9d5       8 days ago         215MB
redis               alpine            aeeb92ae6202       9 days ago         29.9MB
mysql               8.0.28            f2ad9f23df82       10 months ago     521MB

C:\Users\ragha>docker pull raghav3322/docker-demo:latest
latest: Pulling from raghav3322/docker-demo
Digest: sha256:710aac2ed70229be8da28e91a3b6d575989ce2f42ccd0efaaaf6331b6bf088e4d
Status: Downloaded newer image for raghav3322/docker-demo:latest
docker.io/raghav3322/docker-demo:latest

C:\Users\ragha>docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
composetest         latest             392257fb07a1       43 minutes ago     215MB
raghav3322/docker-demo latest             392257fb07a1       43 minutes ago     215MB

```

### Result:

Thus, the pull and push commands are performed in docker hub.

|                 |  |
|-----------------|--|
| <b>EX.NO: 7</b> | <b>RUNNING MULTIPLE DOCKER CONTAINERS USING<br/>DOCKER COMPOSE</b> |
| <b>DATE:</b>    |  |

***Aim:***

To run multiple Docker containers using docker compose.

***Requirements:***

- Docker Desktop and Compose
- Docker Hub

***Procedure:***

Step 1: Create a folder named react-java-mysql. Next, create a compose.yaml file.

Step 2: Create 3 folders frontend, backend and db where frontend consist of react app, backend consists of Spring (Java) and Maria as database.

Step 3: Create a docker-compose.yml file which consist of three services frontend, backend and database.

Step 4: After that compose the container using the command docker compose up. Then go to the localhost:3000 port. You can see your react app.

***Program:***

***Compose.yml***

services:

backend:

build: backend

restart: always

secrets:

- db-password

environment:

MYSQL\_HOST: db

networks:

- react-spring
- spring-mysql

depends\_on:

db:

condition: service\_healthy

db:

# We use a mariadb image which supports both amd64 & arm64 architecture

image: mariadb:10.6.4-focal

# If you really want to use MySQL, uncomment the following line

#image: mysql:8.0.19

environment:

- MYSQL\_DATABASE=example
- MYSQL\_ROOT\_PASSWORD\_FILE=/run/secrets/db-password

restart: always

```

healthcheck:
  test: ["CMD", "mysqladmin", "ping", "-h", "127.0.0.1", "--silent"]
  interval: 3s
  retries: 5
  start_period: 30s
secrets:
  - db-password
volumes:
  - db-data:/var/lib/mysql
networks:
  - spring-mysql
frontend:
  build:
    context: frontend
    target: development
  ports:
    - 3000:3000
  volumes:
    - ./frontend/src:/code/src
    - /project/node_modules
  networks:
    - react-spring
  depends_on:
    - backend
  expose:
    - 3306
    - 33060
volumes:
  db-data: {}
secrets:
  db-password:
    file: db/password.txt
networks:
  react-spring: {}
  spring-mysql: {}

```

### ***App.tsx***

```

import React, { useEffect, useState } from "react";
import logo from "./logo.svg";
import "./App.css";
type Greeting = {
  id: number;
  name: string;
};
function App() {
  const [greeting, setGreeting] = useState<Greeting>();
  useEffect(() => {

```

```

    fetch("/api")
      .then(res => res.json())
      .then(setGreeting)
      .catch(console.error);
  }, [setGreeting]);
return (
  <div className="App">
    <header className="App-header">
      <img src={logo} className="App-logo" alt="logo" />
      {greeting ? (
        <p>Hello from {greeting.name}</p>
      ) : (
        <p>Loading...</p>
      )}
    <p>
      Edit <code>src/App.tsx</code> and save to reload.
    </p>
    <a
      className="App-link"
      href="https://reactjs.org"
      target="_blank"
      rel="noopener noreferrer"
    >
      Learn React
    </a>
  </header>
</div>
);
}
export default App;

```

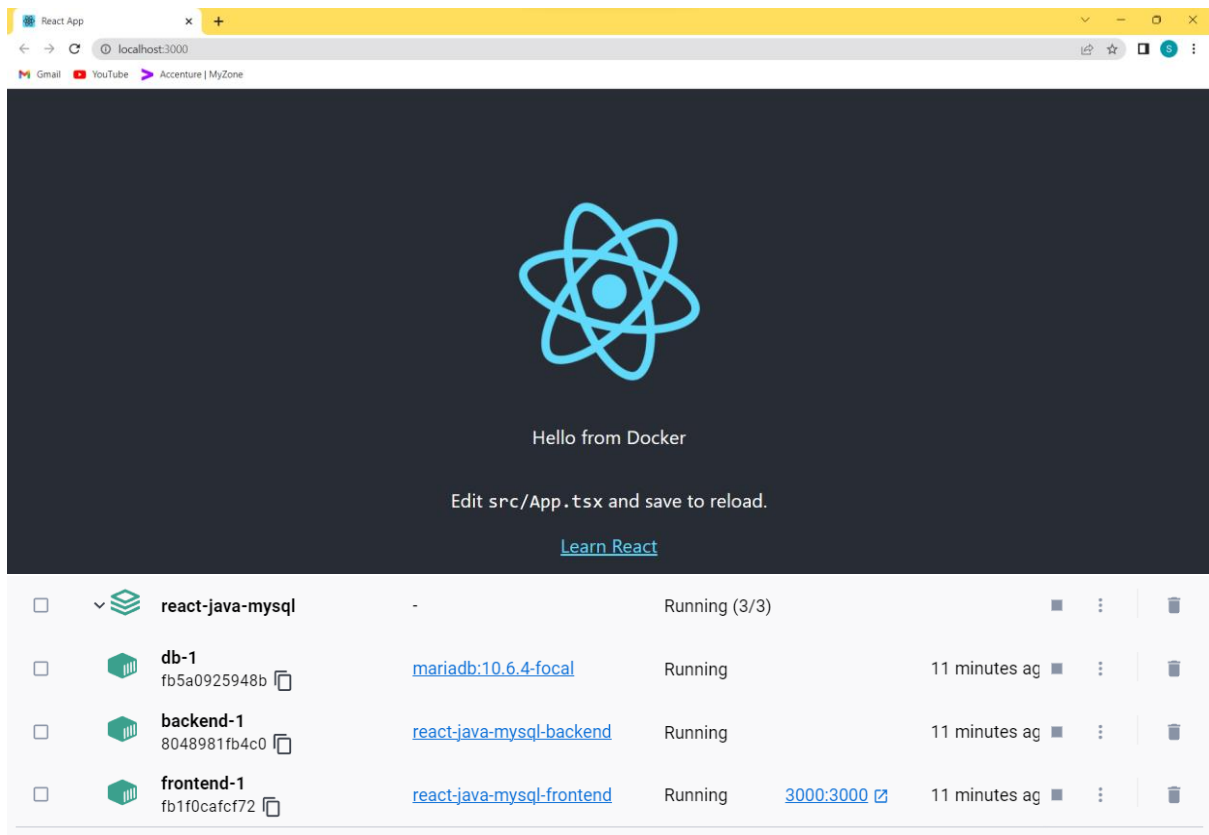
### **Output:**

```

C:\Users\ragha\react-java-mysql>docker compose up
[+] Running 11/11
 - db Pulled
   - 7b1a6ab2e44d Pull complete
   - 034655750c88 Pull complete
   - f0b757a2a0f0 Pull complete
   - 5c37daf8b6b5 Pull complete
   - b4cd9409b0f6 Pull complete
   - dbcda06785eb Pull complete
   - a34cd90f184c Pull complete
   - fd6cef4ce489 Pull complete
   - 3cb89a1550ea Pull complete
   - df9f153bd930 Pull complete
[+] Building 337.9s (39/39) FINISHED
=> [react-java-mysql-backend internal] load build definition from Dockerfile
=> => transferring dockerfile: 1.08kB
=> [react-java-mysql-frontend internal] load build definition from Dockerfile
=> => transferring dockerfile: 709B
=> [react-java-mysql-backend internal] load .dockerignore
=> => transferring context: 2B

```

| Name         | Date modified    | Type                | Size  |
|--------------|------------------|---------------------|-------|
| .docker      | 21-02-2023 19:24 | File folder         |       |
| backend      | 21-02-2023 19:24 | File folder         |       |
| db           | 21-02-2023 19:24 | File folder         |       |
| frontend     | 21-02-2023 19:24 | File folder         |       |
| compose.yaml | 10-01-2023 03:00 | Yaml Source File    | 2 KB  |
| output.jpg   | 10-01-2023 03:00 | JPG File            | 36 KB |
| README.md    | 10-01-2023 03:00 | Markdown Source ... | 4 KB  |



The screenshot shows a web browser window with the React logo and the text "Hello from Docker". Below the browser, the Docker Desktop interface displays a list of running containers:

| Container Name   | Image                     | Status        | Created        | Ports     |
|------------------|---------------------------|---------------|----------------|-----------|
| react-java-mysql | -                         | Running (3/3) | -              | -         |
| db-1             | mariadb:10.6.4-focal      | Running       | 11 minutes ago | -         |
| backend-1        | react-java-mysql-backend  | Running       | 11 minutes ago | -         |
| frontend-1       | react-java-mysql-frontend | Running       | 11 minutes ago | 3000:3000 |

### **Result:**

Thus, multiple containers have been successfully created using docker compose.

**EX.NO: 8**

**DATE:**

## EXPERIMENTS ON DOCKER SWARM

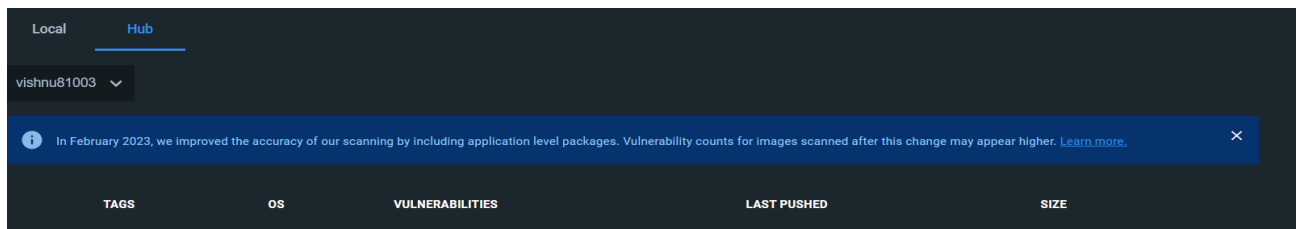
### Aim:

To create and manage docker swarm using Docker.

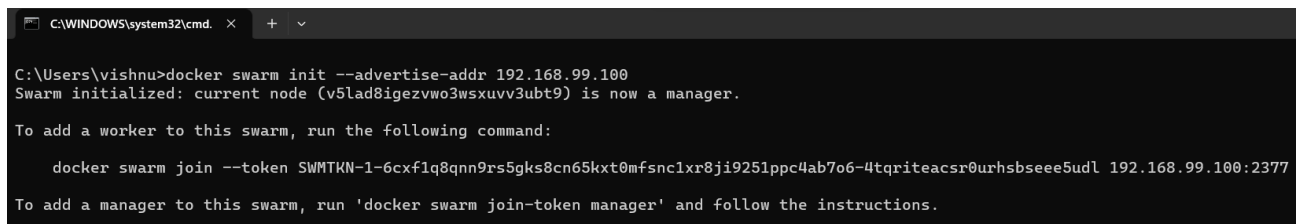
### Procedure:

Step 1: Start.

Step 2: Install Docker Desktop and Log in to your account on it.

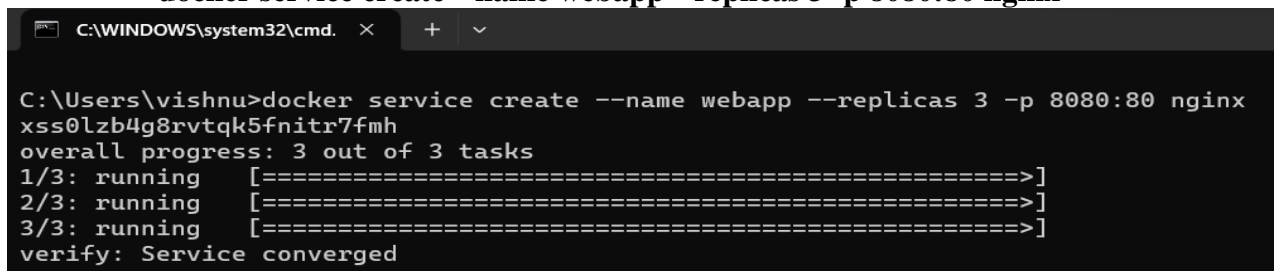


Step 3: To create a swarm specify an IP Address in which the swarm is needed to be created (Be careful that creating a swarm required firewall permissions).

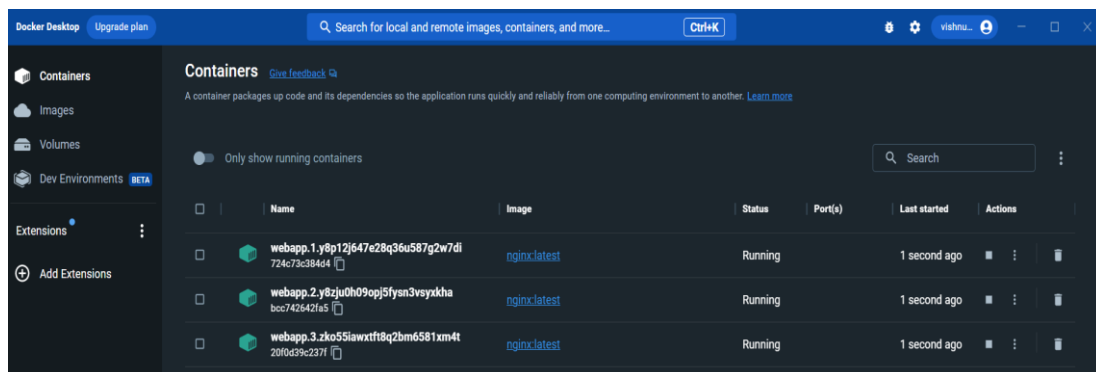


Step 4: Let's create a swarm service with the nginx image(ver.1.17.6) in the port 8080 named as webapp

**docker service create --name webapp --replicas 3 -p 8080:80 nginx**



### Docker Reflection:



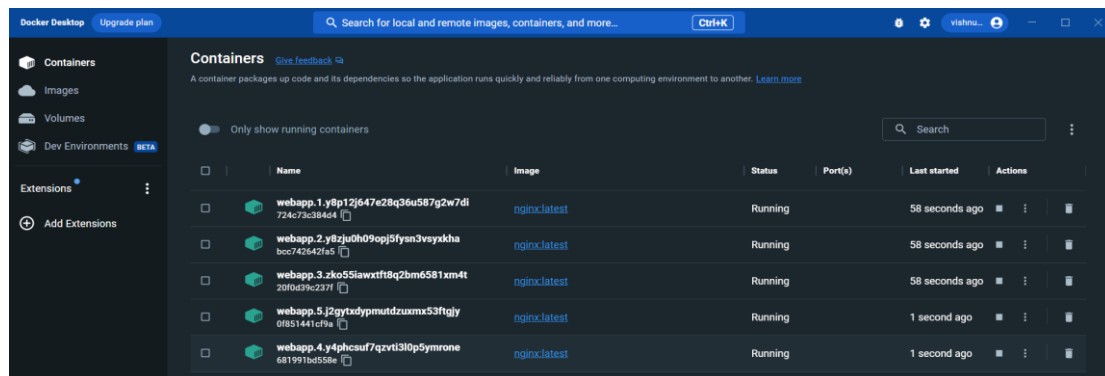
Step 5: The process we perform is that we create a copy of the images in the swarm using scaling command.

**docker service scale webapp=5**

```
C:\Users\vishnu>docker service scale webapp=5
webapp scaled to 5
overall progress: 5 out of 5 tasks
1/5: running
2/5: running
3/5: running
4/5: running
5/5: running
verify: Service converged
```

Two new containers will be formed as a replica of the previous nginx images

**Docker reflection:**



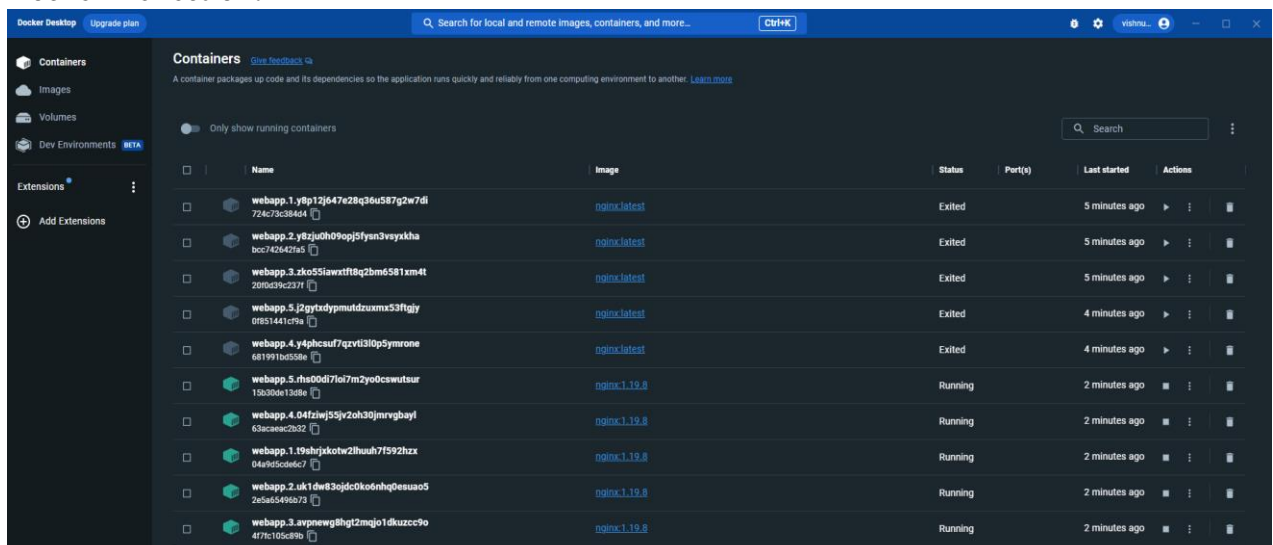
Step 6: Update the swarm containers with the new containers with the nginx image's next version 1.19.8

**docker service update --image nginx:1.19.8 webapp**

```
C:\Users\vishnu>docker service update --image nginx:1.19.8 webapp
webapp
overall progress: 5 out of 5 tasks
1/5: running
2/5: running
3/5: running
4/5: running
5/5: running
verify: Service converged
```

This process would stop all the running containers and run new containers with the updated versions on the swarm

**Docker Reflection:**





Step 7: We can manually delete all the containers in the docker desktop itself. but in the instance of swarm, we can't delete it directly so, we need find the swarm in which those images are created. (If u try to delete the containers in docker desktop created using the swarm it will automatically replicate itself. you could never stop the container from running)

#### Docker services ls --filter name=webapp

```
C:\Users\vishnu>docker service ls --filter name=webapp
```

| ID           | NAME   | MODE       | REPLICAS | IMAGE        | PORTS          |
|--------------|--------|------------|----------|--------------|----------------|
| xss0lzb4g8rv | webapp | replicated | 5/5      | nginx:1.19.8 | *:8080->80/tcp |

This displays all the details of the swarm

Step 8: Find all the containers running on the Swarm

#### Docker ps -a

```
C:\Users\vishnu>docker ps -a
```

| CONTAINER ID | IMAGE        | COMMAND                 | CREATED            | STATUS            | PORTS  | NAMES                               |
|--------------|--------------|-------------------------|--------------------|-------------------|--------|-------------------------------------|
| 543da95ba4d7 | nginx:1.19.8 | "/docker-entrypoint..." | About a minute ago | Up About a minute | 80/tcp | webapp.1.oiksgucacd1ss508vmdxt0jb   |
| ca0d19d2ee12 | nginx:1.19.8 | "/docker-entrypoint..." | 3 minutes ago      | Up 3 minutes      | 80/tcp | webapp.3.6xxjrvmanhktl8ngaj81qiqkv  |
| 0c9dd5fe004c | nginx:1.19.8 | "/docker-entrypoint..." | 4 minutes ago      | Up 4 minutes      | 80/tcp | webapp.2.tvcqthumoev9n9wobsdsagouzq |
| 2839b7ddcf01 | nginx:1.19.8 | "/docker-entrypoint..." | 4 minutes ago      | Up 4 minutes      | 80/tcp | webapp.5.ui5d7gdm4zv4lx9hsardy470   |
| 32625b9ccc9a | nginx:1.19.8 | "/docker-entrypoint..." | 4 minutes ago      | Up 4 minutes      | 80/tcp | webapp.4.8jnrnk41264bce9khdbrz16r   |

This command displays all the running and stopped containers in the swarm. "-a" is used to display all the containers that aren't in the working(running) state.

Step 9: After the tasks is been completed exit from the swarm to relieve the IP Address.

#### Docker swarm leave --force

```
C:\Users\vishnu>docker swarm leave --force
Node left the swarm.
```

If you don't leave the swarm, you couldn't be able to run any other images or process in the local machine/docker.

Step 10: After the process is completed remove all the volumes of the containers so that the spaces occupied by those images and containers would be freed up.

#### Docker system prune -a --volumes

```
C:\Users\vishnu>docker system prune -a --volumes
WARNING! This will remove:
- all stopped containers
- all networks not used by at least one container
- all volumes not used by at least one container
- all images without at least one container associated to them
- all build cache

Are you sure you want to continue? [y/N] y
Deleted Containers:
f0b11de2721db394d9f6d641876c8444a4feb77c42910dbf5a33c707bb9330e1
ec6e0ad910185a3defb9cbe2640656f1fb3808865249073ab637f49fbbab6b489
15a89e1945c4a34852e86327e74d0d7a69b47519bcb9c48b909a7df95167a9e
6c8148bba1d429ad21b08385d19af4863c7eaf31718b6d617488f824eadc79f1
2f8189f55dce587884ce3eb824e1a5b6f3a2b697858b58875f857e410a6ace3b850
bd7dfe28a225b8960799c9d52c05f3d5b727f535c89db3845032ba681005a442
ac467f75457fe322b4780a2d7d337a19805e836787cf25430ac039f5030d9c91
936526cc832fafce7d61f485973a856e4c02e9875769b6d2d0de632d8aba5714
c066d3efc3e3190420ca68feb383d65fb432526e60ca288eb59ee6bda12fcb9e
11651904a1ab3908bfcdd5f2d5277ea94d74e3aee18d7e559d5c250949db763
3c51406ef6c9c3634f4163bce7d7402db6504b46fe84451ee57ed88a2999d58a
b4e67601a23074dfe7b2f8b19674a87a505f515fee69564c8e974cce5d3cfb5b
93f4fd4ae13a45f053a9b16853310de4aa282fb7b4a29c7d39bda0d59a591e5e
f905ebb4435e5ceb9c7cf5e19c675216ae61cd81499cf9d4da0de2ef6e12a701
7a0b0b57ec9513a420d334ca977ec053a61a80a6ff6d74b201d5ad6cccd646fc
6028e777b61f5528331b5f7e22abe3b4910cbdea6649bcb2a64bd4f42eeb1c448
27fdd4d56e46915a4dbf64e241cc26d039a9a8991611caa0ab3c8bbcd1d3688bc
c423fa36b886fb7b61f0f99153f1edabf36c10c3f87c8b6f346bccdf36ca6bd0
d8b87321284fd317694cfb7acbffde8277c15e6d4af865b28c5ffe168a2eb017
34e8d671107491240ecfd4338217517bc541284ed81a406763e7097db7978a2b5
bd20823b3c244a9a8be849e81ca3563bc75e99a0517973fd7ca1c6a4b436252b
dd0a0b326ef1edcf8e51e716c1f732b5f9a034def9a114ad59120def1d17a8fa
84bc021063e0ea37e5f1ae43a00f89c904797e9a8a9e52814054bf5cd1b5a00e
8e3a006092cf166de04dbfe41791d1c499f81958a3165942c7768223dc9bb084

Deleted Networks:
my-network
```

```

Deleted Images:
untagged: docker/desktop-vpnkit-controller:v2.0
deleted: sha256:8c2c38aa676e97e57b4c8385bcbcd340a933fafcc5f6cc508d2a3a005b74cb8
deleted: sha256:00bee617592167c296c5c286986d34dd40d35be095146227a394a53290785657
untagged: registry.k8s.io/etcd:3.5.5-0
deleted: sha256:4694d02f8e611efdffe9fb83a86d9d2969ef57b4b56622388eca6627287d6fd6
deleted: sha256:ca4a0f789280cf8c3c58182905cbe24ec9d6336065660480c5ec210577ca9ba1
deleted: sha256:b103fe33d253852f98cb035eb6840e5081d1b4d77fd9442cb13a48a017362750
deleted: sha256:f5ea95f09f85a0d1bb5c5a6ac48473dfcee8db4bfeb6d724580571ab2e0de407
deleted: sha256:877cf3f528e4de3b3276d13a95d6fdb4cb0939f92c4b1a7df676465ed847088f
deleted: sha256:fa9b438e48f4d7a186affe9140032e419ec1891e18ab876609b796902498366b
untagged: kubernetesui/dashboard:v2.6.0
untagged: kubernetesui/dashboard@sha256:4af9580485920635d888efe1edd6d67e12f9d5d84dba87100e93feb4e46636b3
deleted: sha256:1042d9e0d8fcc64f2c6b9ade3af9e8ed25fa04d18d83d0b3650ad7636534a9
deleted: sha256:40ec3a173138951d608c6c60332682f95f6e0803028a0c8cfabbee8f4f07a54c
deleted: sha256:e303f29bbae253e878ac6f83a04bb75308abf14f04010a5c2e41297bb3dc6a4d
untagged: registry.k8s.io/kube-scheduler:v1.25.4
deleted: sha256:e2d1ec744c16f1ee6d8b676fec571faee36b16261d367670492ae4f472cfe9
deleted: sha256:ea36a5bb4072df2584c47209a11213ea42626c2b6b1642cd57d0a2be88b01b8f
untagged: registry.k8s.io/kube-apiserver:v1.25.4
deleted: sha256:00631e54acha3a4d507a9f7b7095a81151b8a8f909f93e50f64269ea39daf2cf
deleted: sha256:7670dc5a8813ad26baef681e11acbd8c8c6db72fd19d246871d8defae8af0ae
untagged: kubernetesui/metrics-scraper:v1.0.8
untagged: kubernetesui/metrics-scraper@sha256:76049887f07a0476dc93efc2d3569b9529bf982b22d29f356092ce206e98765c
deleted: sha256:115053965e86b2df4d78af78d7951b8644839d20a03820c6df59a261103315f7
deleted: sha256:cff214f0d75059c2b4fbc5bbd1193f8dfcd56dff0cb694dcfce26a907f92ec2
deleted: sha256:d01384fea991c7bac1249edc4ad75507ea8f4eececc71c779a3f9d787ad8d5b0
untagged: docker/desktop-storage-provisioner:v2.0
deleted: sha256:99f89471f4708f1173e688f7f77bf6b995b10355a46cc388b273b0130add7aad
deleted: sha256:ac642f643aa36f89e4314102ad90aee3e82f8ed6ced8568e256294f78cc4d74
untagged: registry.k8s.io/coredns/coredns:v1.9.3
deleted: sha256:5185b96f0becf59032b8e3646e99f84d9655dff3ac9e2605e0dc77f9c441ae4a
deleted: sha256:e99a82a659f95954fb241f8811974cb66ace6161c42fa4d8e1dc0d35b09397a5
deleted: sha256:256bc5c338a684323ce8b6f58f1b0d0573f5137e610e7b0a05bc4460d9ea0219
untagged: registry.k8s.io/kube-controller-manager:v1.25.4
deleted: sha256:8f59f6d4aed60b6613fdb2b50a9dd31584e52f56513b01ce4bb779da5ee0cbd1
deleted: sha256:4343e3f0a3124218956707ec3317bb579f1201336a0893f444ed13ad83c23400
deleted: sha256:251251726900a10507811411f71e60d9efc09d1f45fc9c47bbeedc40b9336c67
deleted: sha256:f3d1c6badec91c053775deb21a1af846ab7a884255ee85c97abeadd265577122d
untagged: registry.k8s.io/kube-proxy:v1.25.4
deleted: sha256:2c2bc1864279016154930e10764b82f3ba0e24e5beb650c062e6cab20241eebf
deleted: sha256:b10aebb7c8643a5a9d11cfb26595d4f178e49b88254c9e6c048672dacdf046733
deleted: sha256:e4d19dd12df2042fd4dd860b2af2074b3cbdd7e88dc4c3a6c92912d420e918da
untagged: registry.k8s.io/pause:3.8
deleted: sha256:4873874c08efc72e9729683a83fbb7502ee729e9a5ac097723806ea7fa13517
deleted: sha256:961e93cda9dd918dbe26aca24cccd6c5db05176850d2c53476d881df5d0d4816

Total reclaimed space: 1.052GB

```

All the disk spaces occupied by the swarms' and its containers are removed and deleted completely.

### **Result:**

Thus, the Docker Swarm has been created and executed successfully.

**EX.NO: 9**

## **DEVELOPMENT OF SIMPLE EXPERIMENTS USING MINIKUBE**

**DATE:**

### ***Aim:***

To develop simple experiment using Kubernetes Minikube.

### ***Procedure:***

Step 1: Start.

Step 2: Install Kubernetes (Kubectl) from the official documentation page and then install Minikube in the system and set the path for the environment variable.

Step 3: Start the Minikube cluster

### **Minikube start**

```
$ start.sh
Starting Kubernetes...minikube version: v1.18.0
commit: ec61815d60f66a6e4f6353030a40b12362557caa-dirty
* minikube v1.18.0 on Ubuntu 18.04 (kvm/amd64)
* Using the none driver based on existing profile


X The requested memory allocation of 2200MiB does not leave room for system overhead (total system memory: 2460MiB). You may face stability issues.
* Suggestion: Start minikube with less memory allocated: 'minikube start --memory=2200mb'

* Starting control plane node minikube in cluster minikube
* Running on localhost (CPUs=2, Memory=2460MB, Disk=194868MB) ...
* OS release is Ubuntu 18.04.5 LTS
* Preparing Kubernetes v1.20.2 on Docker 19.03.13 ...
  - kubelet.resolv-conf=/run/systemd/resolve/resolv.conf
  - Generating certificates and keys ...
  - Booting up control plane ...
  - Configuring RBAC rules ...
* Configuring local host environment ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v4
* Enabled addons: default-storageclass, storage-provisioner
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
  - Using image k8s.gcr.io/metrics-server-amd64:v0.2.1
* The 'metrics-server' addon is enabled
  - Using image kubernetesui/dashboard:v2.1.0
  - Using image kubernetesui/metrics-scraper:v1.0.4
* Some dashboard features require the metrics-server addon. To enable all features please run:

    minikube addons enable metrics-server

* The 'dashboard' addon is enabled
Kubernetes Started
```

### ***Kubernetes Dashboard:***

| Service   |           |  |            |   |                    |               |
|---|-----------|--|------------|---|--------------------|---------------|
| Services  |           |  |            |   |                    |               |
| Name  | Namespace | Labels                                       | Cluster IP | Internal Endpoints                        | External Endpoints | Created ↑     |
|  <b>kubernetes</b> | default   | component: apiserver<br>provider: kubernetes | 10.96.0.1  | kubernetes:443<br>TCP<br>kubernetes:0 TCP | -                  | 5 minutes ago |
| 1 - 1 of 1  < < > >   |           |  |            |   |                    |               |

Step 4: If the cluster is started correctly then, obtain the information of all the clusters running in that deployment

### **Kubectl cluster-info**

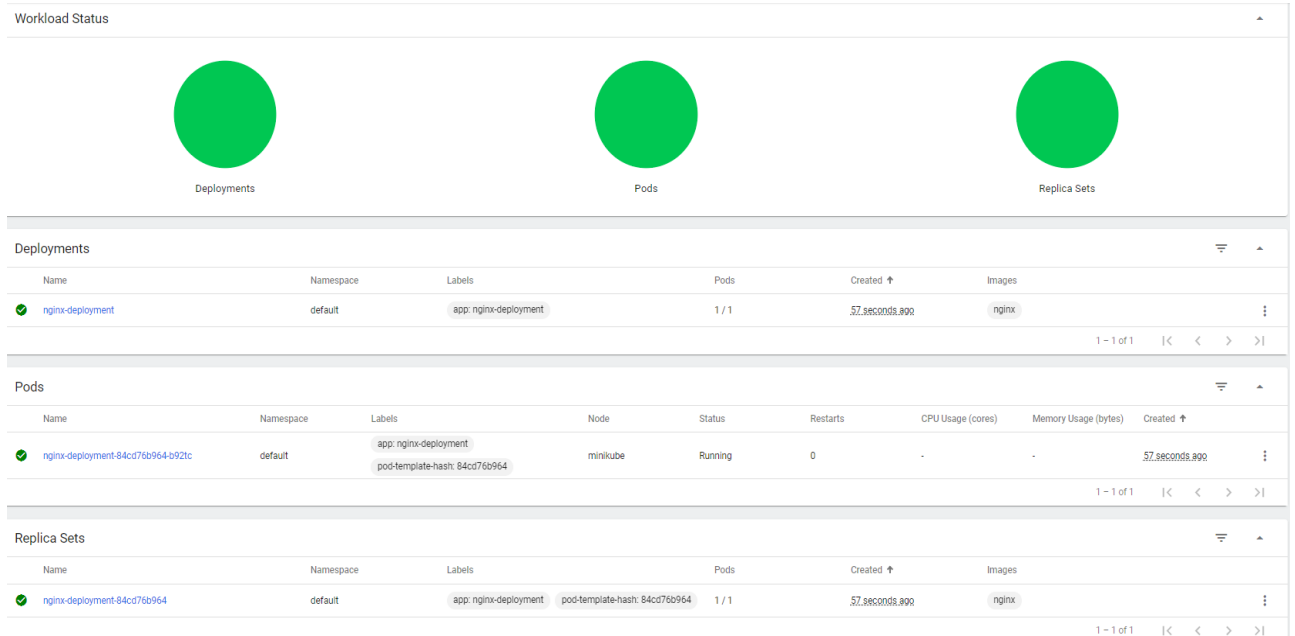
```
$ kubectl cluster-info
Kubernetes control plane is running at https://10.0.0.14:8443
KubeDNS is running at https://10.0.0.14:8443/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
```

Step 5: Create an image in the deployment. nginx is the deployment we've created here

**kubectl create deployment nginx-deployment --image=nginx**

```
$ kubectl create deployment nginx-deployment --image=nginx
deployment.apps/nginx-deployment created
```

## Kubernetes Dashboard:

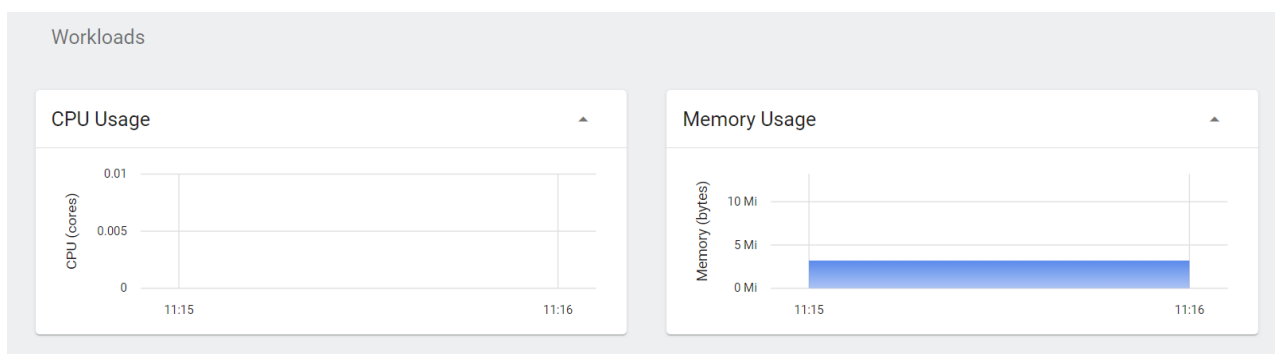
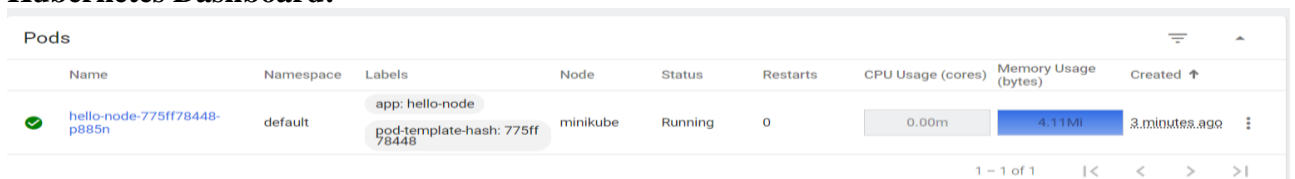


Step 6: Obtain all the pods from the deployment. That also displays all the secrets, nodes, Replica sets etc.

**kubectl get pods**

```
$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nginx-6799fc88d8-lvcps             1/1     Running   0           45s
```

## Kubernetes Dashboard:



Replica Sets

| Name   | Namespace | Labels  | Pods  | Created ↑     | Images                         |             |
|--|-----------|---|-------|---------------|--------------------------------|-------------|
| <div><div></div><div>hello-node-775ff78448</div></div>             | default   | <div>app: hello-node</div> <div>pod-template-hash: 775ff78448</div> | 1 / 1 | 3 minutes ago | registry.k8s.io/echoserver:1.4 | <div></div> |
| 1 - 1 of 1 <div><div></div><div></div><div></div><div></div></div> |           |   |       |               |                                |             |

Service

Services

| Name   | Namespace | Labels  | Cluster IP     | Internal Endpoints                          | External Endpoints | Created ↑      |             |
|--|-----------|---|----------------|---|--------------------|----------------|-------------|
| <div><div></div><div>hello-node</div></div>                        | default   | <div>app: hello-node</div>                                      | 10.105.157.230 | hello-node:8080 TCP<br>hello-node:30613 TCP | -                  | 3 minutes ago  | <div></div> |
| <div><div></div><div>kubernetes</div></div>                        | default   | <div>component: apiserver</div> <div>provider: kubernetes</div> | 10.96.0.1      | kubernetes:443 TCP<br>kubernetes:0 TCP      | -                  | 11 minutes ago | <div></div> |
| 1 - 2 of 2 <div><div></div><div></div><div></div><div></div></div> |           |   |                |   |                    |                |             |

Step 7: Display all the deployments running on the port 80.

**kubectll expose deployment nginx-deployment --port=80 --type=NodePort**

| NAMESPACE            | NAME                          | TARGET PORT  | URL                   |
|----------------------|-------------------------------|--------------|-----------------------|
| default              | kubernetes                    | No node port |                       |
| kube-system          | kube-dns                      | No node port |                       |
| kube-system          | metrics-server                | No node port |                       |
| kubernetes-dashboard | dashboard-metrics-scraper     | No node port |                       |
| kubernetes-dashboard | kubernetes-dashboard          | No node port |                       |
| kubernetes-dashboard | kubernetes-dashboard-katagoda | 80           | http://10.0.0.8:30000 |

**Result:**

Thus, the experiment on Minikube is completed and executed successfully.

**DATE:**

**CONTENT BEYOND SYLLABUS  
STUDY ON DEVOPS**

***Aim:***

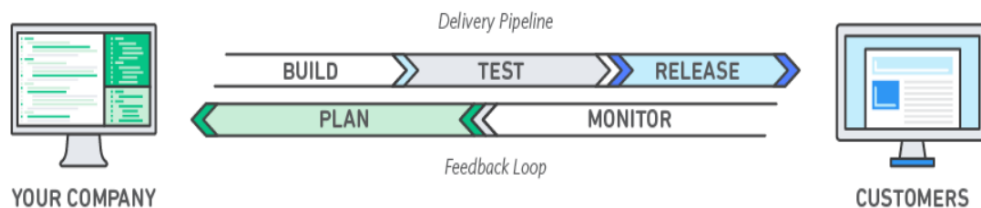
To study about purpose of cloud computing on DevOps.

***Description:***

***DevOps:***

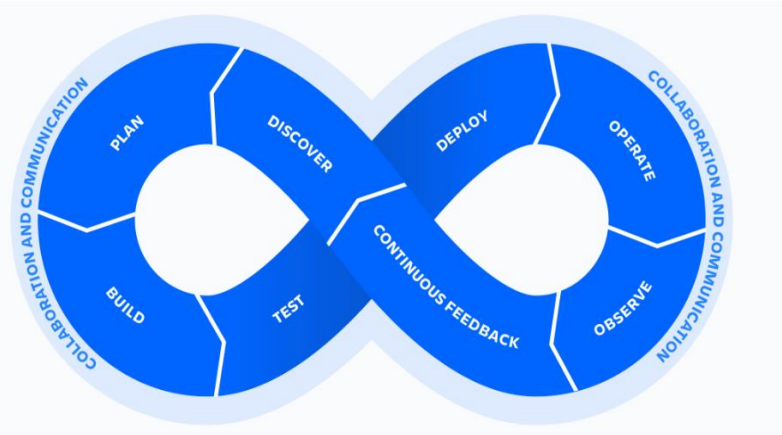
- DevOps is a set of practices, tools, and a cultural philosophy that automate and integrate the processes between software development and IT teams. It emphasizes team empowerment, cross-team communication and collaboration, and technology automation.
- The DevOps movement began around 2007 when the software development and IT operations communities raised concerns about the traditional software development model, where developers who wrote code worked apart from operations who deployed and supported the code. The term DevOps, a combination of the word's development and operations, reflects the process of integrating these disciplines into one, continuous process.

***Working Of DevOps:***



- A DevOps team includes developers and IT operations working collaboratively throughout the product lifecycle, in order to increase the speed and quality of software deployment. It's a new way of working, a cultural shift, that has significant implications for teams and the organizations they work for.
- Under a DevOps model, development and operations teams are no longer "siloeed." Sometimes, these two teams are merged into a single team where the engineers work across the entire application lifecycle, from development and test to deployment to operations, and develop a range of skills not limited to a single function.
- DevOps teams use tools to automate and accelerate processes, which helps to increase reliability. A DevOps toolchain helps teams tackle important DevOps fundamentals including continuous integration, continuous delivery, automation, and collaboration.
- In some DevOps models, quality assurance and security teams may also become more tightly integrated with development and operations and throughout the application lifecycle. When security is the focus of everyone on a DevOps team, this is sometimes referred to as DevSecOps.

## *DevOps Lifecycle:*



### **1. DISCOVER:**

Building software is a team sport. In preparation for the upcoming sprint, teams must workshop to explore, organize, and prioritize ideas. Ideas must align to strategic goals and deliver customer impact. Agile can help guide DevOps teams.

### **2. PLAN:**

DevOps teams should adopt agile practices to improve speed and quality. Agile is an iterative approach to project management and software development that helps teams break work into smaller pieces to deliver incremental value.

### **3. BUILD:**

Git is a free and open-source version control system. It offers excellent support for branching, merging, and rewriting repository history, which has led to many innovative and powerful workflows and tools for the development build process.

### **4. TEST:**

Continuous integration (CI) allows multiple developers to contribute to a single shared repository. When code changes are merged, automated tests are run to ensure correctness before integration. Merging and testing code often help development teams gain reassurance in the quality and predictability of code once deployed.

### **5. DEPLOY:**

Continuous deployment (CD) allows teams to release features frequently into production in an automated fashion. Teams also have the option to deploy with feature flags, delivering new code to users steadily and methodically rather than all at once. This approach improves velocity, productivity, and sustainability of software development teams.

### **6. OPERATE:**

Manage the end-to-end delivery of IT services to customers. This includes the practices involved in design, implementation, configuration, deployment, and maintenance of all IT infrastructure that supports an organization's services.

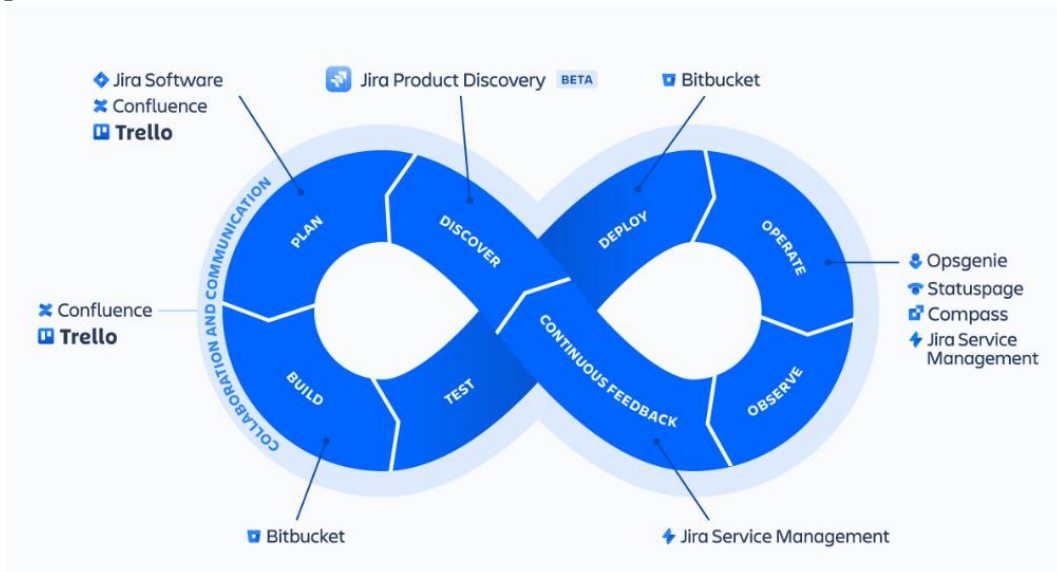
### **7. OBSERVE:**

Quickly identify and resolve issues that impact product uptime, speed, and functionality. Automatically notify your team of changes, high-risk actions, or failures, so you can keep services on.

### **8. CONTINEOUS FEEDBACK:**

DevOps teams should evaluate each release and generate reports to improve future releases. By gathering continuous feedback, teams can improve their processes and incorporate customer feedback to improve the next release.

## ***DevOps Tools:***



- Confluence.
- Trello.
- JIRA Software
  - JIRA service management.
  - JIRA product discovery.
- Statuspage.
- Opsgenie.
- Compass.
- BitBucket.

## ***Benefits of DevOps:***

- **SPEED:**

Move at high velocity so you can innovate for customers faster, adapt to changing markets better, and grow more efficient at driving business results. The DevOps model enables your developers and operations teams to achieve these results. For example, microservices and continuous delivery let teams take ownership of services and then release updates to them quicker.

- **RAPID DEPLOYMENT/DELIVERY:**

Increase the frequency and pace of releases so you can innovate and improve your product faster. The quicker you can release new features and fix bugs, the faster you can respond to your customers' needs and build competitive advantage.

- **QUALITY and RELIABILITY:**

Ensure the quality of application updates and infrastructure changes so you can reliably deliver at a more rapid pace while maintaining a positive experience for end users. Use practices like continuous integration and continuous delivery to test that each change is functional and safe. Monitoring and logging practices help you stay informed of performance in real-time.



- **IMPROVED COLLABORATION:**

Build more effective teams under a DevOps cultural model, which emphasizes values such as ownership and accountability. Developers and operations teams collaborate closely, share many responsibilities, and combine their workflows. This reduces inefficiencies and saves time (e.g. reduced handover periods between developers and operations, writing code that takes into account the environment in which it is run).

- **SCALE:**

Operate and manage your infrastructure and development processes at scale. Automation and consistency help you manage complex or changing systems efficiently and with reduced risk. For example, infrastructure as code helps you manage your development, testing, and production environments in a repeatable and more efficient manner.

- **SECURITY:**

Move quickly while retaining control and preserving compliance. You can adopt a DevOps model without sacrificing security by using automated compliance policies, fine-grained controls, and configuration management techniques. For example, using infrastructure as code and policy as code, you can define and then track compliance at scale.

### *Adopting DevOps:*

#### **1) CONTINUOUS INTEGRATION:**

Continuous integration is the practice of automating the integration of code changes into a software project. It allows developers to frequently merge code changes into a central repository where builds and tests are executed. This helps DevOps teams address bugs quicker, improve software quality, and reduce the time it takes to validate and release new software updates.

#### **2) CONTINUOUS DELIVERY:**

Continuous delivery expands upon continuous integration by automatically deploying code changes to a testing/production environment. It follows a continuous delivery pipeline, where automated builds, tests, and deployments are orchestrated as one release workflow.

#### **3) SITUATIONAL AWARENESS:**

It is vital for every member of the organization to have access to the data they need to do their job as effectively and quickly as possible. Team members need to be alerted of failures in the deployment pipeline — whether systemic or due to failed tests — and receive timely updates on the health and performance of applications running in production. Metrics, logs, traces, monitoring, and alerts are all essential sources of feedback teams need to inform their work.

#### **4) AUTOMATION:**

Automation is one of the most important DevOps practices because it enables teams to move much more quickly through the process of developing and deploying high-quality software. With automation the simple act of pushing code changes to a source code repository can trigger a build, test, and deployment process that significantly reduces the time these steps take.

## **5) INFRASTRUCTURE AS CODE:**

Whether your organization has an on-premise data center or is completely in the cloud, having the ability to quickly and consistently provision, configure, and manage infrastructure is key to successful DevOps adoption. Infrastructure as Code (IaC) goes beyond simply scripting infrastructure configuration to treating your infrastructure definitions as actual code: using source control, code reviews, tests, etc.

## **6) MICROSERVICES:**

Microservices is an architectural technique where an application is built as a collection of smaller services that can be deployed and operated independently from each other. Each service has its own processes and communicates with other services through an interface. This separation of concerns and decoupled independent function allows for DevOps practices like continuous delivery and continuous integration.

## **7) MONITORING:**

DevOps teams monitor the entire development lifecycle — from planning, development, integration and testing, deployment, and operations. This allows teams to respond to any degradation in the customer experience, quickly and automatically. More importantly, it allows teams to “shift left” to earlier stages in development and minimize broken production changes.

### ***Agile:***

- Agile methodologies are immensely popular in the software industry since they empower teams to be inherently flexible, well-organized, and capable of responding to change. DevOps is a cultural shift that fosters collaboration between those who build and maintain software. When used together, agile and DevOps result in high efficiency and reliability.
- Organizations that do DevOps well are places where experimentation and some amount of risk-taking are encouraged. Where thinking outside the box is the norm, and failure is understood to be a natural part of learning and improving.
- A DevOps culture is where teams embrace new ways of working that involve greater collaboration and communication. It’s an alignment of people, processes, and tools toward a more unified customer focus. Multidisciplinary teams take accountability for the entire lifecycle of a product.

### ***Result:***

Thus, the study about the purpose of cloud computing DevOps has been known successfully.