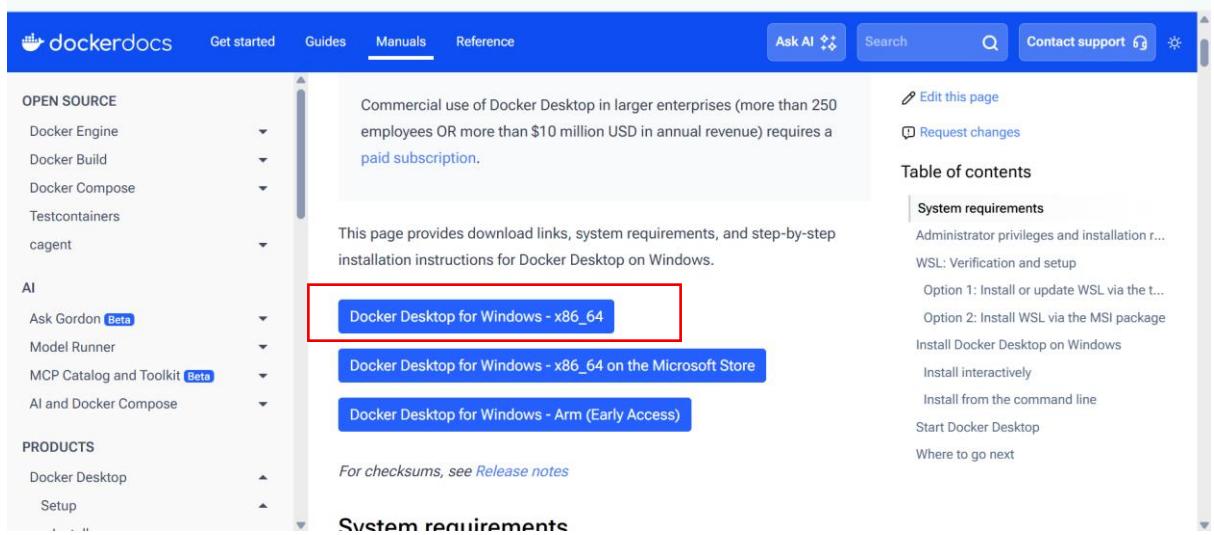


9-10-2025

Day-2 :- Docker Hands-on

1. First install the **Docker Desktop** in Your system :-

<https://docs.docker.com/desktop/setup/install/windows-install/>



The screenshot shows the Docker Docs website with the 'Manuals' tab selected. On the left, there's a sidebar with sections like 'OPEN SOURCE', 'AI', and 'PRODUCTS'. In the main content area, there's a note about commercial use and a link to download Docker Desktop for Windows. Three download options are listed: 'Docker Desktop for Windows - x86_64' (which is highlighted with a red box), 'Docker Desktop for Windows - x86_64 on the Microsoft Store', and 'Docker Desktop for Windows - Arm (Early Access)'. To the right, there's a 'System requirements' section and a 'Table of contents'.

2. Sign up the docker desktop and complete all process.

We can create a **Flask web application** and running it inside a **Docker container** — a lightweight, isolated environment that contains *everything* needed to run the app (Python, Flask, dependencies, etc.).

1. First, we need to install **Python** on our system. Python is required to create and run the Flask web application.
2. You can download and install Python from the official site:
<https://www.python.org/downloads/>
3. After installation, verify it using: `Python --version`
4. Flask is a lightweight web framework used to build web applications using Python.
5. Install Flask using: `pip install flask`
6. After installation, you can verify it with: `python -m flask --version`

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\user\OneDrive\Desktop\Devops_session> python --version
Python 3.8.10
PS C:\Users\user\OneDrive\Desktop\Devops_session> pip install flask
Requirement already satisfied: flask in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (3.0.3)
Requirement already satisfied: Jinja2>=2.1.2 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (3.1.6)
Requirement already satisfied: itsdangerous>=2.1.2 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (2.1.0)
Requirement already satisfied: importlib-metadata>=3.6.0 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (3.5.0)
Requirement already satisfied: blinker>=1.6.2 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (1.8.2)
Requirement already satisfied: click>=8.1.3 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (8.1.8)
Requirement already satisfied: Werkzeug>=3.0.0 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (3.0.6)
```

```
Requirement already satisfied: Werkzeug>=3.0.0 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from flask) (3.0.6)
Requirement already satisfied: colorama in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from click>=8.1.3->flask) (0.4.6)
Requirement already satisfied: zipp>=3.20 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from importlib-metadata>=3.6.0->flask) (3.20.2)
Requirement already satisfied: MarkupSafe>=2.0 in c:\users\user\appdata\local\programs\python\python38\lib\site-packages (from Jinja2>=3.1.2->flask) (2.1.5)
WARNING: You are using pip version 21.1.1; however, version 25.0.1 is available.
You should consider upgrading via the 'c:\users\user\appdata\local\programs\python\python38\python.exe -m pip install --upgrade pip' command
.
PS C:\Users\user\OneDrive\Desktop\Devops_session> python -m flask --version
Python 3.8.10
Flask 3.0.3
Werkzeug 3.0.6
PS C:\Users\user\OneDrive\Desktop\Devops_session>
PS C:\Users\user\OneDrive\Desktop\Devops_session>
```

7. Create a new file named **app.py** and write the following code:

```
from flask import Flask
app= Flask(__name__)
@app.route('/')
def home():
    return "☑ Hello , This Flask App is Running inside Docker !"
if __name__ == "__main__":
    app.run(host='0.0.0.0', port=5000)
```

8. This code runs a simple web server that responds with a message when accessed on port **5000**.

Command :-

```
python app.py
```

```

EXPLORER               ...   ocleanup.sh    app.py    cal.py    prometheus.yaml    prometheus.yml    health_checks.sh    shell Scripting    auto_backup.sh    shell Scripting
DEVOPS SESSION
Docker
  app.py
  cal.py
  dockerfile
  minikube-linux-amd64
  requirements.txt
> Kubernetes
> Monitoring Tool
shell Scripting
  auto_backup.sh
  condition.sh
  firstsh
  health_checks.sh
  logcleanup.sh
  loop.sh
System_health_2025-10-11...
variable.sh

Docker > app.py > ...
1  from flask import Flask
2  app=Flask(__name__)
3  @app.route('/')
4  def home():
5      return "Hello , This Flask App is Running inside Docker !"
6  if __name__ == "__main__":
7      app.run(host='0.0.0.0', port=5000)

PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS
----  -----
-a--l  09-10-2025  14:05      211 app.py
-a--l  10-10-2025  00:56      5511 cal.py
-a--l  11-10-2025  19:33      102 dockerfile
-a--l  10-10-2025  10:30  139886451 minikube-linux-amd64
-a--l  09-10-2025  14:33      5 requirements.txt

PS C:\Users\user\OneDrive\Desktop\Devops_session\docker> python app.py
* Serving Flask app 'app'
* 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 127.0.0.1:5000 (Press CTRL+C to quit)
* Running on Follow link (ctrl + click)
* Running on http://10.29.130.73:5000

OUTLINE   TIMELINE

```



9. Create requirements.txt File .

This file lists all Python dependencies required for the project. Add the following line:

```
flask
```

10. Create a Dockerfile

Create Dockerfile (no extension) with the following contents. This file contains the instructions Docker uses to build the image.

```
FROM python:3.9
WORKDIR /app
COPY . .
RUN pip install -r requirements.txt
CMD ["python", "app.py"]
```

11. Build the Docker image : Open a terminal in the project folder and run:

```
docker build -t flask-docker-image:1.0 .
```

```
FROM python:3.9
WORKDIR /app
COPY .
RUN pip install -r requirements.txt
CMD ["python", "app.py"]

user@DESKTOP-6FMW9OI:/mnt/c/Users/user/OneDrive/Desktop/Devops_session/docker$ ls
app.py  cal.py  dockerfile  minikube-linux-amd64  requirements.txt
user@DESKTOP-6FMW9OI:/mnt/c/Users/user/OneDrive/Desktop/Devops_session/docker$ docker build -t flask-docker-image:1.0 .
[+] Building 31.5s (10/10) FINISHED
--> [internal] load build definition from dockerfile
--> => transferring dockerfile: 139B
--> [internal] load metadata for docker.io/library/python:3.9
--> [auth] library/python:pull token for registry-1.docker.io
--> [internal] load .dockerignore
--> [internal] transferring context: 2B
--> [1/4] FROM docker.io/library/python:3.9@sha256:1f13ce12331c2d7d62f4f21a75e8794ff4871bfbe95f4f488820cc077386652ff
--> => resolving docker.io/library/python:3.9@sha256:1f13ce12331c2d7d62f4f21a75e8794ff4871bfbe95f4f488820cc077386652ff
--> sha256:792a4763ca0d414be79efdf8a3c8f4b9cf72553a5edc73bcfd075f314b3a1e 248B / 248B
--> sha256:0001e22f10a7e8471449ba2c2a530614d7f6f1fce2110ac674cccdcb40efb8c0 20.37MB / 20.37MB
--> sha256:48fc09e811570eb797345e94ea554cbcd9e600ff83638ab80722c2a5d92d 5.24MB / 5.24MB
--> sha256:48fc09e811570eb797345e94ea554cbcd9e600ff83638ab80722c2a5d92d 24.35
--> => extracting sha256:0001e22f10a7e8471449ba2c2a530614d7f6f1fce2110ac674cccdcb40efb8c0
--> => extracting sha256:792a4763ca0d414be79efdf8a3c8f4b9cf72553a5edc73bcfd075f314b3a1e
--> [internal] load build context
--> => transferring context: 139.93MB
--> [2/4] WORKDIR /app
--> [3/4] COPY .
--> [4/4] RUN pip install -r requirements.txt
--> exporting to image
--> => exporting layers
--> => exporting manifest sha256:ec383f8ed0e2055d552e25975b859ed5b0654220c178cc7252d1f980a94abc9
--> => exporting config sha256:6094e269d1abe74d1254d77bd30a167086a67992f8e3bbac9247b0dc23c
--> => exporting attestation manifest sha256:495821fbef4eaddd91118fa3cd3097e3a1cc47805d1371c3b53bb9a28ba4fc
--> => exporting manifest list sha256:287236f0b3c3f583560c80b8fb2cc9d08356e8974df7a9c9b7f0719acbb39f

--> => exporting attestation manifest sha256:495821fbef4eaddd91118fa3cd3097e3a1cc47805d1371c3b53bb9a28ba4fc
--> => exporting manifest list sha256:287236f0b3c3f583560c80b8fb2cc9d08356e8974df7a9c9b7f0719acbb39f
--> => naming to docker.io/library/flask-docker-image:1.0
--> => unpacking to docker.io/library/flask-docker-image:1.0
user@DESKTOP-6FMW9OI:/mnt/c/Users/user/OneDrive/Desktop/Devops_session/docker$ docker images
REPOSITORY          TAG      IMAGE ID      CREATED       SIZE
flask-docker-image  1.0      287236f0b3c3  About a minute ago  1.79GB
cal-image           1.0      ec2ab2df7d0c  2 days ago   1.66GB
flask-docker        1.0      231553dcc0dd  2 days ago   1.66GB
grafana/grafana     latest   74144189b384  2 weeks ago  975MB
prom/prometheus     latest   76947e7ef22f  2 weeks ago  440MB
prom/node-exporter  latest   d00a542e409e  6 months ago  40.3MB
```

12. Run the container (map port 5000) : Run the container and map container port 5000 to host port 5000

```
user@DESKTOP-6FMW9OI:/mnt/c/Users/user/OneDrive/Desktop/Devops_session/docker$ docker run --name my-flask-app -p 5000:5000 -d flask-docker-image:1.0
e71f3fdf5d08bf38be48f0ec7dcdf9909461d8105bc1bd9361fa6a9654011abb
user@DESKTOP-6FMW9OI:/mnt/c/Users/user/OneDrive/Desktop/Devops_session/docker$ docker ps
CONTAINER ID   IMAGE          COMMAND   CREATED      STATUS      PORTS          NAMES
e71f3fdf5d08   flask-docker-image:1.0   "python app.py"   6 seconds ago   Up 5 seconds   0.0.0.0:5000->5000/tcp, ::1:5000->5000/tcp   my-f1
ask-app
```

13. Verify it works : Open a browser and go to

<http://localhost:5000/>



Homework :-

Q. Develop a Flask-based Calculator Web Application and Containerize it using Docker.

1. Calculator.py

```
from flask import Flask, render_template_string

app = Flask(__name__)

HTML_TEMPLATE = """
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <title>Flask Calculator</title>
    <style>
        body {
            background:
url('https://static.vecteezy.com/system/resources/previews/049/976/216/non_2x/university-graduation-hat-diploma-on-simple-background-study-year-academic-success-student-achievement-celebration-college-cap-academy-bachelor-master-degree-phd-award-study-studying-photo.jpg')
                no-repeat center center fixed;
            background-size: cover;
            display: flex;
            flex-direction: column;
            justify-content: space-between;
            align-items: center;
            min-height: 100vh;
            font-family: 'Poppins', sans-serif;
            color: white;
            margin: 0;
        }

        header {
            margin-top: 25px;
            font-size: 30px;
            font-weight: bold;
            text-shadow: 1px 1px 5px rgba(0,0,0,0.6);
        }

        .calculator {
            background: rgba(255, 255, 255, 0.95);
            padding: 20px;
            border-radius: 15px;
            box-shadow: 0 6px 20px rgba(0,0,0,0.3);
        }
    </style>

```

```
        width: 90%;  
        max-width: 330px;  
        margin: 20px auto;  
    }  
  
    input {  
        width: 100%;  
        height: 55px;  
        font-size: 22px;  
        text-align: right;  
        margin-bottom: 15px;  
        padding: 10px;  
        border: none;  
        border-radius: 8px;  
        background-color: #f3f3f3;  
        box-sizing: border-box;  
    }  
  
.buttons {  
    display: grid;  
    grid-template-columns: repeat(4, 1fr);  
    gap: 10px;  
}  
  
button {  
    height: 55px;  
    font-size: 18px;  
    border: none;  
    border-radius: 8px;  
    cursor: pointer;  
    background-color: #e0e0e0;  
    transition: 0.2s;  
}  
  
button:hover {  
    background-color: #d4d4d4;  
}  
  
.operator {  
    background-color: #0078ff;  
    color: white;  
}  
  
.operator:hover {  
    background-color: #005fcc;  
}  
  
.equals {
```

```
        background-color: #28a745;
        color: white;
    }

    .equals:hover {
        background-color: #218838;
    }

    .clear {
        background-color: #dc3545;
        color: white;
    }

    .clear:hover {
        background-color: #c82333;
    }

    footer {
        width: 100%;
        text-align: right;
        padding: 12px 30px;
        font-size: 20px;
        color: black;
        font-style: italic;
        letter-spacing: 0.6px;
        text-shadow: 1px 1px 3px rgba(255,255,255,0.5);
        box-sizing: border-box;
    }

    @media (max-width: 600px) {
        header {
            font-size: 24px;
        }
        .calculator {
            max-width: 280px;
        }
        footer {
            font-size: 16px;
        }
    }

```

</style>

```
</head>
<body>
    <header>Flask Calculator</header>

    <div class="calculator">
        <input type="text" id="display" readonly>
        <div class="buttons">
```

```

        <button class="clear" onclick="clearDisplay()">C</button>
        <button onclick="appendValue('(')">(</button>
        <button onclick="appendValue('')")>)</button>
        <button class="operator" onclick="appendValue('/')">÷</button>

        <button onclick="appendValue('7')">7</button>
        <button onclick="appendValue('8')">8</button>
        <button onclick="appendValue('9')">9</button>
        <button class="operator" onclick="appendValue('*')">×</button>

        <button onclick="appendValue('4')">4</button>
        <button onclick="appendValue('5')">5</button>
        <button onclick="appendValue('6')">6</button>
        <button class="operator" onclick="appendValue('-')">-</button>

        <button onclick="appendValue('1')">1</button>
        <button onclick="appendValue('2')">2</button>
        <button onclick="appendValue('3')">3</button>
        <button class="operator" onclick="appendValue('+')">+</button>

        <button onclick="appendValue('0')">0</button>
        <button onclick="appendValue('.')">. </button>
        <button class="equals" onclick="calculateResult()">=</button>
    </div>
</div>

<footer>💻 ✒ Calculator Created by Dipali Kshirsagar ☺ ♡ </footer>

<script>
    const display = document.getElementById("display");

    function appendValue(value) {
        display.value += value;
    }

    function clearDisplay() {
        display.value = "";
    }

    function calculateResult() {
        try {
            display.value = eval(display.value);
        } catch (error) {
            display.value = "Error";
        }
    }
</script>
</body>

```

```
</html>
"""

@app.route("/")
def index():
    return render_template_string(HTML_TEMPLATE)

if __name__ == "__main__":
    app.run(host='0.0.0.0', port=2025)
```

2. requirements.txt

```
Flask
```

3. dockerfile

```
FROM python:3.9
WORKDIR /app
COPY . .
RUN pip install -r requirements.txt
CMD ["python", "Calculator.py"]
```

4. Build the Docker Image :-

```
docker build -t cal-docker-image:1.0 .
```

5. Run the container :-

```
docker run -d --name cal_Container -p 2025:2025 cal-docker-image:1.0
```

```
docker ps
```

6. Verify it works : Open a browser and go to

```
http://localhost:2025/
```

