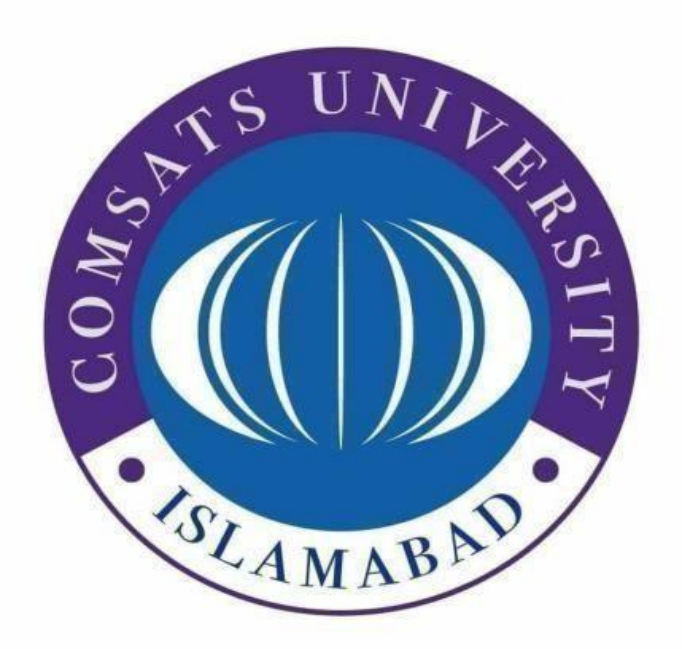
COMSATS University Islamabad, Attock Campus

Course: TOCS



Course	TOCS
Instructor	Dr. Farhan Adil

Group Members Details

Registration No	Name
Sp20-bcs-008	Shahid iqbal

1. Docker Containerization:

1. Create a Simple Web Application:

Create a simple web application, for example, a "Hello World" Flask application or any other sample website template.

2. Write a Dockerfile:

- Create a `Dockerfile` in the root of your project to define the containerization process.

```Dockerfile
FROM python:3.8-alpine

WORKDIR /app

COPY . .

RUN pip install -r requirements.txt  # Install dependencies if needed

CMD ["python", "app.py"]
```

3. Build and Push Docker Image:

- Build the Docker image and push it to Docker Hub.

```bash
docker build -t your-dockerhub-username/your-web-app:latest .

docker push your-dockerhub-username/your-web-app:latest
```

2. Jenkins CI/CD Pipeline:

1. Install Jenkins:

- Install Jenkins on your local machine or a dedicated server. Follow the official [Jenkins installation guide](https://www.jenkins.io/doc/book/installing/) for your specific environment.

2. Set Up Jenkins Job:

- Open Jenkins and create a new freestyle project.
- Configure the job to pull the source code from your version control system (e.g., GitHub).

3. Configure Jenkins Job:

- Set up the Git repository URL and credentials.
- Configure the build step to build the Docker image using the Dockerfile.
- Implement a post-build step to push the Docker image to Docker Hub.

4. Define CI/CD Pipeline Stages:

- Add the following stages to your pipeline:
  - **Build:** Build the Docker image.
  - **Test:** Implement your testing steps.
  - **Deploy:** Deploy the Docker image to AWS EC2 instance.
- Implement rollback functionality in case of a failed deployment.

5. Configure Email Notifications:

- Add email notification post-build actions to notify the team in case of a failed deployment.

3. AWS EC2 Instance:

1. Create an AWS EC2 Instance:

- Log in to your AWS Management Console.
- Launch an EC2 instance (Ubuntu Server) and configure security groups to allow traffic on port 80.
- Configure necessary security groups, key pairs, and network settings.

2. Install Docker on EC2 Instance:

- Connect to your EC2 instance using SSH.
- Install Docker on the EC2 instance:

```bash
sudo apt update
sudo apt install docker.io
sudo systemctl start docker
sudo systemctl enable docker
```

3. Pull and Run Docker Image:

- Pull the Docker image from Docker Hub and run it on the EC2 instance.

```bash
docker pull your-dockerhub-username/your-web-app:latest
docker run -d -p 80:80 your-dockerhub-username/your-web-app:latest
```

4. Pipeline Automation:

1. Trigger Pipeline Automatically:

- Configure Jenkins to trigger the pipeline automatically whenever changes are pushed to the version control system.

- Use webhooks or polling to detect changes in your Git repository.

2. Implement Deployment Steps:

- Modify the Jenkins job to SSH into the AWS EC2 instance and update the running Docker container.

- You can use SSH plugins in Jenkins to execute commands on the remote server.

AWS Console CMD

sudo apt update

sudo apt upgrade

sudo apt install default-jdk

java -version

curl -fsSL https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key | sudo tee \

/usr/share/keyrings/jenkins-keyring.asc > /dev/null

echo deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] \

https://pkg.jenkins.io/debian-stable binary/ | sudo tee \

/etc/apt/sources.list.d/jenkins.list > /dev/null

sudo apt update

sudo apt install jenkins

sudo systemctl start jenkins

sudo systemctl enable jenkins

sudo systemctl status jenkins

sudo cat /var/lib/jenkins/secrets/initialAdminPassword

#Enable Port in SecurityGroup

#add ssh in rules

http://51.20.140.172:8080 go to this open RemoteJenkins

##NoW JenkinsPart

LocalDesktop Part

chmod 400 MyUbuntuServer.pem

ssh -i MyUbuntuServer.pem ubuntu@ec2-51-20-140-172.eu-north-1.compute.amazonaws.com

#ADD WEBHOOK

http://ec2-51-20-140-172.eu-north-1.compute.amazonaws.com:8080/github-webhook/

#add PublishOver SSH IN JENKInS

#add ssh for interactions

#go to send artifect over ssh

#give permiison

sudo chown -R ubuntu:ubuntu /home/ubuntu/python

sudo chmod -R u+w /home/ubuntu/python

#Termianl

Install Jenkins

Plugins:

Publish Over SSH

DockerPlugins

Email Extension

 # Add Docker Credential in Jenkins Server

#Add Github Webhook

#Allow Port in Security Group of Instace

#in repo Add Jenkins File and Docker file

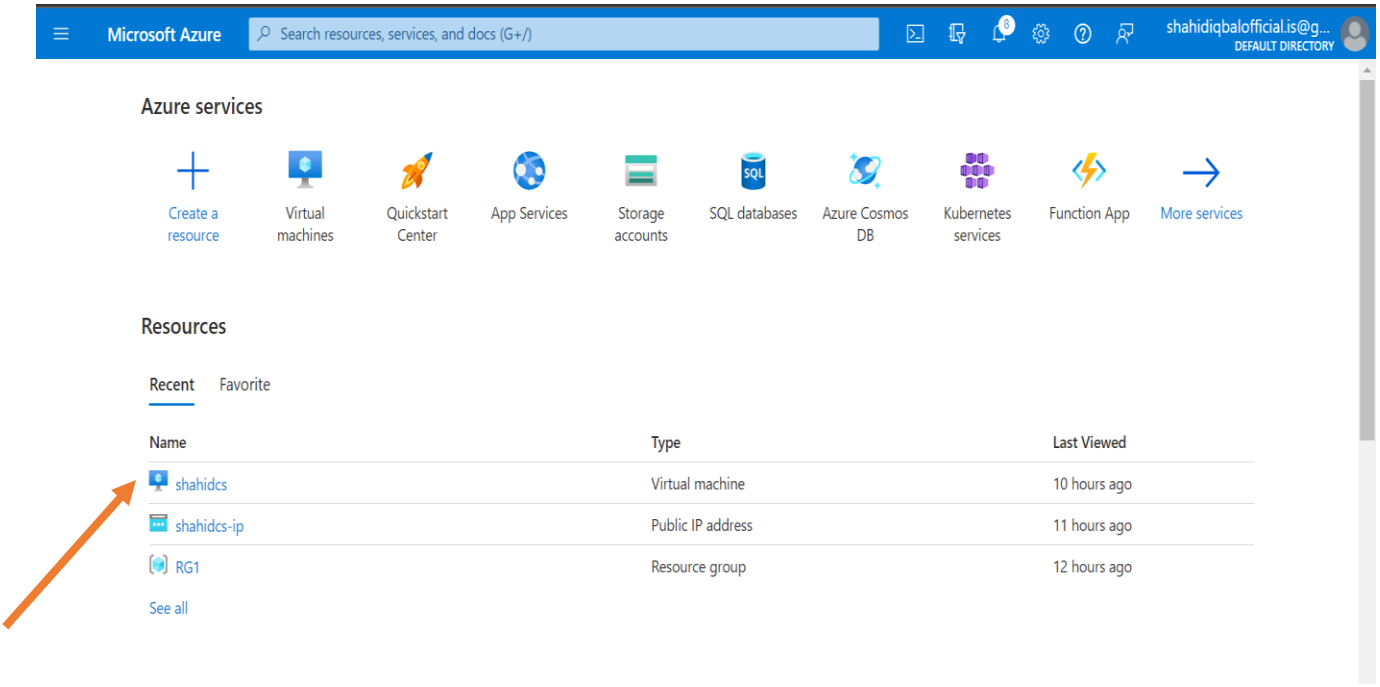
#Commands Ubuntu

sudo apt update

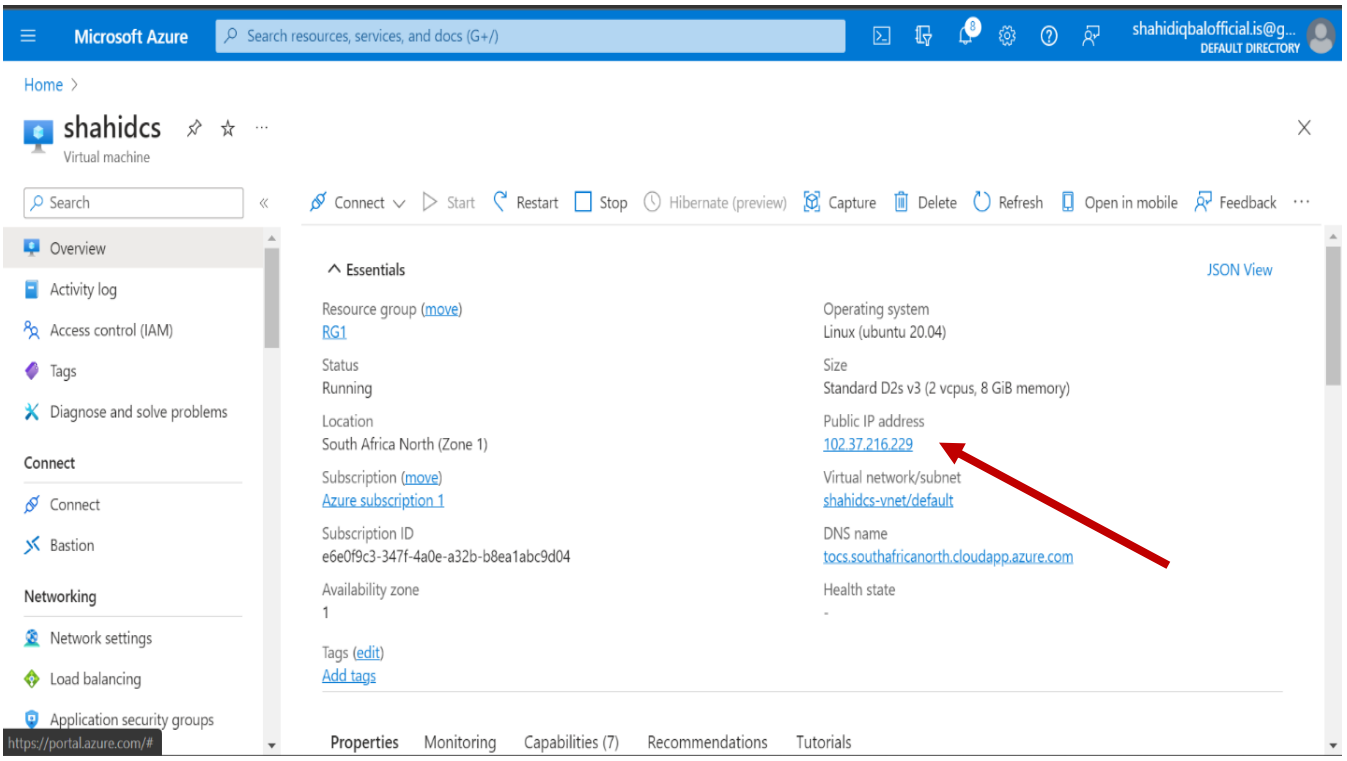
sudo apt install docker.io

```
sudo systemctl start docker

sudo systemctl enable docker

# Add Docker's official GPG key:

sudo apt-get update

sudo apt-get install ca-certificates curl gnupg

sudo install -m 0755 -d /etc/apt/keyrings

curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o
/etc/apt/keyrings/docker.gpg

sudo chmod a+r /etc/apt/keyrings/docker.gpg


# Add the repository to Apt sources:

echo \

  "deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.gpg]
https://download.docker.com/linux/ubuntu \

  $(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \

  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

sudo apt-get update

sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin

sudo usermod -aG docker jenkins

sudo usermod -aG docker ubuntu

sudo systemctl restart jenkins

sudo lsof -i :80

# or

sudo netstat -tulnp | grep :80

sudo reboot
```

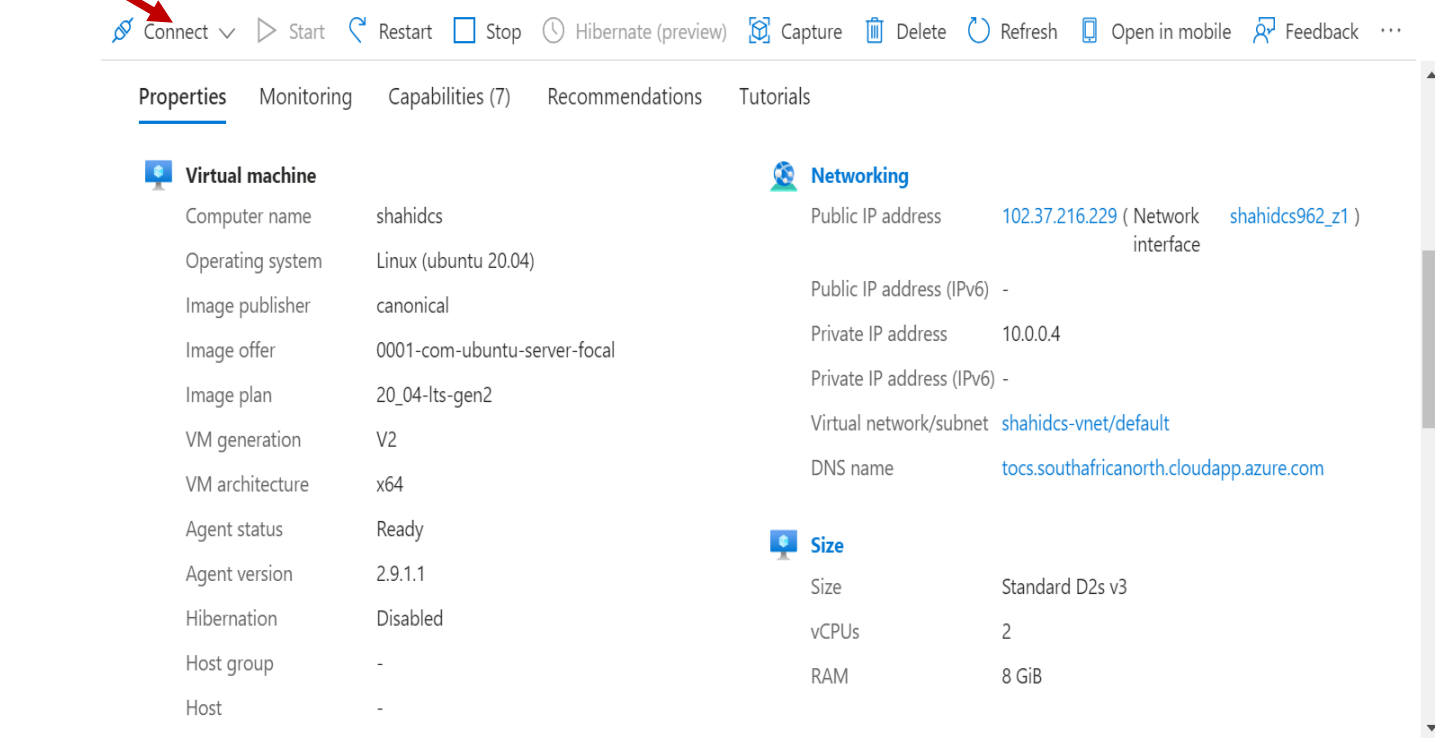
create instance on Azure



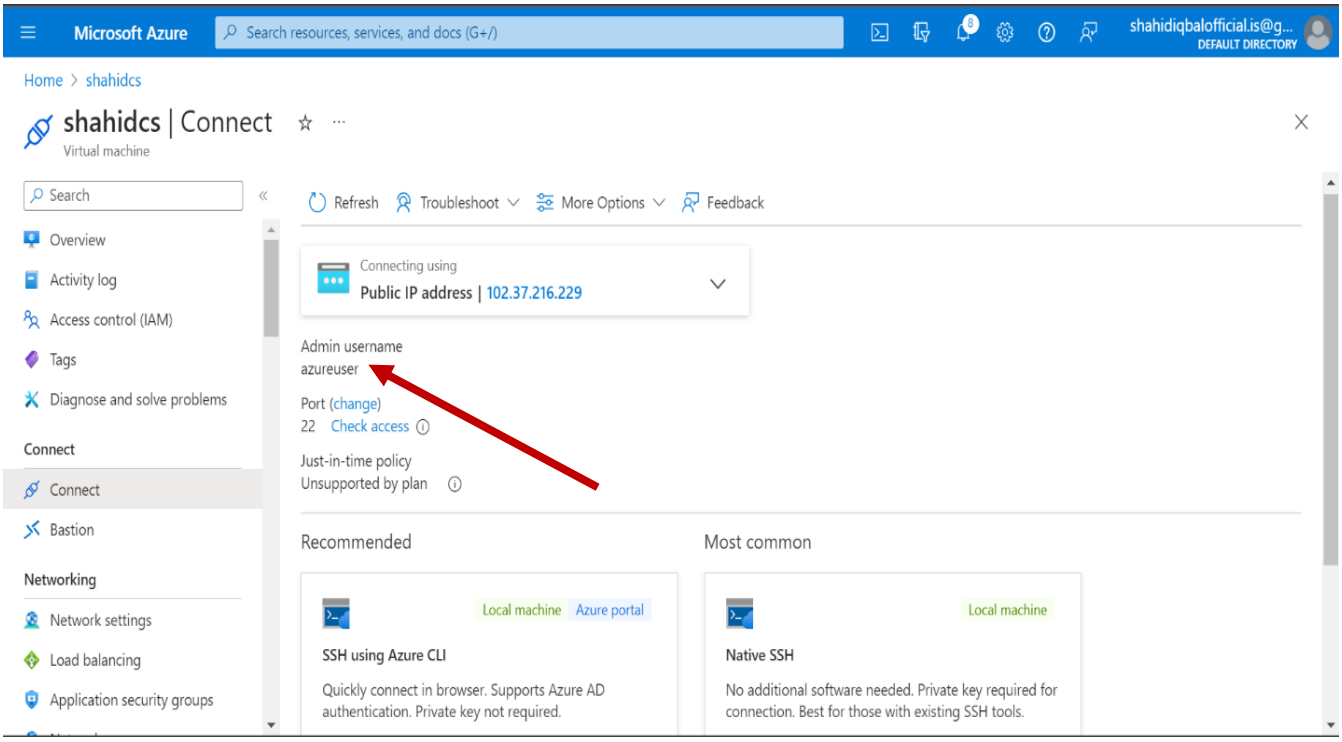
User Details, instance:(shahidcs)



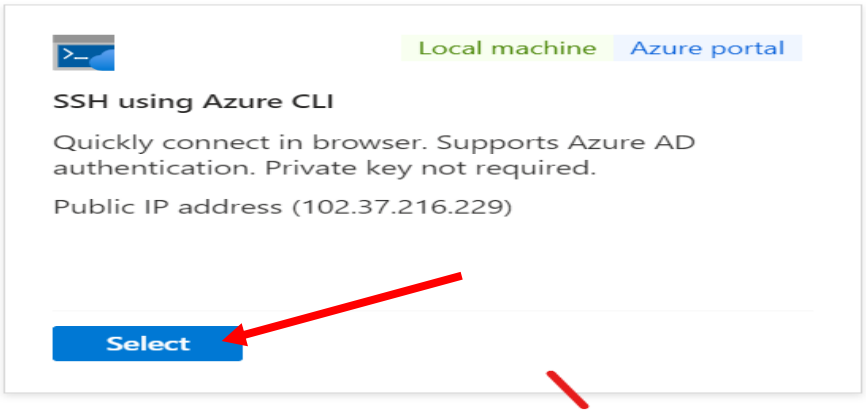
Here we are connecting our instance



Admin name (azureuser)



Here we select (SSH using Azure CLI)



SSH using Azure CLI

Connect from the Azure portal

Connect from your local machine

1 **Configure prerequisites for SSH using Azure CLI**

Azure needs to configure some features in order to connect to the VM.

Prerequisites configured

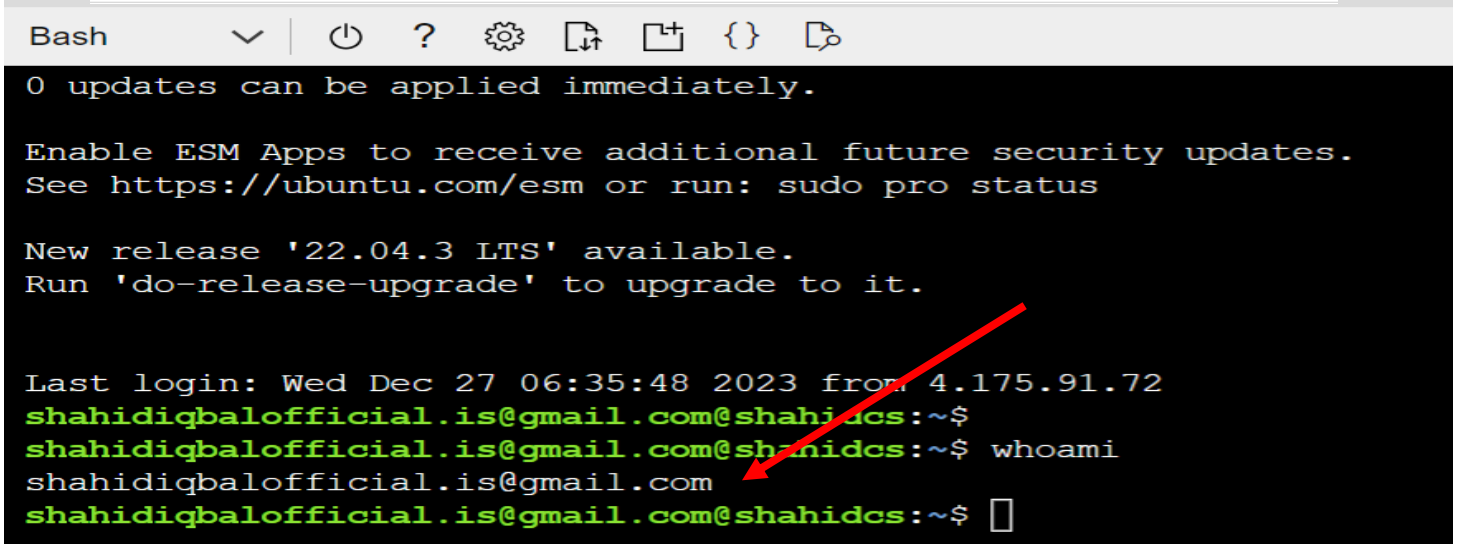
System assigned managed identity
Azure will configure a system-assigned managed identity in order to enable the Azure AD login extension. Learn more

Azure AD SSH Login Extension
The Azure Active Directory based SSH Login extension will securely connect to the VM using Azure AD instead of SSH or a username and password. Learn more

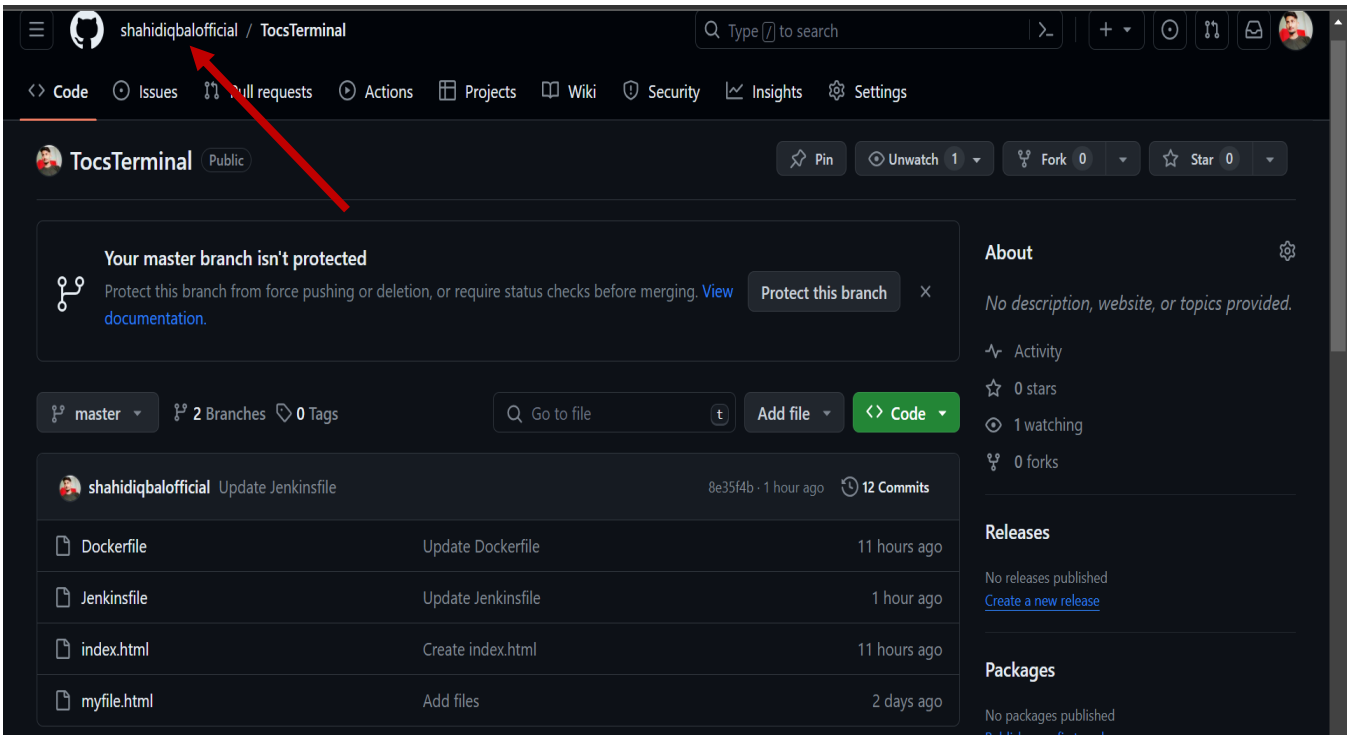
Virtual machine user or administrator login
A virtual machine administrator login role on the resource group will allow login to the virtual machine via CloudShell. Learn more

Port 22 access
Port 22 is accessible on this virtual machine for all configured IPs. Learn more

Change the port for connecting to this virtual machine on the



Github Account shahidiqbalofficial



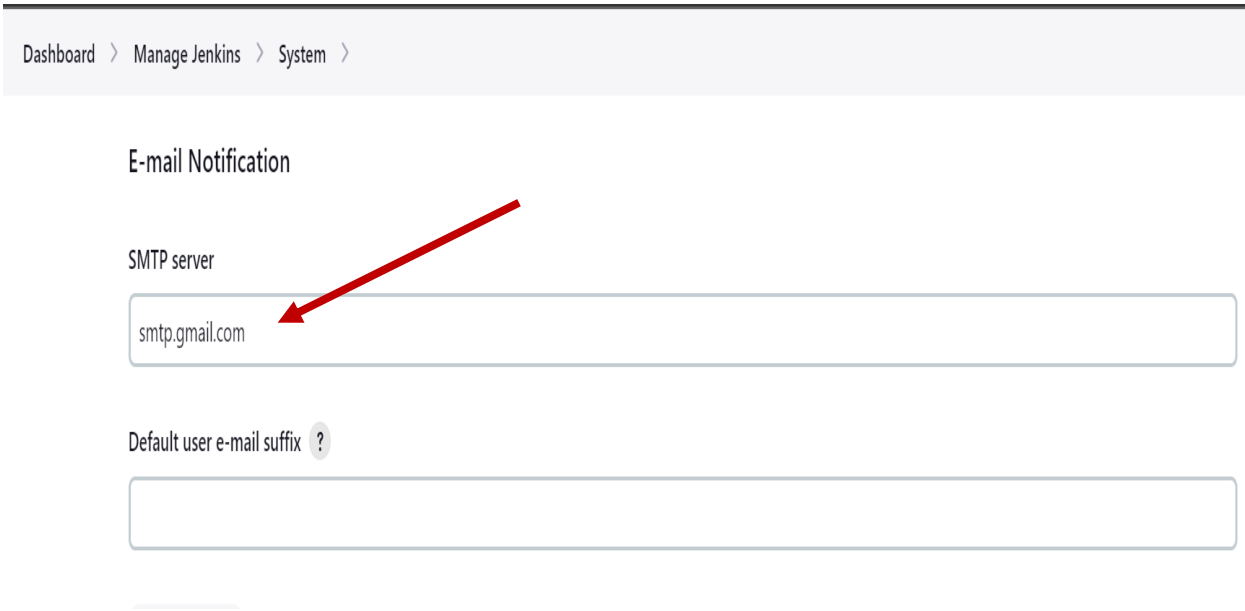
Jenkins files code

```
pipeline {
   agent any
   stages {
    stage('Build') {
      steps {
        script {
          dockerImage = docker.build("shahidiqbal008/distance-converter:${env.BUILD_ID}")
        }
    }
}
      stage('Push') {
         steps {
            script {
               docker.withRegistry('https://registry.hub.docker.com', 'docker-hub-credentials') {
```

```
                dockerImage.push()
            }
        }
    }
}
stage('Test') {
    steps {
        sh 'ls -l index.html'
    }
}
stage('Deploy') {
    steps {
        script {
            sshPublisher(
                publishers: [
                    sshPublisherDesc(
                        configName: "shahidcs",
                        transfers: [sshTransfer(
                            execCommand: """
                                docker pull shahidiqbal008/distance-converter:${env.BUILD_ID}
                                docker stop distance-converter-container || true
                                docker rm distance-converter-container || true
                                docker run -d --name distance-converter-container -p 80:80
shahidiqbal008/distance-converter:${env.BUILD_ID}
                            """
                        )] )                    ]                )
            boolean isDeploymentSuccessful = sh(script: 'curl -s -o /dev/null -w "%{http_code}"
http://102.37.216.229:80', returnStdout: true).trim() == '200'
```

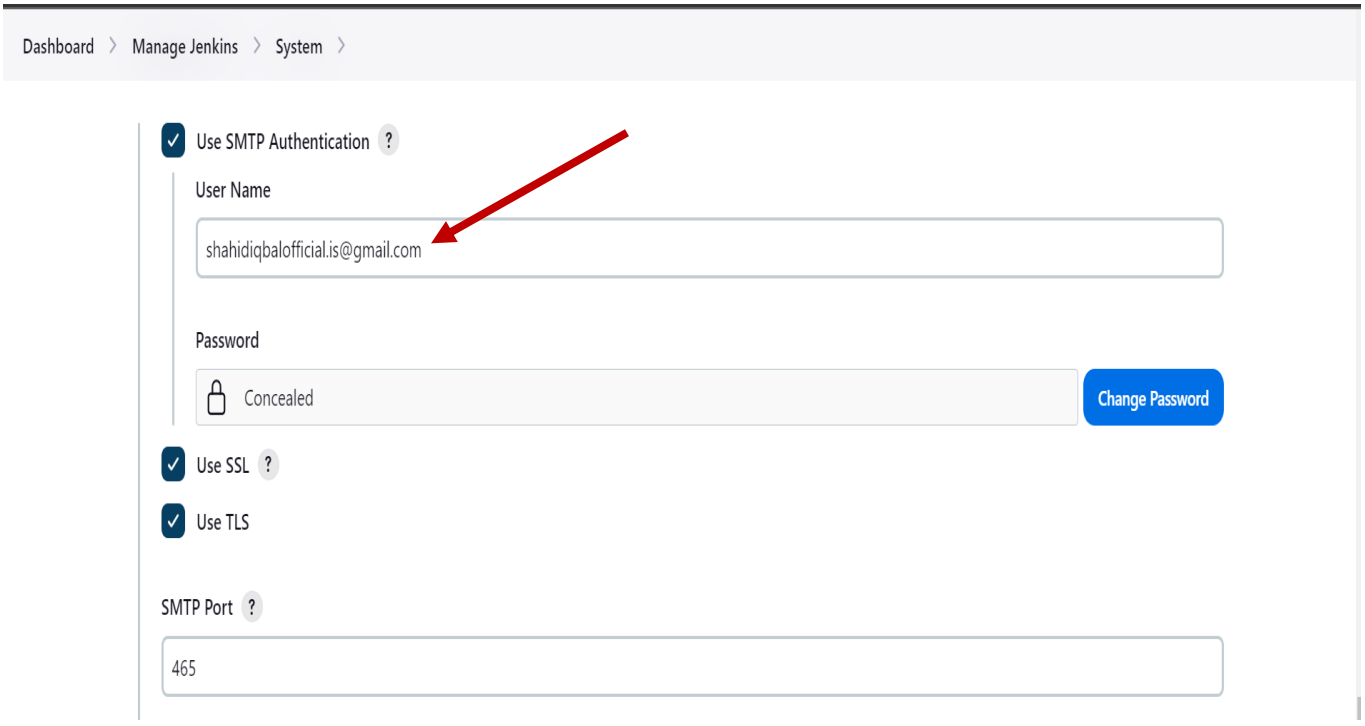
```
            if (!isDeploymentSuccessful) {
                def previousSuccessfulTag = readFile('previous_successful_tag.txt').trim()
                sshPublisher(
                    publishers: [
                        sshPublisherDesc(
                            configName: "shahidcs",
                            transfers: [sshTransfer(
                                execCommand: """
                                    docker pull shahidiqbal008/distance-converter:${previousSuccessfulTag}
                                    docker stop distance-converter-container || true
                                    docker rm distance-converter-container || true
                                    docker run -d --name distance-converter-container -p 80:80
shahidiqbal008/distance-converter:${previousSuccessfulTag}
                                """
                            )] ) ]                    )
            } else {
                writeFile file: 'previous_successful_tag.txt', text: "${env.BUILD_ID}"
            } } } } }
    post {
        failure {
            mail(
                to: 'shahidiqbalofficial.is@gmail.com',
                subject: "Failed Pipeline: ${env.JOB_NAME} [${env.BUILD_NUMBER}]",
                body: """Something is wrong with the build ${env.BUILD_URL}
                Rolling back to the previous version
                Regards,
                Jenkins
                """
            ) } } }
```

Jenkins Process

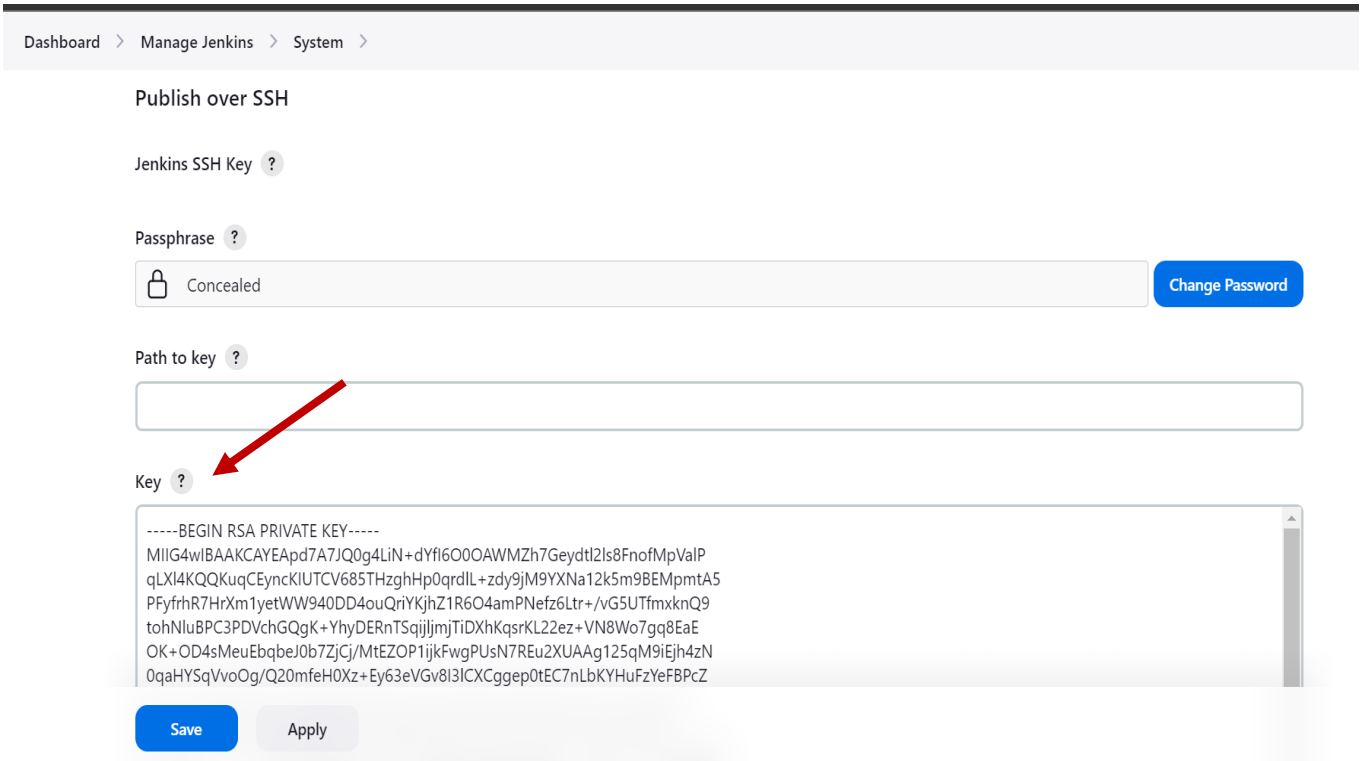


Next

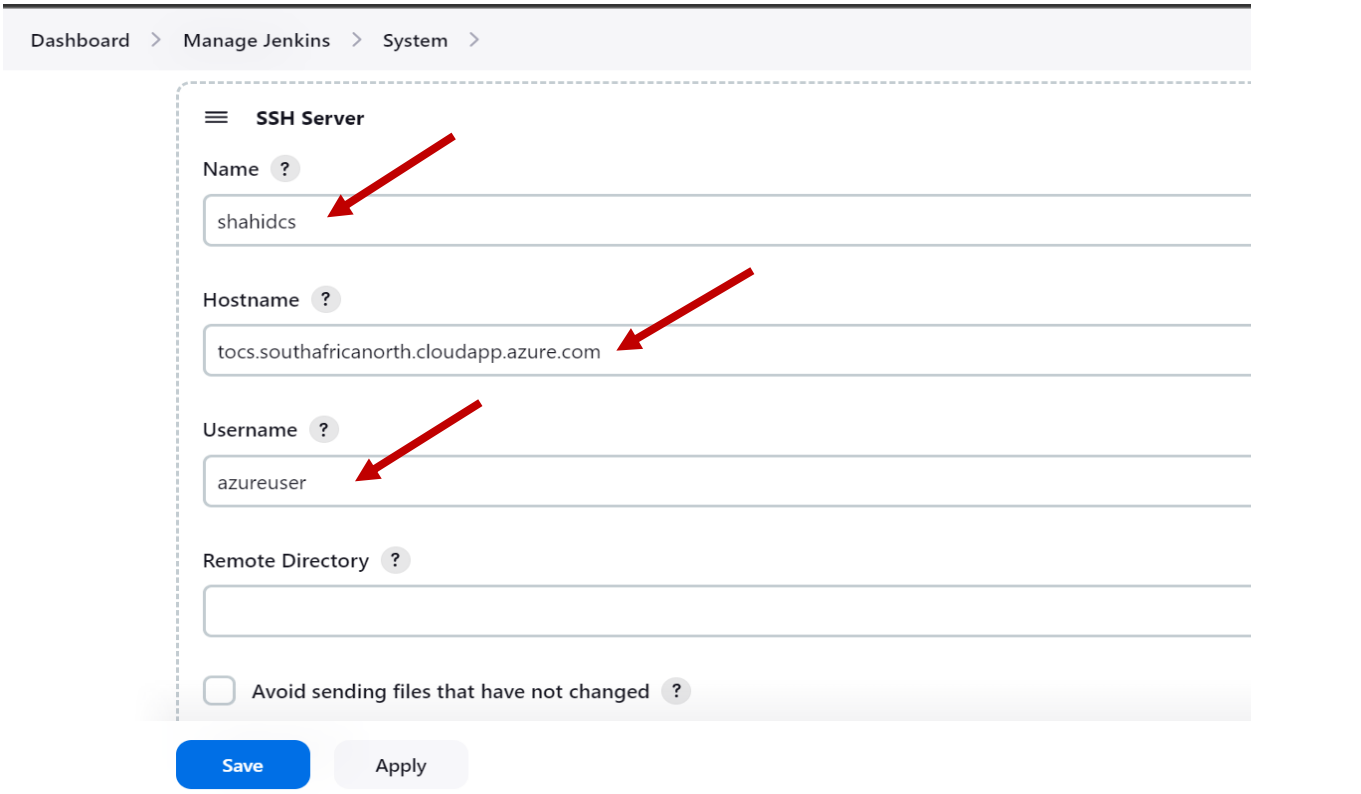
Email testing.....



Next

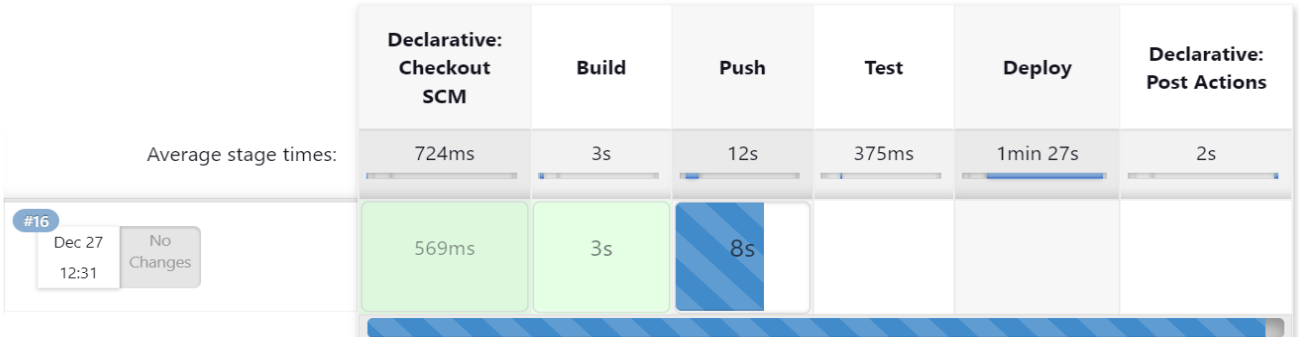

Dashboard > Manage Jenkins > System >
Publish over SSH
Jenkins SSH Key ?
Passphrase ?
Concealed
Change Password
Path to key ?
Key ?
-----BEGIN RSA PRIVATE KEY-----
MIIG4wIBAAKCAYEApd7A7JQ0g4LiN+dYfI6O0OAWMZh7Geydtl2ls8FnofMpVaIP
qLXl4KQQKuqCEyncKIUTCV685THzghHp0qrdlL+zdy9jM9YXNa12k5m9BEMpmtA5
PFyfrhR7HrXm1yetWW940DD4ouQriYKjhZ1R6O4amPNefz6Ltr+/vG5UTfmxknQ9
tohNluBPC3PDVchGQgK+YhyDERnTSqijljmjTiDXhKqsrKL22ez+VN8Wo7gq8EaE
OK+OD4sMeuEbqbeJ0b7ZjCj/MtEZOP1ijkFwgPUsN7REu2XUAAg125qM9iEjh4zN
0qaHYSqVvoOg/Q20mfeH0Xz+Ey63eVGv8l3lCXCggep0tEC7nLbKYHuFzYeFBPcZ
Save
Apply

Next


Dashboard > Manage Jenkins > System >
SSH Server
Name ?
shahidcs
Hostname ?
tocs.southafricanorth.cloudapp.azure.com
Username ?
azureuser
Remote Directory ?
Avoid sending files that have not changed ?
Save
Apply

Building process

Stage View



Console output

```
Started by user shahid iqbal
Obtained Jenkinsfile from git https://github.com/shahidiqbalofficial/TocsTerminal
[Pipeline] Start of Pipeline
[Pipeline] node
Running on Jenkins in /var/lib/jenkins/workspace/Terminal
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Declarative: Checkout SCM)
[Pipeline] checkout
Selected Git installation does not exist. Using Default
The recommended git tool is: NONE
No credentials specified
 > git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/Terminal/.git # timeout=10
Fetching changes from the remote Git repository
 > git config remote.origin.url https://github.com/shahidiqbalofficial/TocsTerminal # timeout=10
Fetching upstream changes from https://github.com/shahidiqbalofficial/TocsTerminal
 > git --version # timeout=10
 > git --version # 'git version 2.25.1'
 > git fetch --tags --force --progress -- https://github.com/shahidiqbalofficial/TocsTerminal
+refs/heads/*:refs/remotes/origin/* # timeout=10
 > git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 8e35f4b6dbe90484a5782fedc09c0a23f8e4aad4 (refs/remotes/origin/master)
 > git config core.sparsecheckout # timeout=10
```

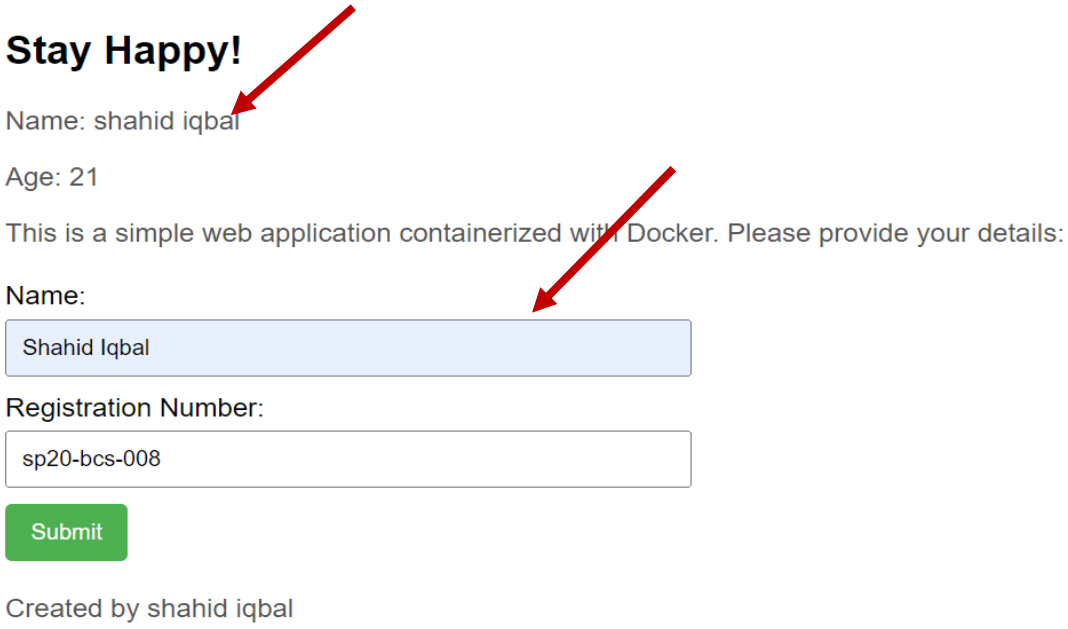
```
 > git checkout -f 8e35f4b6dbe90484a5782fedc09c0a23f8e4aad4 # timeout=10
Commit message: "Update Jenkinsfile"
 > git rev-list --no-walk 8e35f4b6dbe90484a5782fedc09c0a23f8e4aad4 # timeout=10
[Pipeline] }
[Pipeline] // stage
[Pipeline] withEnv
[Pipeline] {
[Pipeline] stage
[Pipeline] { (Build)
[Pipeline] script
[Pipeline] {
[Pipeline] isUnix
[Pipeline] withEnv
[Pipeline] {
[Pipeline] sh
+ docker build -t shahidiqbal008/distance-converter:16 .
#0 building with "default" instance using docker driver

#1 [internal] load build definition from Dockerfile
#1 transferring dockerfile: 94B done
#1 DONE 0.0s
```

.....And.....

```
#2 [internal] load .dockerignore
#2 transferring context: 2B done
#2 DONE 0.0s

#3 [internal] load metadata for docker.io/library/nginx:alpine
#3 DONE 2.0s

#4 [1/2] FROM
docker.io/library/nginx:alpine@sha256:a59278fd22a9d411121e190b8cec8aa57b306aa3332459197777583beb728f59
#4 DONE 0.0s

#5 [internal] load build context
#5 transferring context: 6.01kB 0.0s done
#5 DONE 0.0s

#6 [2/2] COPY . /usr/share/nginx/html
#6 CACHED

#7 exporting to image
#7 exporting layers done
#7 writing image sha256:3ca22ed56508fdd704808e5574f78403af61b067753361de047541d5ff245188 done
#7 naming to docker.io/shahidiqbal008/distance-converter:16 0.0s done
#7 DONE 0.0s
```

```
$ docker login -u shahidiqbal008 -p ******** https://registry.hub.docker.com
WARNING! Using --password via the CLI is insecure. Use --password-stdin.
WARNING! Your password will be stored unencrypted in /var/lib/jenkins/workspace/Terminal@tmp/3c2990f3-4921-4e8f-9bc2-19da5acfe06c/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
[Pipeline] {
[Pipeline] isUnix
[Pipeline] withEnv
[Pipeline] {
[Pipeline] sh
+ docker tag shahidiqbal008/distance-converter:16 registry.hub.docker.com/shahidiqbal008/distance-converter:16
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] isUnix
[Pipeline] withEnv
[Pipeline] {
[Pipeline] sh
+ docker push registry.hub.docker.com/shahidiqbal008/distance-converter:16
The push refers to repository [registry.hub.docker.com/shahidiqbal008/distance-converter]
8b5df497b8ce: Preparing
```

```
[Pipeline] sh
+ ls -l index.html
-rw-r--r-- 1 jenkins jenkins 254 Dec 26 21:13 index.html
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Deploy)
```


Hello, Docker World!
Stay Happy!
Name: shahid iqbal
Age: 21
This is a simple web application containerized with Docker. Please provide your details:
Name:
Shahid Iqbal
Registration Number:
sp20-bcs-008
Submit
Created by shahid iqbal