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.

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.

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
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
```

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.

Configuration of Docker Image Creation Build Job

Pre-Requisites

- Create a codecommit 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:5.0`.
  - 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

- 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": "*"
  }]
}
```

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`

Repository structure

- `docker_python` - contains `buildspec.yml` file that will be used by CodeBuild Project
- `src` - contains web app code base for python 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.

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 --region us-east-1 | docker login --username AWS --password-stdin ACCOUNT_ID.dkr.ecr.REGION_NAME.amazonaws.com`
- Use below command to start container using the image that is pushed in ECR in the previous step
- `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`.

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.

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.

Image Creation Continuous Integration Pipeline Assignment

- Refer above CI scenario and create a similar CI Pipeline for Image Creation with Source Control System as Github.