
Docker Image Creation Pipeline

- This Project will create Docker Images and push the Docker Images to Amazon ECR repository. This will enable Continuos Integration Pipeline for Docker Images creation using CodeBuild Job.

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Sample Web App

- Add/validate the code having a Python file with name **app.py**.
- Place both the Python Application and requirements files in a folder and name it **src/**
- This project requires Python libraries to be installed for it to run.
- The libraries will be recorded in a **requirements.txt** file. This file will be used during docker build process.

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Docker Setup

- The **Dockerfile** required for this project mainly has to achieve the following logical steps:
  - Create base image
  - Copy source code
  - Install requirements and dependencies
  - Expose required port
  - Run the Streamlit app within the Docker environment
- Copy the Docker commands below in **Dockerfile**

```
FROM python:3.8-slim
ENV MICRO_SERVICE=/home/app/webapp

# set work directory
RUN mkdir -p $MICRO_SERVICE
# where your code lives
```

```
WORKDIR $MICRO_SERVICE
# set environment variables
ENV PYTHONDONTWRITEBYTECODE 1
ENV PYTHONUNBUFFERED 1

# install dependencies
RUN pip install --upgrade pip

# copy project
COPY src/ $MICRO_SERVICE
RUN pip install -r requirements.txt
EXPOSE 8501
CMD streamlit run app.py
```

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Running the Project Locally

- With both files set up, you are ready to build and run your image. To build your image, run the command

```
docker build -t python_web_app .
```

- After the docker image is built, we can run the Docker Image in detached mode.

```
docker run -d -p 8888:8501 python_web_app
```

- The app is now running at the IP Address and can be accessed on Browser with :8501.

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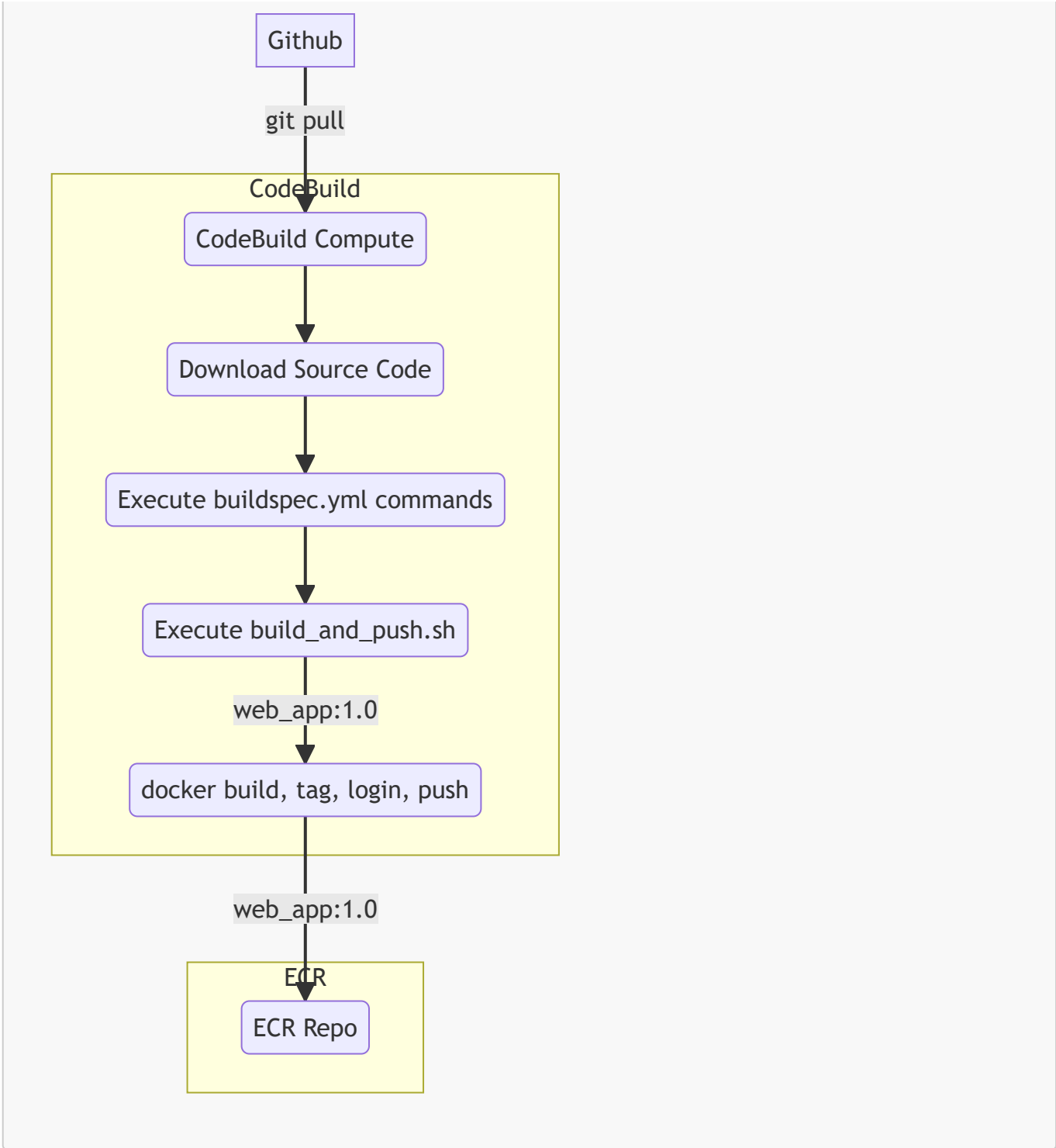
Configuration of Docker Image Creation Build Job



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Pre-Requisites

- Create a Github repository and upload the files using git bash and other git commands like **git add, git commit and git push**
- Create a Codebuild Project from AWS Console with below information:
  - For Operating system, choose Ubuntu.
  - For Runtime, choose Standard.
  - For Image, choose **aws/codebuild/standard:7.0**.
  - Since we have to use this build project to build a Docker image, select **Privileged** checkbox.

> ==Privileged== :Enable this flag if you want to build Docker images or want your builds to get elevated privileges.

- Add Below Environment Variables in CodeBuild Project Configuration.
    - **DOCKER_IMAGE_NAME**

> Values for this environment variables will be passed during execution of CodeBuild Job

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- Add below inline policy to Codebuild Project Role.

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
        "ecr:CreateRepository",
        "ecr:BatchCheckLayerAvailability",
        "ecr:CompleteLayerUpload",
        "ecr:GetAuthorizationToken",
        "ecr:InitiateLayerUpload",
        "ecr:PutImage",
        "ecr:UploadLayerPart",
        "ecr:DescribeRepositories"
      ],
    "Resource": "*"
  }]
}
```

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Executing CodeBuild Job

- Navigate to above created CodeBuild Job and click on **Start Build with overrides**
- Specify the branch name and provide values for environment variables : **DOCKER_IMAGE_NAME**
- Validate the CodeBuild Execution Logs for Docker Image Creation and if docker image created inside the CodeBuild Container is available in ECR Repository.
- Every Image inside a ECR Repo contains a Image URI similar to this : **ACCOUNT_ID.dkr.ecr.REGION_NAME.amazonaws.com/python_webapp-ecr-repo:python_webapp-5**

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Repository structure

- **docker_python** - contains **buildspec.yml** file that will be used by CodeBuild Project
- **src** - contains web app code base for python i.e ==app.py== and ==requirements.txt== file, this will be used to install python packages using **pip**.

- **scripts** - contains **image_build_push.sh** file that has code to build image locally using **Dockerfile** and push it to ECR Repository.

> Note : Delete the Images in ECR Repo if its not used to avoid cost.

- ==buildspec.yml==
    - Execute **scripts/build_and_push.sh**
        - aws ecr cli commands execution
        - Refer **Dockerfile** by using **docker build**
            - COPY src/ $MICRO_SERVICE
            - RUN pip install -r requirements.txt
            - CMD streamlit run app.py

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Executing Container created by Build Job

- If you have pushed your docker image in Private ECR Repository, to pull image from ECR repository and execute a container using this image, you will require **docker login** authentication steps.
- Get the login using **aws ecr get-login-password**
- Use below command to start container using the image that is pushed in ECR in the previous step

```
aws ecr get-login-password --region ap-south-1 | docker login --username AWS --
password-stdin ACCOUNT_ID.dkr.ecr.ap-south-1.amazonaws.com

docker run -d -p 8888:8501
ACCOUNT_ID.dkr.ecr.REGION_NAME.amazonaws.com/python_webapp-ecr-repo:python_webapp-
5**
```

- Validate the container python app browser with Public IP Address on port **8888**.

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Change Implementation for Code

If any application source code is to be modified, below generic steps can be followed.

- 1. Code has to be modified in Remote Git Repository in specific branch.
- 2. Execute the Build CI Pipeline to create new Docker Image that will copy newly updated Code into a new Docker Image and Push the Image into a Image Registry i.e **ECR/DockerHub**
- 3. Use this new IMAGE URI to execute the container and validate the changes.

```
docker run -d -p 8080:8501
ACCOUNT_ID.dkr.ecr.REGION_NAME.amazonaws.com/python_webapp-ecr-repo:python_webapp-
5**
```

> Once a specific feature or development work is completed for the application, image creation build job can be executed.

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CodeBuild Image Creation Build Pipeline Assignment

- Refer above shell script and convert above shell script to use **ecr-public** commands to build and push Image in Amazon ECR Public Repo.
- Also Run the container from this Public Repo.