





The goal of this assignment was to use Elastic Container Service (ECS) to host our Jenkins application that we created using a Dockerfile. This Jenkins application is our controller which essentially tells an agent hosted on an EC2 to build an image and push it to Dockerhub.

The controller application does not take a lot of resources so it's best to host it on Fargate where we are charged by the second and how much resources we use.

We are then doing all the building on an agent that is hosted on a separate EC2 instance which will save us more money than building on ECS.

Overall, installing Jenkins on Fargate is faster than installing Jenkins on an EC2 because all you need is the image. When installing on an EC2, you will need to install java, Jenkins, all the dependencies, and wait for it to start up.

Instructions

We need to create a container that has a Jenkins application using a Dockerfile. This will speed up the process of setting up a Jenkins application. We can then use these containers to host quickly on AWS using AWS Elastic Container Service. Dockerfiles is a text document that has all the commands the user uses when assembling an image. In other words, it is a text definition that defines the Docker image. It is a word to define your custom environment to be used in a docker container.

FROM jenkins/jenkins
USER root
RUN apt update && apt upgrade -y
USER jenkins
EXPOSE 8080

Once we create the Dockerfile, we have to build it. Doing this will create a docker image that we can use to create containers.

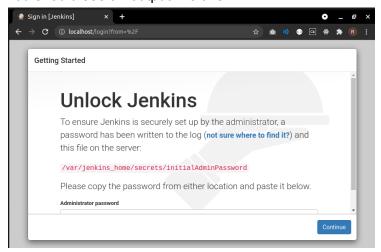
docker build -t jenkins-app .

We can also test the image by creating a container. The -it flag tells docker that it should open an interactive container instance. The --name flag gives the container a name. The --rm flag tells docker that the container should automatically be removed after we close docker. The -p flag specifies which port we want to make available for docker. Port 80 is where we access and 8080 is the container.

docker run -ti --name jenkins-app --rm -p 80:8080 jenkins-app

We can check if the container is running by going to localhost on our browser localhost:80

You should see an output like this...

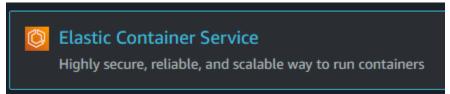


Once we have successfully created the image and checked the image is working, we can move it on to Elastic Container Service (ECS) which will allow us to spin up multiple containers anytime.

Before we deploy to ECS, we need to make sure we have AWS CLI set up. AWS CLI is simply a tool to manage AWS services on the terminal.

Make sure you install AWS CLI and sign into it. -> here

Once that is set up, Log into your AWS user and go to ECR Service



We will need to navigate to the Repositories section on the left side. This is where we will host our Dockerized Jenkins image.

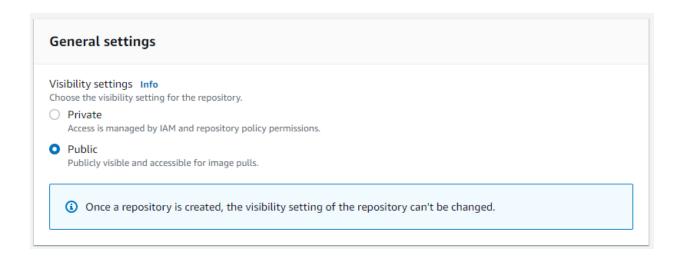
Amazon ECR

Repositories

We can start by selecting create a repository.

Create repository

In the options to create a repository, we will need to make the repository public for this scenario. Select a public repository



In the details section, any name will work but follow the minimum requirements.



Scroll down and create the repository



After the repository is created, copy the URI to a notepad. We will need this URI for a future step.



We will need the helpful push commands to connect to the repository now. Select the application.



Click on the push commands in the top right.



These push commands will help us authenticate and push an image to our remote repository.

First we will need to retag our image with the URI of the repository. Run the following: docker tag (APPNAME) (URI)

We will then use the first command to retrieve an authentication token and authentication our docker client to the ECR

Retrieve an authentication token and authenticate your Docker client to your registry.
 Use the AWS CLI:



You should see a Login Succeeded...

We then have to simply push the image to AWS using the uri... docker push URI:latest

Once the image has successfully pushed, go back to ECR Repositories and click on the respiratory name to check if the image was successfully pushed.

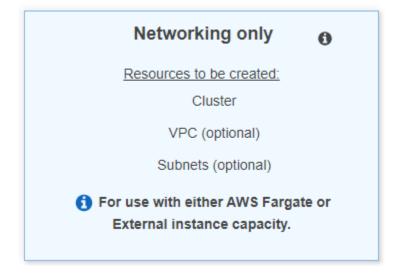
Once that is successful, we can create the cluster now. Clusters allow us to group container instances which we can then run task requests on. Select clusters



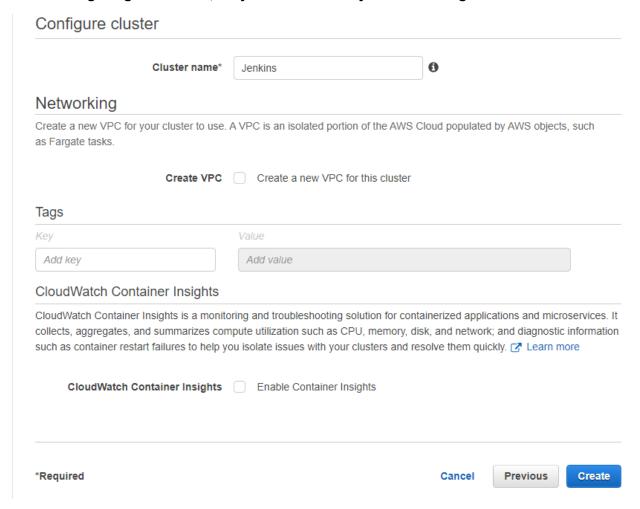
Create a cluster



For this scenario, we will be using AWS Fargate to host our application. Fargate is a serverless service compared to ECS. With Fargate, we do not have to provision resources. With ECS, we will have to manage the EC2 that is created. Select networking Only. This is used for AWS Fargate.



When configuring the cluster, we just have to worry about naming it.



Once you choose a name, create it and choose the view cluster button.

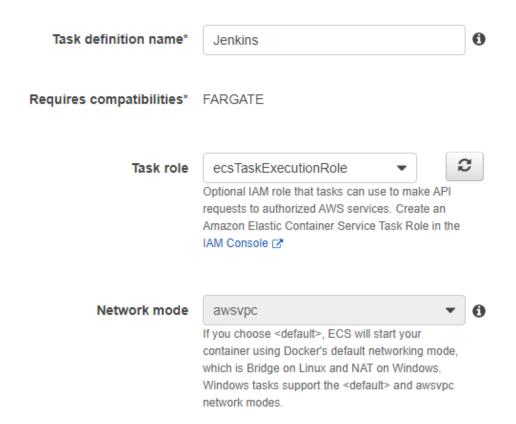
We can then move onto Task Definitions. Task definitions are required to run Docker containers in ECS. In other words, this will allow us to create our application to run on ECS. Click on Task Definitions

Amazon ECS
Clusters
Task Definitions

Select the launch type Fargate and go to the next step.



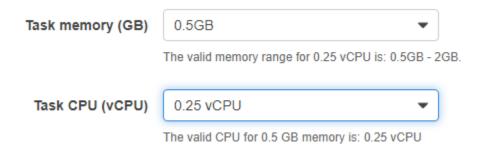
In this part, we will have to configure the task and container definitions. We will have to name it then attach a task role. If you have no task roles, then skip that.



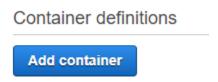
If you don't have a task execution role, select the dropdown and create a new role. This role allows the tasks to pull our image and publish container logs to AWS CloudWatch for us.

Task execution role	ecsTaskExecutionRole	•	Ø
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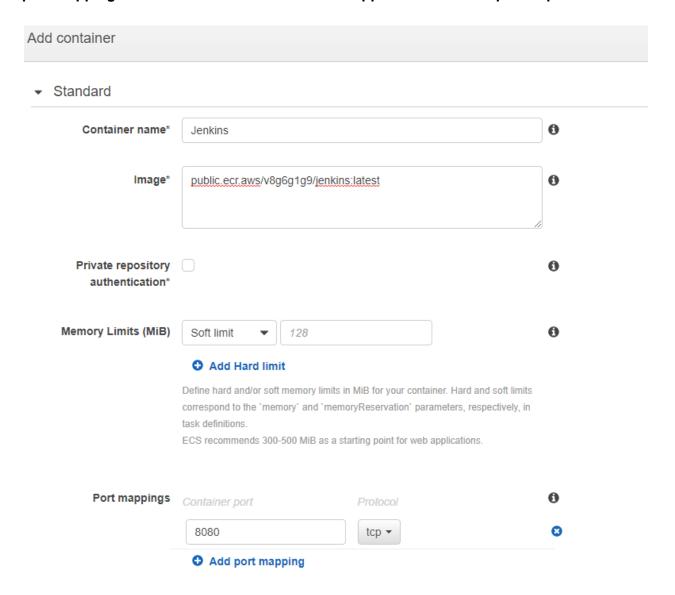
We will then have to give a certain task size. For this scenario, the lowest options will work.



We will need to add our application container that we pushed earlier onto the public ECR repository. Select the add container.



For this option we can give any name for the container name and for the image, we will need to paste the <u>URI</u> you copied earlier followed by :latest. We will also need to add the port mapping which will allow us to access our application on that specific port.



Once everything is configured, select add the bottom. We can then create the task definition in the bottom right.

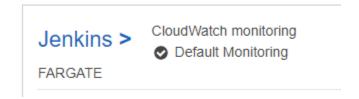
The task definition will create. We can then select the task definition button once finished.

View task definition

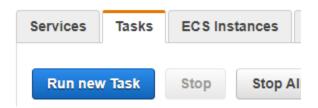
We need to go to the clusters section to run a new task

Amazon ECS
Clusters

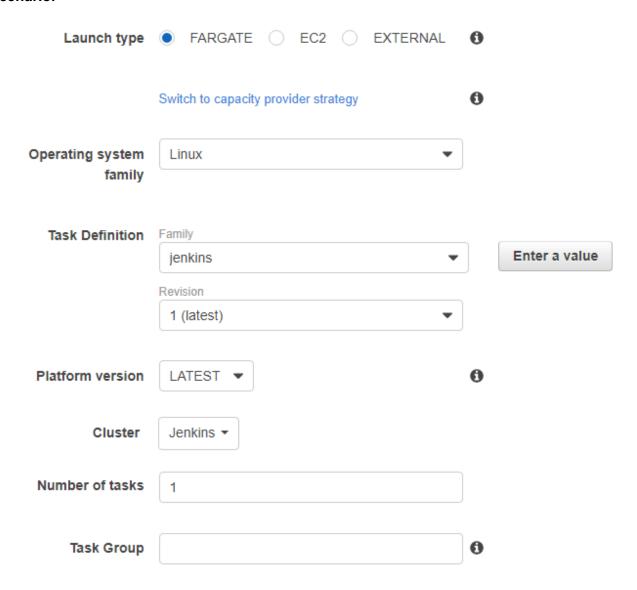
Select the cluster that we created



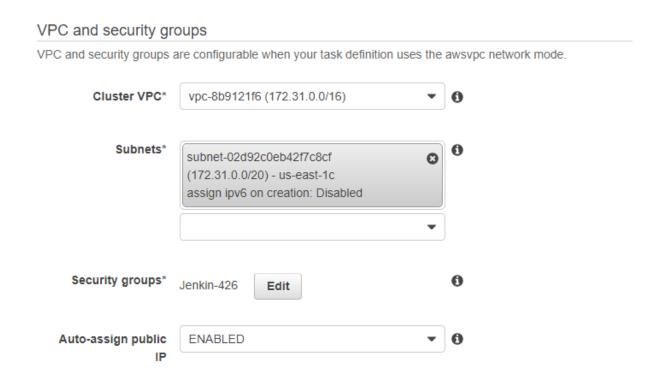
Select the task tab and press Run a new task



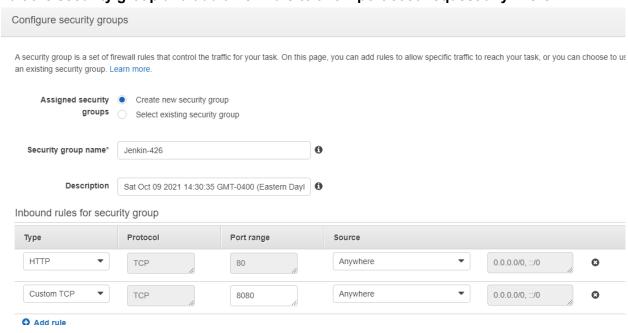
We will have to configure this task. The following settings should be applied for our scenario.



Make sure the VPC is default. Remember the subnet that you choose because you will need it in future steps. (us-east-1c)



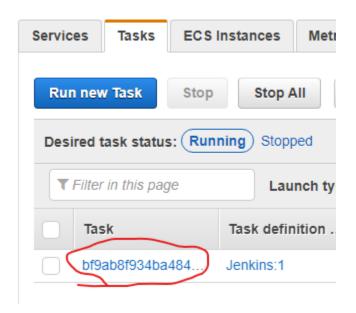
Edit the security group and add a new rule to allow port 8080 request anywhere.



Once all the settings are configured, create the task.



Click on the Task that was created...



Once its running, copy the Public IP and go to it followed by the port 8080

Public IP 3.239.255.237

Example: 3.239.255.237:8080

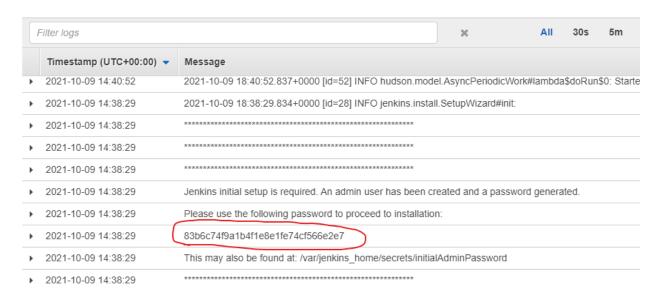
Once the jenkins application loads and ask for your password go back to ECS and in the cluster task we created, go to the logs tab on the top

Clusters > Jenkins > Task: bf9ab8f934ba4846877a191a79094839

Task: bf9ab8f934ba4846877a191a79094839



The logs will contain the password for this Jenkins application. Copy it and paste it into jenkins



Install the suggest plugins



Create a user

Once inside Jenkins Dashboard, we will need to install two Plugins. Select Manage Jenkins in the left side of the Dashboard.



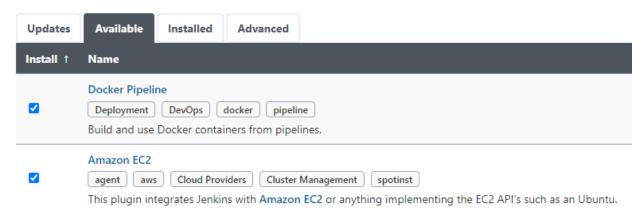
Select Manage plugins option.



Manage Plugins

Add, remove, disable or enable plugins that can extend the functionality of Jenkins.

We then need to switch to the available tab to see available plugins. Search up and install "Docker Pipeline" and "Amazon EC2" plugins.



Once both are selected, Download now and install after restart.

Download now and install after restart

Select the following option to complete all installation.

Restart Jenkins when installation is complete and no jobs are running

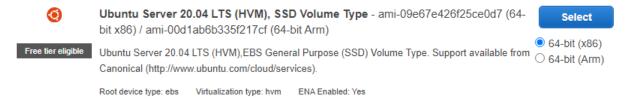
Creating the Agent's EC2

While Jenkins restarts, we can create an EC2 instance in the meantime. This EC2 instance will be our jenkins agent. This instance will have more resources than the Jenkins Controller has. The Jenkins controller application we hosted on Fargate only gives instructions to the agents. The agents then use resources to complete the task given.

In AWS EC2 Service, create a new Instance.

Launch instances

For this scenario we will use Ubuntu Server 20.04 LTS AMI.



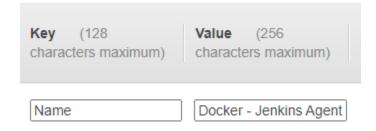
The instance type will be a simple t2.micro

For the instance details we need to make sure to select the subnet we chose above when creating the Task. (us-east-1c)



For the storage section, we can keep the defaults and continue to tags.

It's best practice to always create a tag.



For Security Groups we need to create a new security group to allow SSH access to our EC2.

	Security group name	: Docker		
	Description	docker agent		
Туре (і)	Protocol (i)	Port Range (i)	Source (i)	Descri
SSH	TCP	22	Custom • 0.0.0.0/0	e.g. S

Launch the instance and select a Key Pair that you have.

While waiting for the instance to start...

Configuring the Agent's Tasl

Fork the Deployment 7 Repository -> https://github.com/kura-labs-org/DEPLOY07_ECS
When Forking a repository, we are simply making a copy of our own where we can edit it as we like and make a pull request to merge our changes to the original repository.

For this assignment, we need to move a java application we created into the repository. We then need to create a Dockerfile that will run a simple Java application. The following Dockerfile will pull the openjdk:11 image from DockerHub. It will then copy the local java application and move it to a new path on the container. The CMD function will then run a command once the container runs.

FROM openjdk:11 COPY ./demo-0.0.1-SNAPSHOT.jar app.jar CMD ["java","-jar","app.jar"]

Inside your repository,

Add a the java archive file and a dockerfile with your instructions for creating the Java application to your repository.

demo-0.0.1-SNAPSHOT.jar is a simple Java application from Kura Labs Class.



Once that is set up, we will need to go back into our Jenkins application that is hosted on Fargate and set up a node. A node is simply an agent. This agent will do all the building for us.

Log back in and go to the Dashboard. Once inside, select manage jenkins



Select manage nodes.



Manage Nodes and Clouds

Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

In the left side, click create new node



We can name the agent anything. Select Permanent agent and proceed.

Node name
agent
Permanent Agent
Adds a plain, permanent agent to type if no other agent types appl
ОК

In the next steps we will need to fill out the following. Remote root directory is important. This is based on the Ubuntu 20.04 image we chose when creating the EC2. The label will also be vital when we create the pipeline script. Make sure to write down the label name.

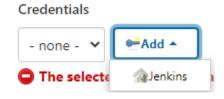
Description	
Agent that is hoste	ed on ec2
Number of executo	rs
Remote root direct	ory
/home/ubuntu/	

In the following settings, we need to set up how we will access our agent which is hosted on an EC2. When we created our EC2, we set up SSH access from anywhere in the security group. For launch methods we need to select launch via SSH.

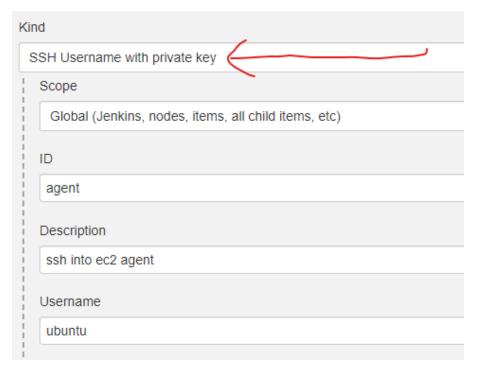
The Host IP is the private IPv4 of the EC2 we created. You can find yours by opening AWS EC2 service in another tab and selecting the instance you created.



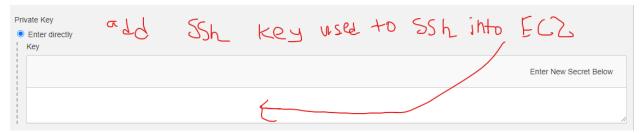
We need to add credentials to access the EC2 instance.



For the settings, change the Kind to SSH username with a private key. The username is important. It will be the same as our AMI. Since we are using ubuntu, the username will be ubuntu.



We then need to select Enter directly for the Private key. The following value that we enter inside this field will contain our private keypair we use to SSH into the instance. In most cases it's a .pem file. You will need to create a copy and change it to a txt file to read the value.



Once all the credentials is filled, add it

Select the credentials that you just created. You will also need to change the host key verification strategy to "Non Key Verification Strategy"



Availability

Keep this agent online as much as possible

Once everything is set up, save it.



We will then need to SSH manually into the EC2 and set up some requirements before the Jenkins controller can access it.

SSH into the agent using the following. The key.pem is the keypair you created. The publicIPv4 is from the EC2 we created.

ssh -i key.pem ubuntu@publicIPv4

Once successfully inside the instance, run the following commands one at a time. We will update the instance and then install Java. Java is a requirement to allow the Jenkins controller to connect to the agent.

sudo apt update && sudo apt upgrade -y sudo apt install default-ire -y

We will also need to install Docker on this instance because it will do all the building for us. Run the following commands one at a time.

curl -fsSL https://get.docker.com -o get-docker.sh && sudo bash get-docker.sh

sudo usermod -aG docker \$USER newgrp docker sudo shutdown -r now

This will close the connection to the ec2 instance. We can then go back into the Jenkins Controller and refresh the status of the nodes. You should see the agent we created is online (in sync)



agent

Linux (amd64)

In sync

We will now need to get a docker access token which will be used in the pipeline to build and push our images to DockerHub. Go to -> https://hub.docker.com/settings/security and signup/signin. Once you are logged in to Dockerhub, select the security tab



We need to create an access token which will be used to access Dockerhub without a password. Create an new access token

Access Tokens

It looks like you have not created any access tokens.

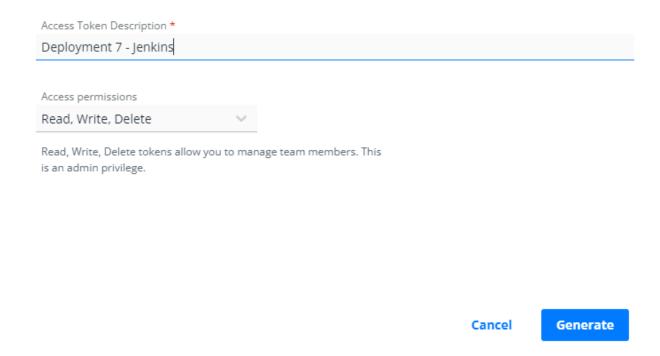
Docker Hub lets you create tokens to authenticate access. Treat personal access tokens as alternatives to your password. Learn more

New Access Token

You can put anything inside the description.

New Access Token

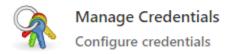
A personal access token is similar to a password except you can have many tokens and revoke access to each one at any time. Learn more



Generate your token and make SURE to copy the personal access token. Navigate back to the Jenkins Controller and go to the dashboard. Once inside the dashboard, select Manage Jenkins.



Navigate to Manage Credentials



Select the following Credentials.



т -	P	Store 1	Domain	ID	Name
6	19	Jenkins	(global)	agent	ubuntu (ssh into ec2 agent)

Once inside that credentials, select Global Credentials



This is where we will configure our credentials to DockerHub. Choose Add credentials



For the following settings, the Username should be your DockerHub username. The password is the personal access token that you created previously. The ID will simply have your DockerHub username followed by -dockerhub. (ex. ricardo-dockerhub)

se	ername with password
	cope
L	Global (Jenkins, nodes, items, all child items, etc)
U	sername
	rixardo
	Treat username as secret
p	assword
	4577014
Ľ	••••••
I)
ŀ	rixardo-dockerhub
D	escription

Once set up, you can save the input

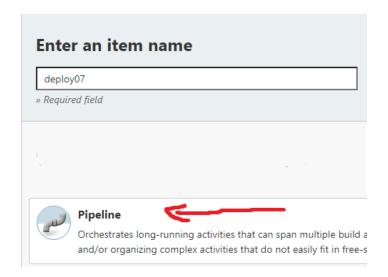
Creating the Pipeline

We will have to set up a pipeline script to build our application and push it to Dockerhub.

In the Jenkins Controller, go to the dashboard and select New Item



You can name the item anything and select Pipeline.



In the pipeline configuration, scroll down to Pipeline and change the definition to "Pipeline scripts from SCM".

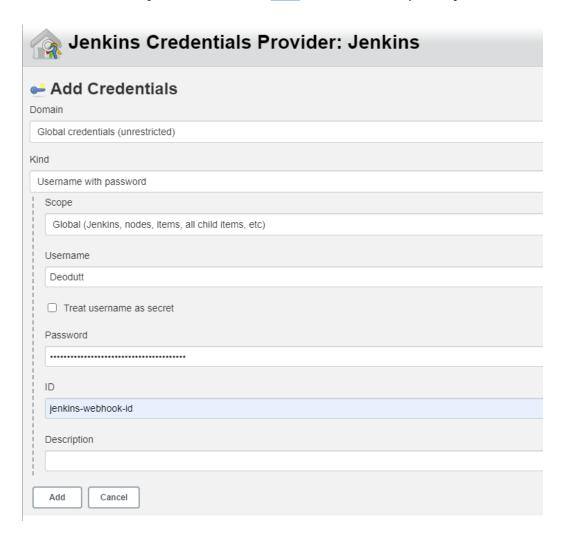
In the SCM select "Git"

For the Repository URL paste in your repository URL that you forked previously.

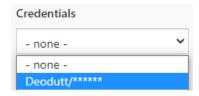
We will need to add new GitHub credentials next.



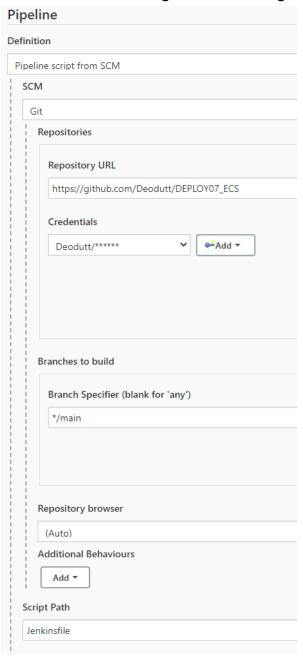
In the following settings, we will create a Username with password. Inside of that the username will be your GitHub username. The password will be your GitHub personal access token that you can create -> here The ID can simple be jenkins-webhook-id.



Once created we need to select the credentials we just made

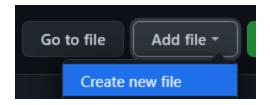


Once we created the credentials, we will need to change the branch specifier to "*/main". Most branches have migrated from using master to main



Save the pipeline script and we can proceed.

Navigate to your GitHub and create a new file



Name is Jenkinsfile and paste the following script in it

```
pipeline {
  agent {
    label "jenkins-agent"
  environment {
    DOCKERHUB_CREDENTIALS = credentials("rixardo-dockerhub")
  }
  stages {
    stage('Build') {
       steps {
         sh 'docker build -t rixardo/deploy07 .'
         sh 'echo "completed build"
       }
    }
    stage('Login') {
       steps {
         sh 'echo $DOCKERHUB_CREDENTIALS_PSW | docker login -u
$DOCKERHUB_CREDENTIALS_USR --password-stdin'
         sh 'echo "completed login"
       }
    }
    stage('Push'){
       steps {
         sh 'docker push rixardo/deploy07:latest'
         sh 'echo "completed push"
       }
    }
  }
}
```

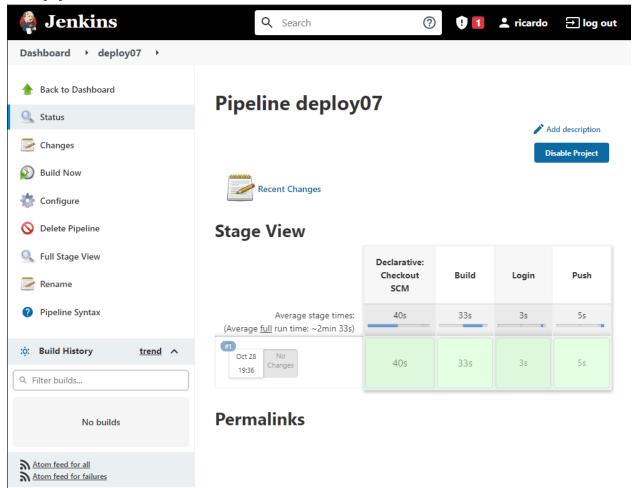
You will need to make sure to change the agent label to what you labeled your agent. You then need to change the DOCKER_CREDENTIALS to match your user (username-dockerhub). You will also have to change the docker commands which tags your username to your docker image(sh 'docker build -t user/deploy07 .'). Lastly you need to change the docker push command in the push stage to match your user (sh 'docker push

user/deploy07:latest') Once that is set up you can commit the new file and go back to the Jenkins controller.

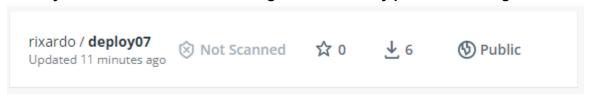
Once inside the Jenkins controller, we simply have to select Build Now in the pipeline that we created



Finally, you should have a successful test build



Check your DockerHub to see if the Agent successfully pushed the image.



Cleanup

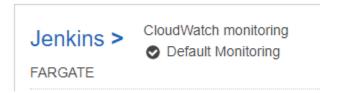
Once you have gotten all that, we should clean up to avoid AWS Fees

Terminate the AWS EC2 - Docker Agent

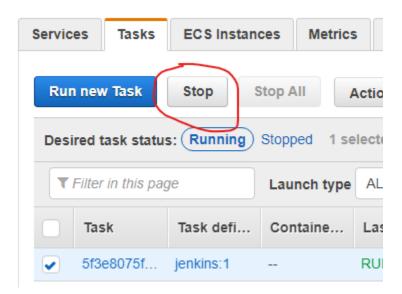
Navigate to Elastic Container Service



Select Cluster and pick the Cluster you created



Select the Task tab and stop the task



In the top right of the page,

Go to Task Definitions

Amazon ECS

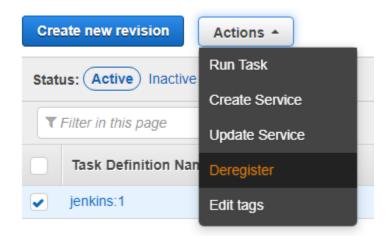
Clusters

Task Definitions

Click on your task definition you created



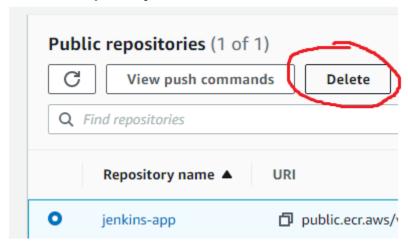
Deregister the certain revision



Navigate to repositories

Amazon ECR Repositories

Select the repository and delete it



You are finished!