DevSecOps Pipeline: Deploying ReactJS on Kubernetes

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Tools and technologies:

1. AWS EC2 instance (for Jenkins/Sonarqube server):
   - Operating system : Ubuntu(22.04) T2 Large Instance
   - Storage : 15 GB

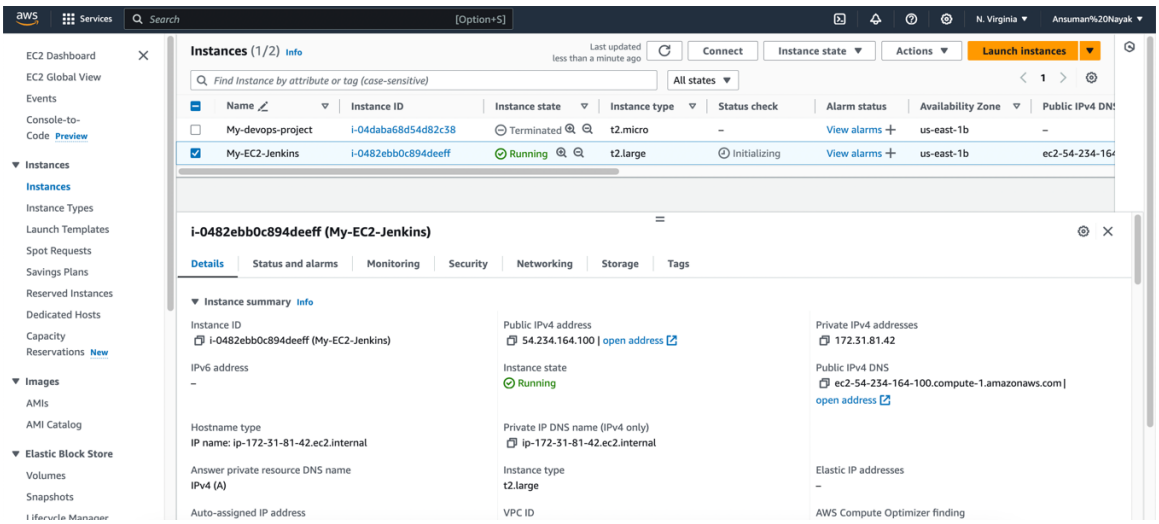
   For Kubernetes Master/Worker :

   - Operating system : Ubuntu 20.04 T2.Meduim Instance
   - Storage : 15 GB

2. Jenkins
3. Sonarqube
4. Trivy
5. Docker
6. Kubernetes

Steps:

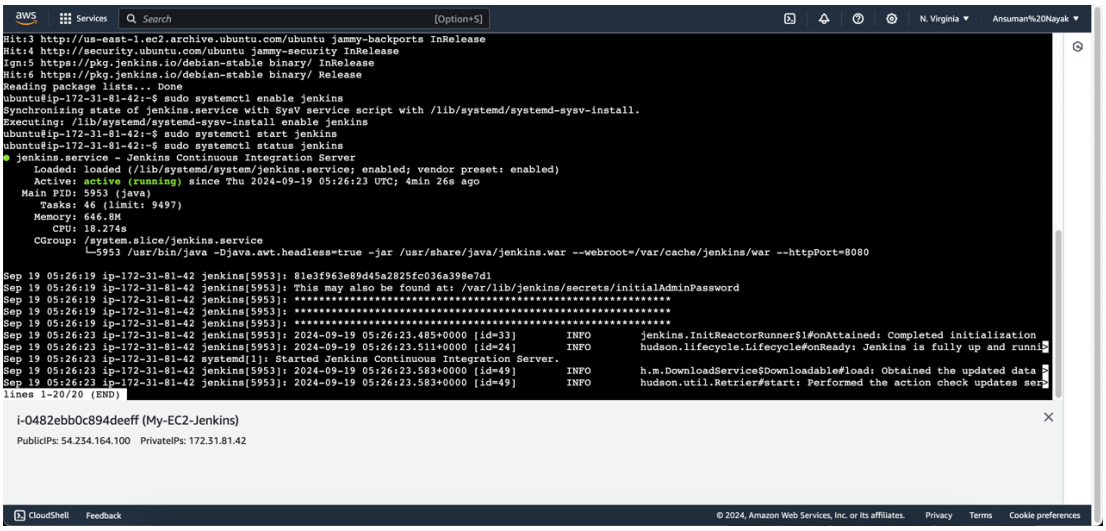
1. Launch an Ubuntu(22.04) T2 Large Instance for setting up Jenkins.



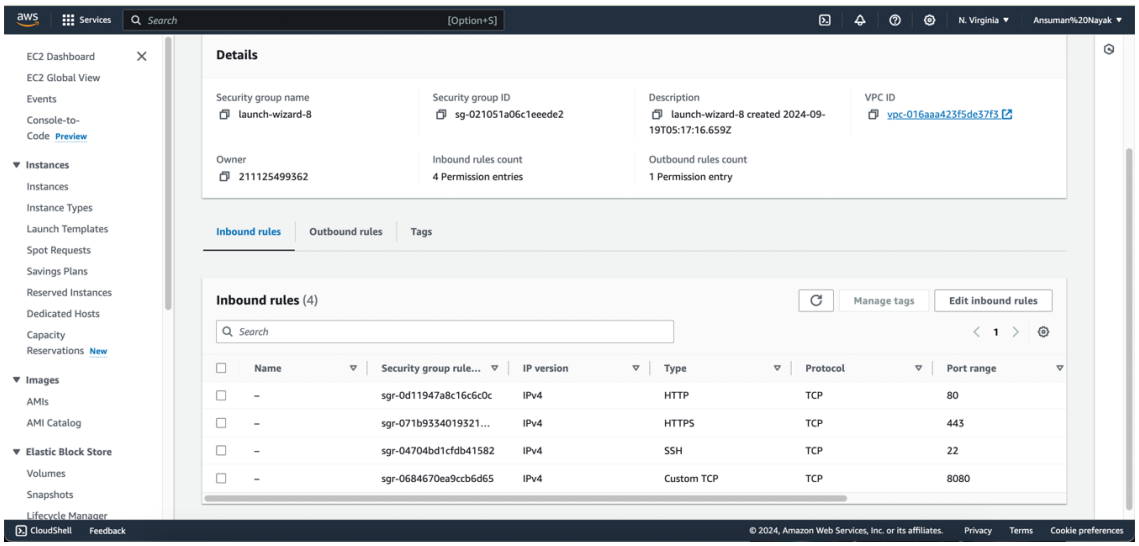
2. Install Jenkins on the EC2 instance sudo apt update -y sudo apt install openjdk-17-jre -y curl -fsSL https://pkg.jenkins.io/debian-stable/jenkins.io-2023.key | sudo tee \ /usr/share/keyrings/jenkins-keyring.asc > /dev/null

   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

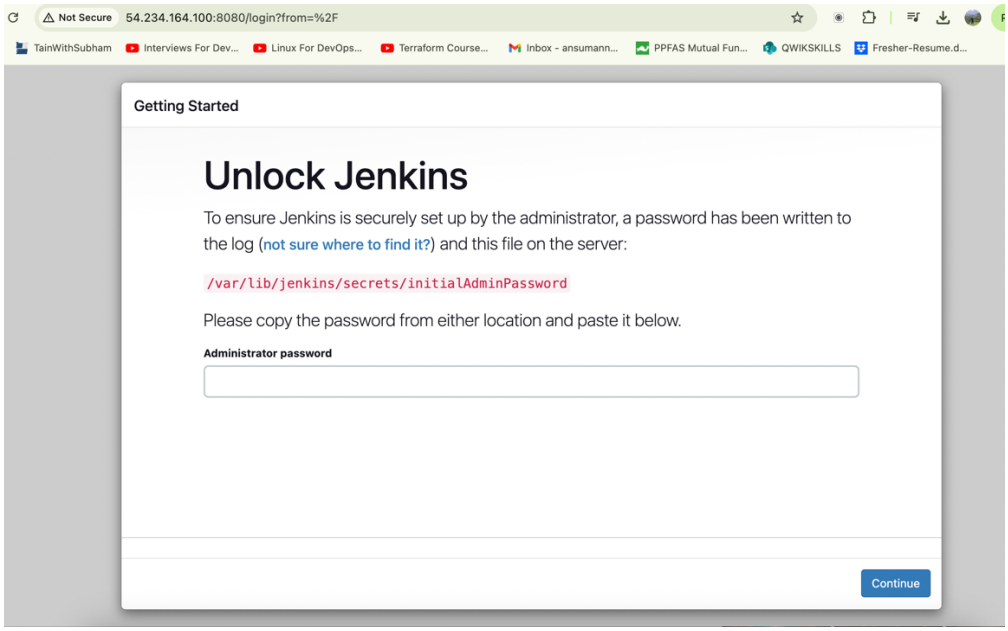
   sudo apt-get install jenkins -y sudo
   systemctl start jenkins sudo
   systemctl status Jenkins



3. Go to AWS EC2, Security Group and open Inbound Port 8080.

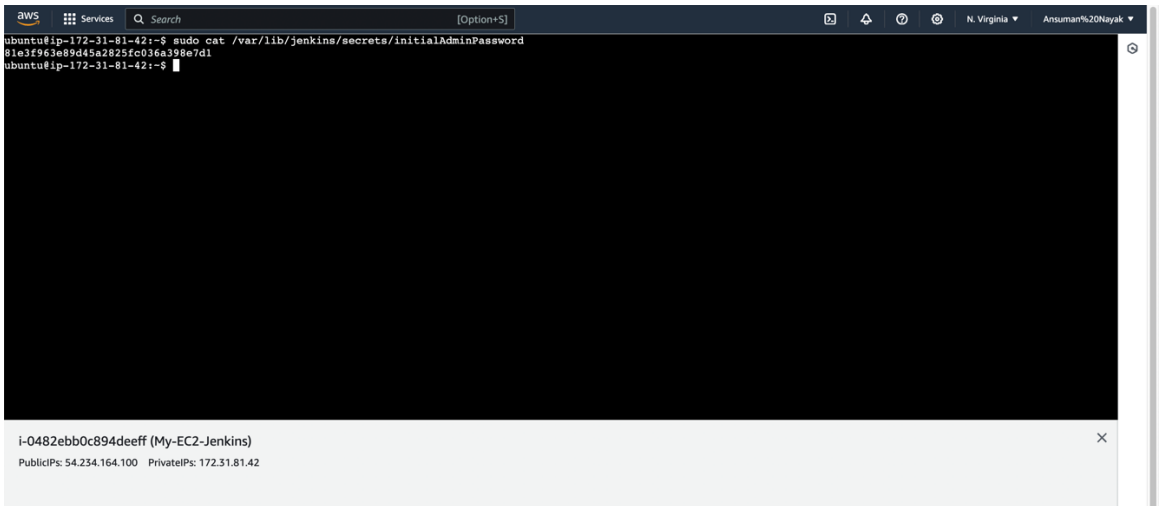


Type<EC2 Public IP Address:8080> in web browser to access Jenkins server.

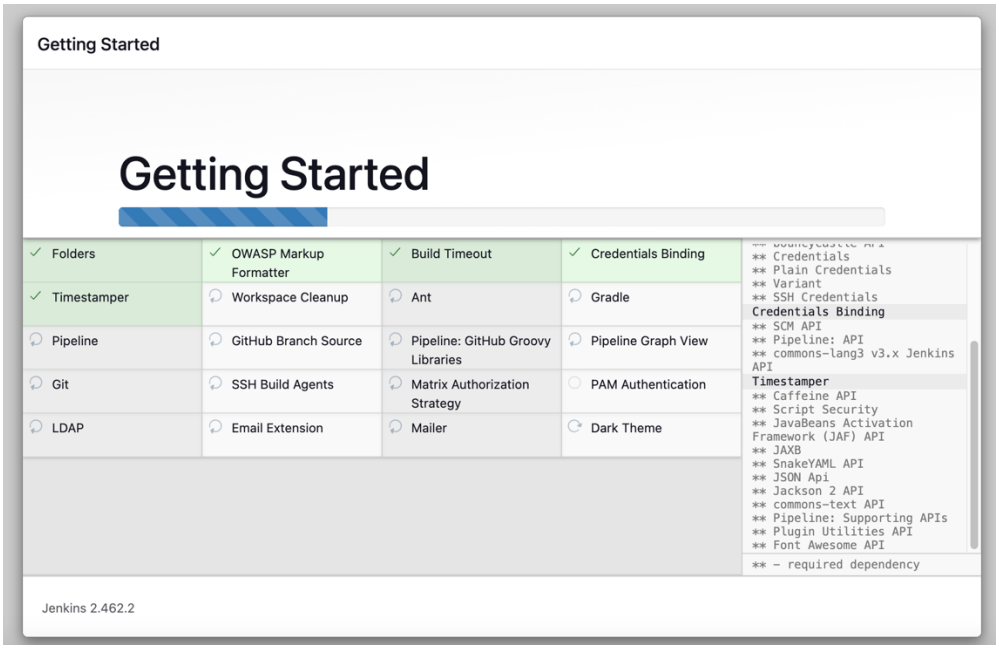


Copy the displayed path and paste it on the EC2 terminal as displayed below.
sudo cat /var/lib/jenkins/secrets/initialAdminPassword

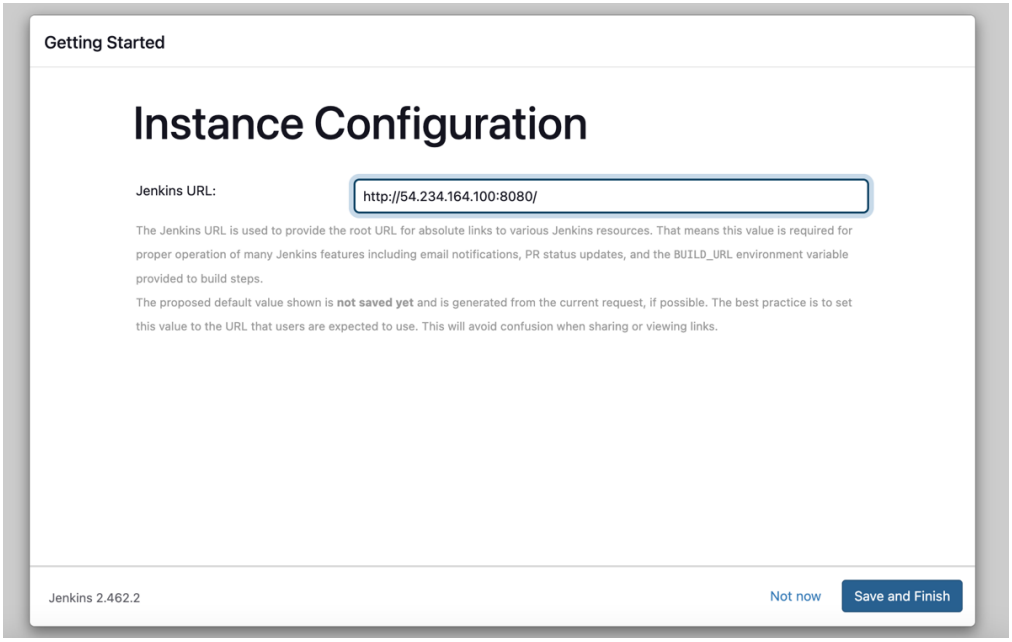
Copy the token and paste it in Jenkins administrator password section.

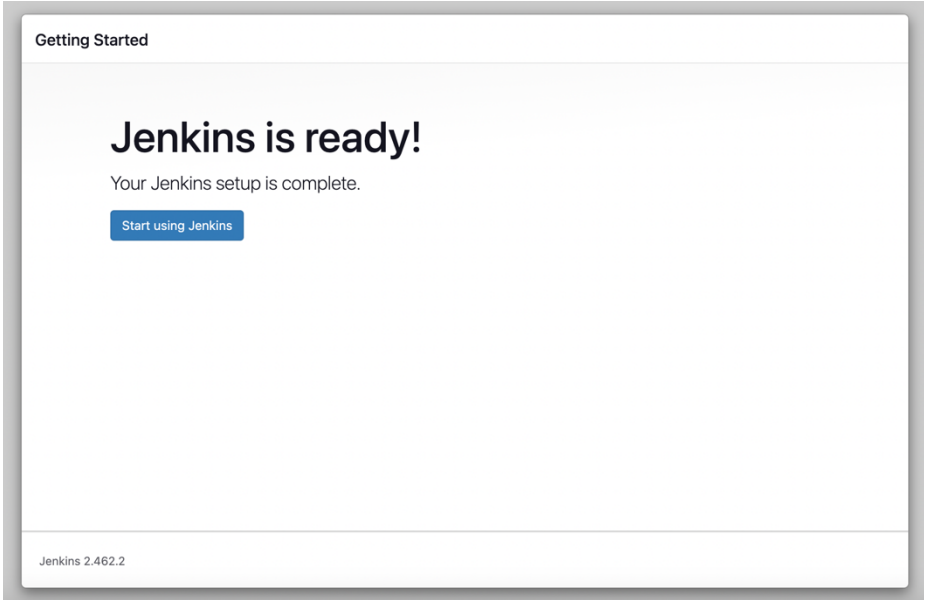


4. Install the suggested plugins



5. Now create a user in Jenkins with own username, password and email.





6. You're doing really well! Let now install Docker and Sonarqube

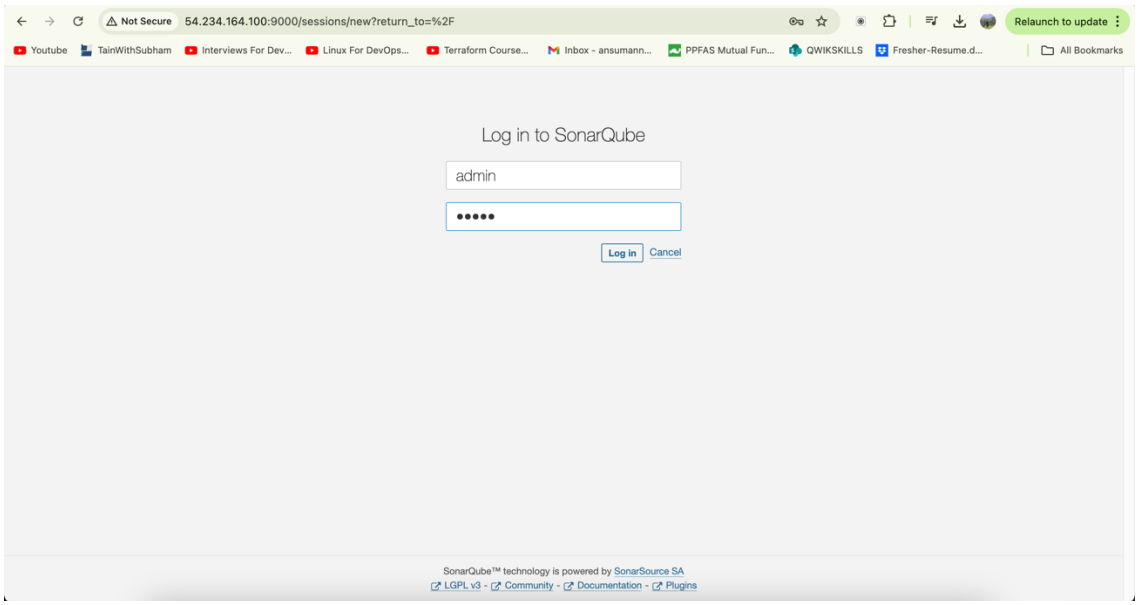
   sudo apt-get update sudo apt-get install
   docker.io -y sudo usermod -aG docker
   $USER newgrp docker sudo chmod
   777 /var/run/docker.sock

7. After the docker installation, we will install sonarqube using a Sonarqube container (Remember to add 9000 ports in the security group as done for Jenkins).

   - docker run -d --name sonar -p 9000:9000 sonarqube:lts-community

8. Enter public ip of EC2 instance and the port number in web browser.
   <public-ip-of-EC2:9000>

9. Enter username and password, click on login and change password
   Note: For the first time the default credentials will be username= admin and password =admin, following this update new password.



10. Our infrastructure needs some security, so now we will install Trivy.
    - sudo apt-get install wget apt-transport-https gnupg lsb-release -y
    - wget -qO - https://aquasecurity.github.io/trivy-repo/deb/public.key | gpg --dearmor | sudo tee /usr/share/keyrings/trivy.gpg > /dev/null
    - echo "deb [signed-by=/usr/share/keyrings/trivy.gpg] https://aquasecurity.github.io/trivy-repo/deb $(lsb_release -sc) main" | sudo tee -a /etc/apt/sources.list.d/trivy.list
    - sudo apt-get update
    - sudo apt-get install trivy -y

11. Now install plugins like JDK, Sonarqube Scanner, NodeJS, OWASP dependency check.

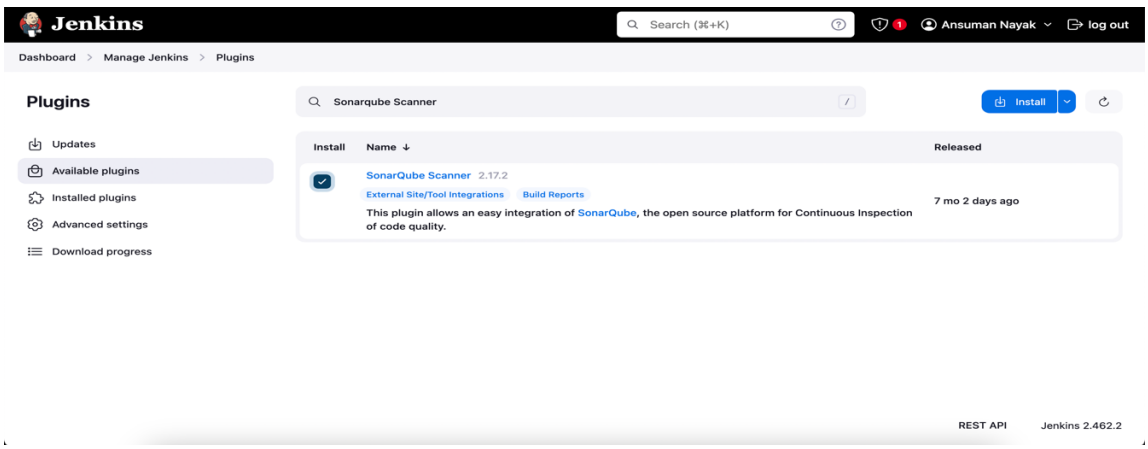
    Install plugins

    Go to Manage Jenkins →Plugins → Available Plugins → Install below plugins

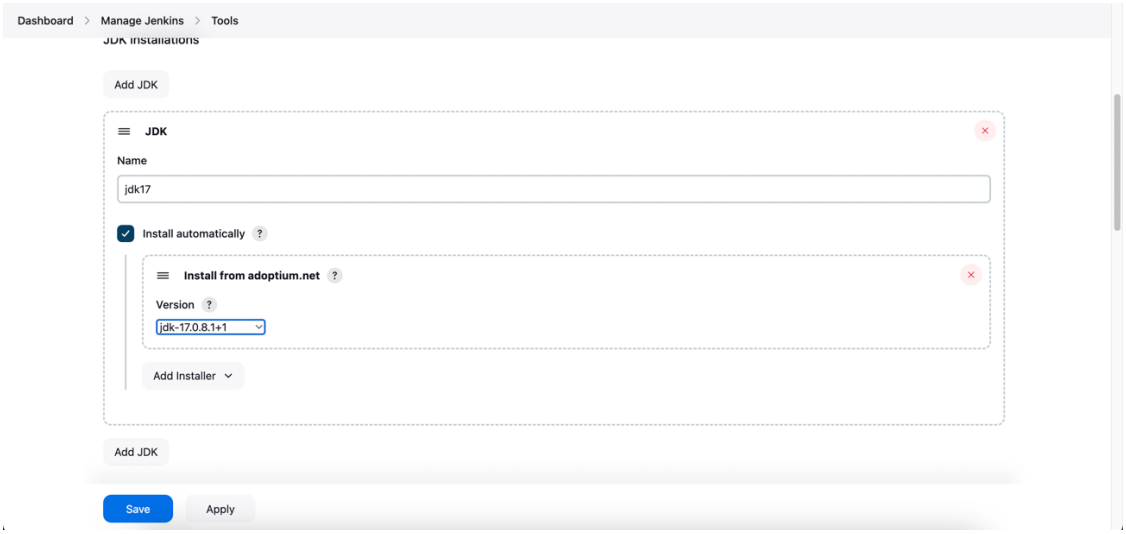
    → Eclipse Temurin Installer (Install without restart)

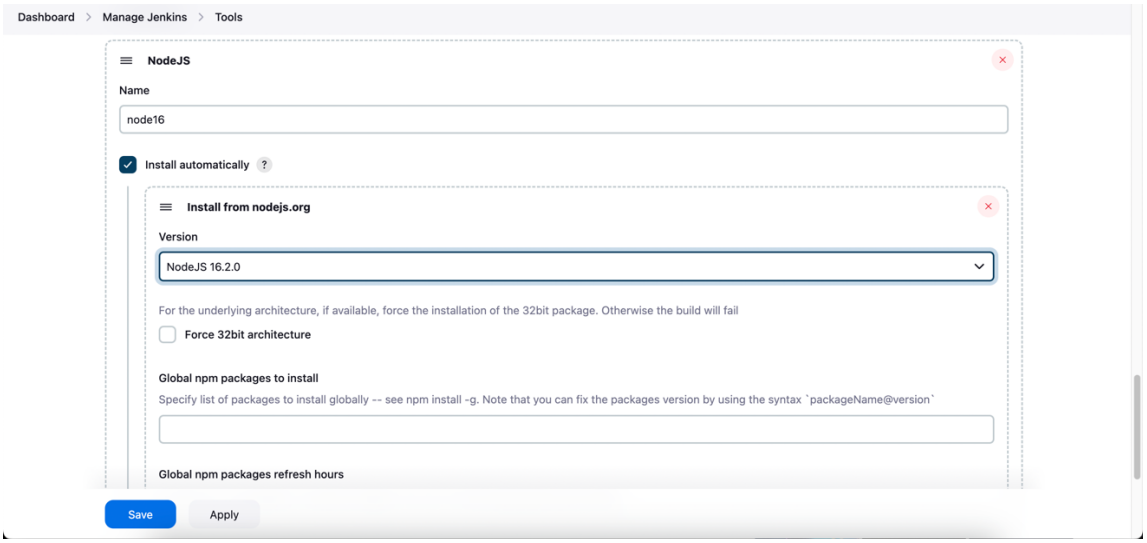
    → Sonarqube Scanner (Install without restart)

    → NodeJS Plugin (Install Without restart)



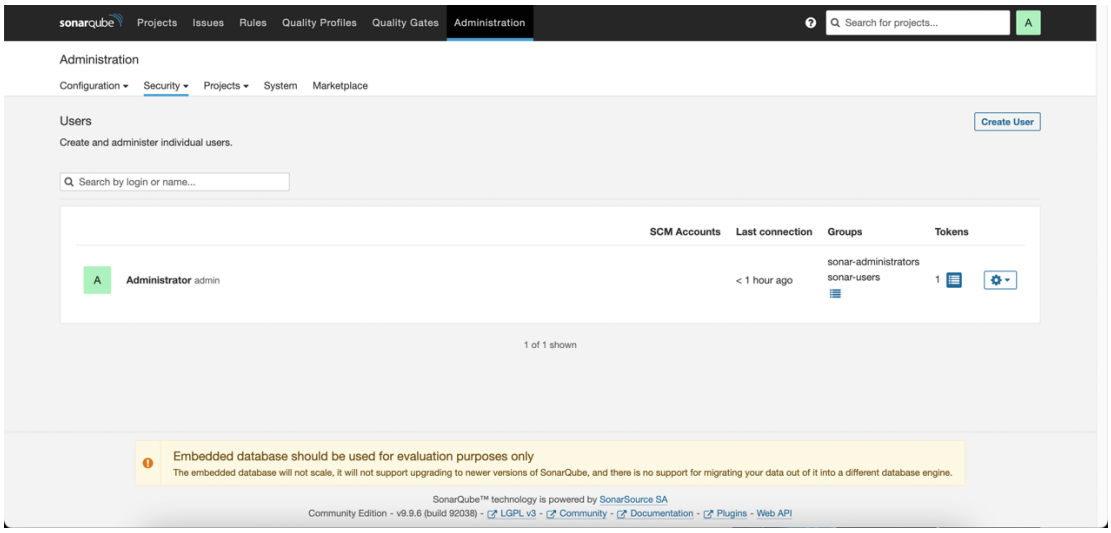
12. Configure Java and Nodejs in Global tool configuration
Goto Manage Jenkins → Tools → Install JDK(17) and NodeJs(16)→ Click on Apply and Save.





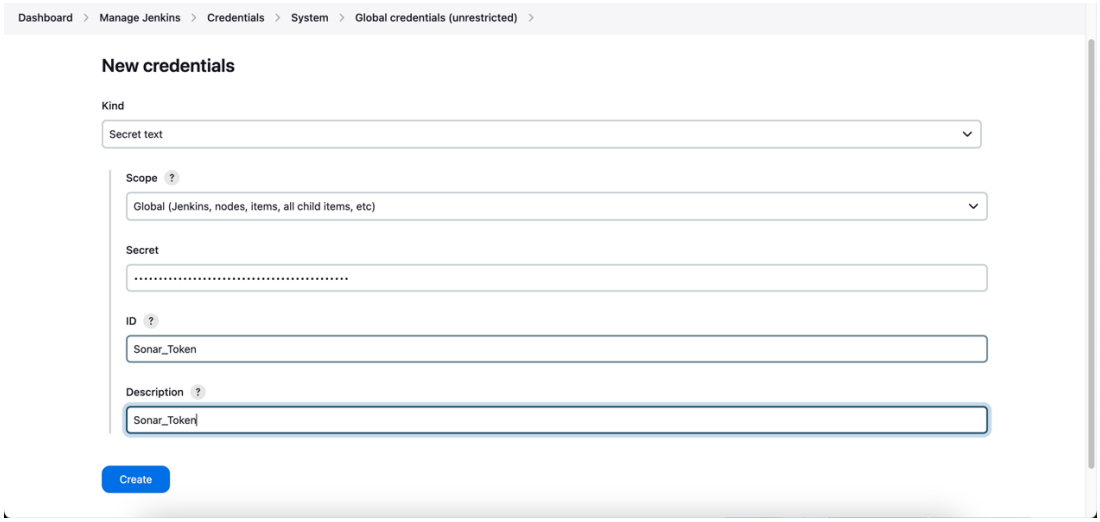
13. Create a Job create a job as Devsecops_demo Name, select pipeline and click ok.

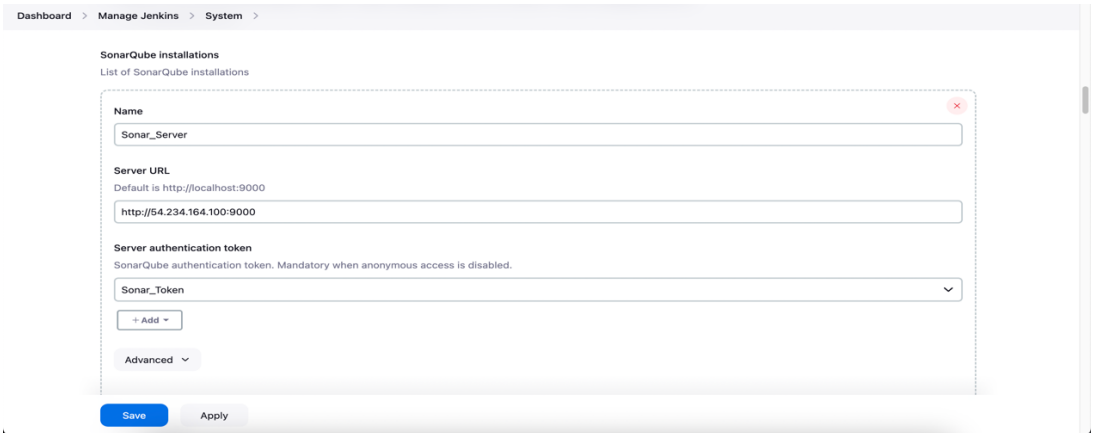
14. Configure Sonar Server in Manage Jenkins
Copy the Public IP of your EC2 instance, Sonarqube works on port 9000, <Public IP EC2>:9000.
Goto your Sonarqube Server.
Click on Administration → Security → Users → Click on Tokens and Update Token → Give it a name → click on Generate Token→Copy the token.



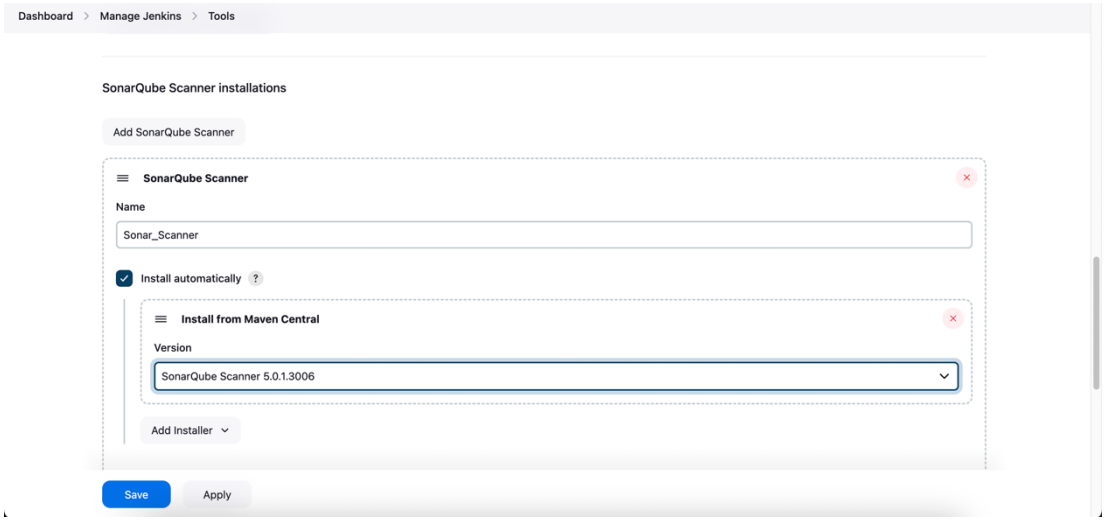
Goto Jenkins Dashboard → Manage Jenkins → Credentials → Add Secret Text.

Now, go to Dashboard → Manage Jenkins → System and Add like the below image. Click on Apply and Save.

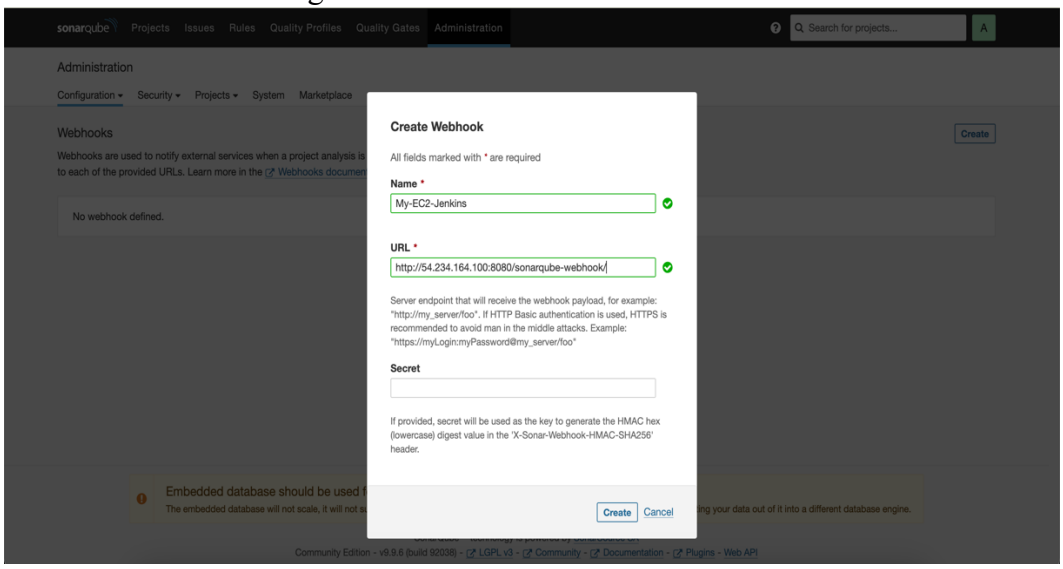


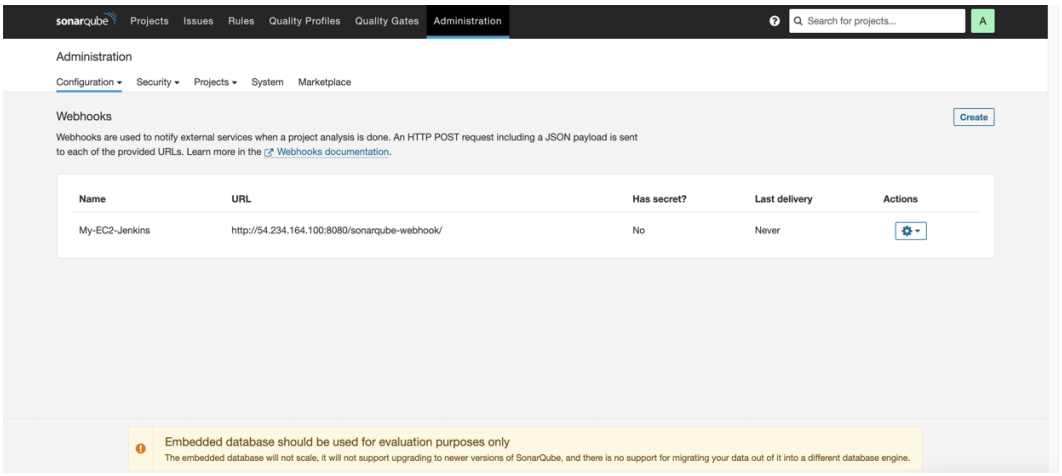


15. We will install a sonar scanner in the tools.

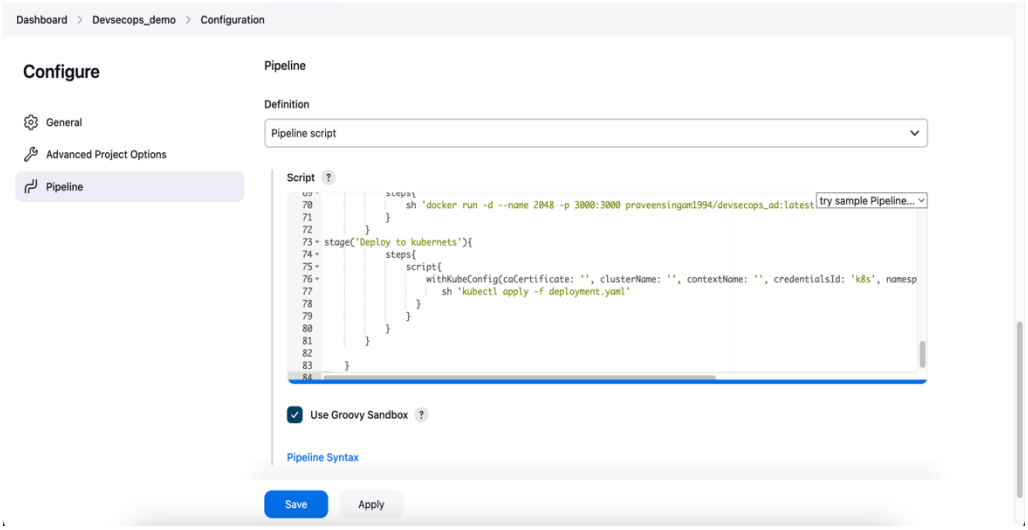


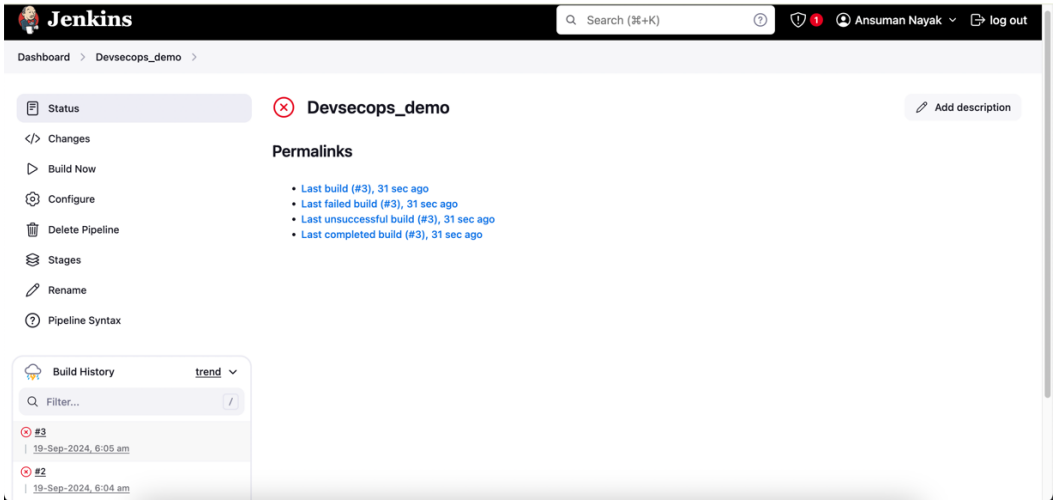
16. In the Sonarqube Dashboard add a quality gate also
Administration → Configuration →Webhooks



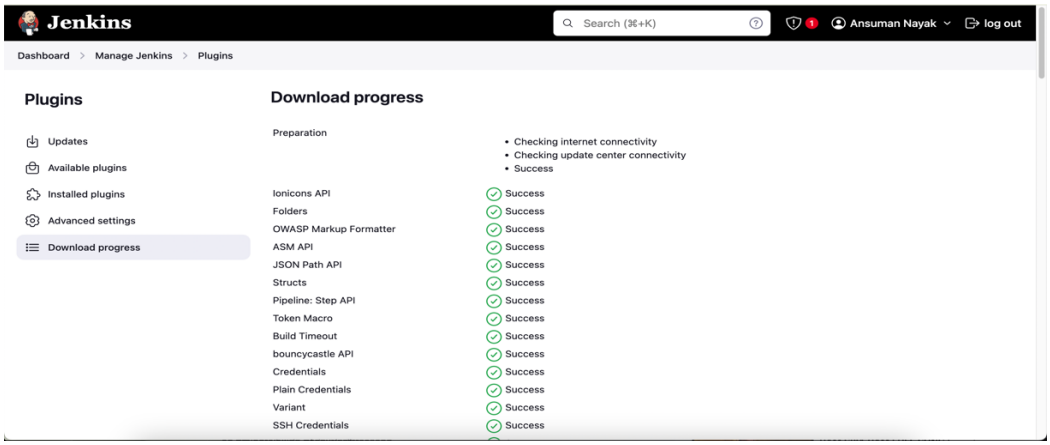


17. Let's go to our Pipeline and add the script in our Pipeline Script.
https://github.com/AWS-AZURE-Bootcamp5/Devsecops-Project1/blob/main/Jenkinsfile1





18. Install OWASP Dependency Check Plugins
Go to Dashboard → Manage Jenkins → Plugins → OWASP Dependency-Check. Click on it and install it without restart.



First, we configured the Plugin and next, we had to configure the Tool

Go to Dashboard → Manage Jenkins → Tools

Now go configure → Pipeline and add OWASP and TRIVY stage to your pipeline and build.

19. Docker Image Build and Push

We need to install the Docker tool in our system, Goto Dashboard → Manage Plugins → Available plugins → Search for Docker and install these plugins:

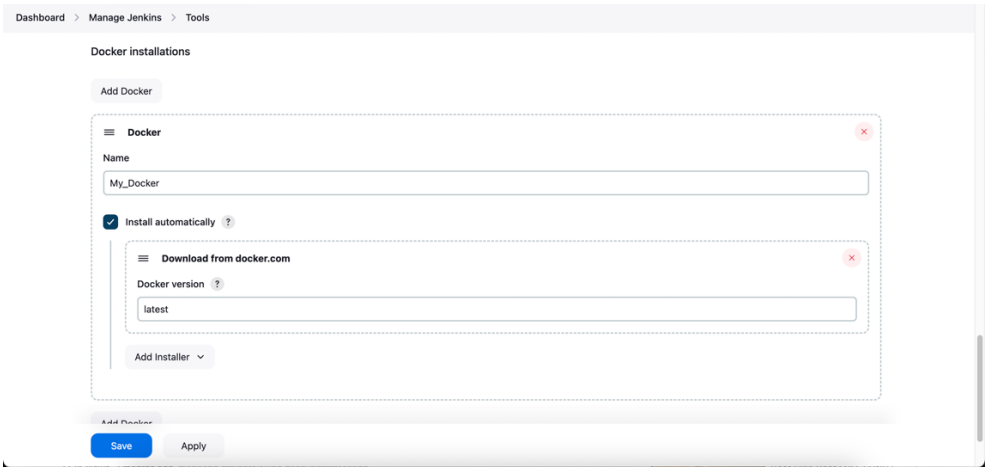
Docker

Docker Commons

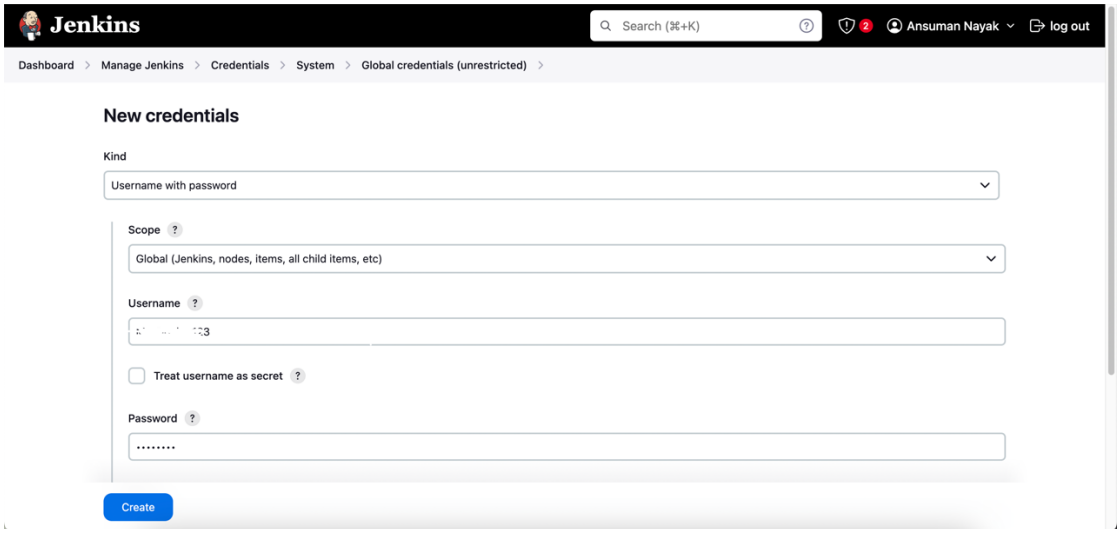
Docker Pipeline

Docker API

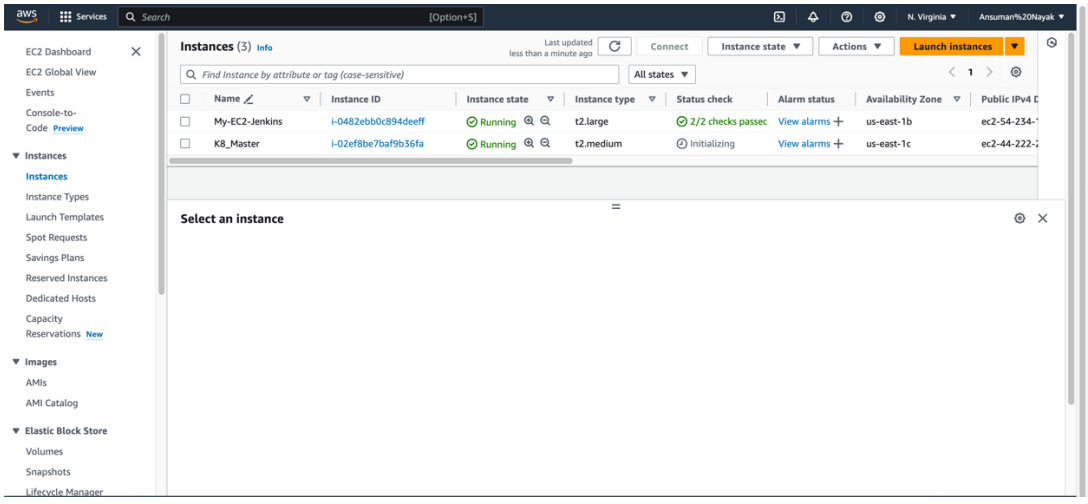
Docker-build-step



Now, goto Dashboard → Manage Jenkins → Tools
Add Docker Hub Username and Password under Global Credentials



20. Kubernetes setup
Deploy 2 Ubuntu 20.04 instances for kubernetes master and worker. T2.Medium 15 GB
Install Kubectl on Jenkins machine aswell.



- sudo apt update
- sudo apt install curl -y
- curl -LO https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl
- sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl - kubectl version –client

21. Set hostname for Master node
    - sudo hostnamectl set-hostname K8s-Master
22. Set hostname for Master node
    - sudo hostnamectl set-hostname K8s-Worker
23. Install Kubeadm/Kubelet/kubectl on Master and Worker
    - sudo apt-get update
    - sudo apt-get install -y docker.io
    - sudo usermod –aG docker Ubuntu
    - newgrp docker
    - sudo chmod 777 /var/run/docker.sock

    - sudo curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | sudo apt-key add -

    - sudo tee /etc/apt/sources.list.d/kubernetes.list <<EOF deb https://apt.kubernetes.io/ kubernetes-xenial main # 3lines same command EOF

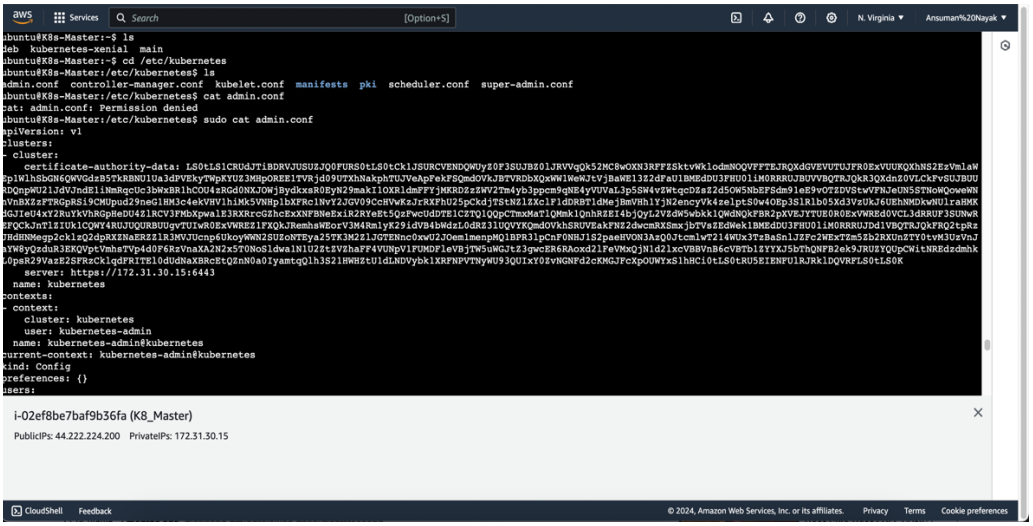
    - sudo apt-get update
    - sudo apt-get install -y kubelet kubeadm kubectl
    - sudo snap install kube-apiserver

24. On Master node
    - sudo kubeadm init --pod-network-cidr=10.244.0.0/16
    - mkdir -p $HOME/.kube
    - sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
    - sudo chown $(id -u):$(id -g) $HOME/.kube/config
    - kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/master/Documentation/kub e-flannel.yml

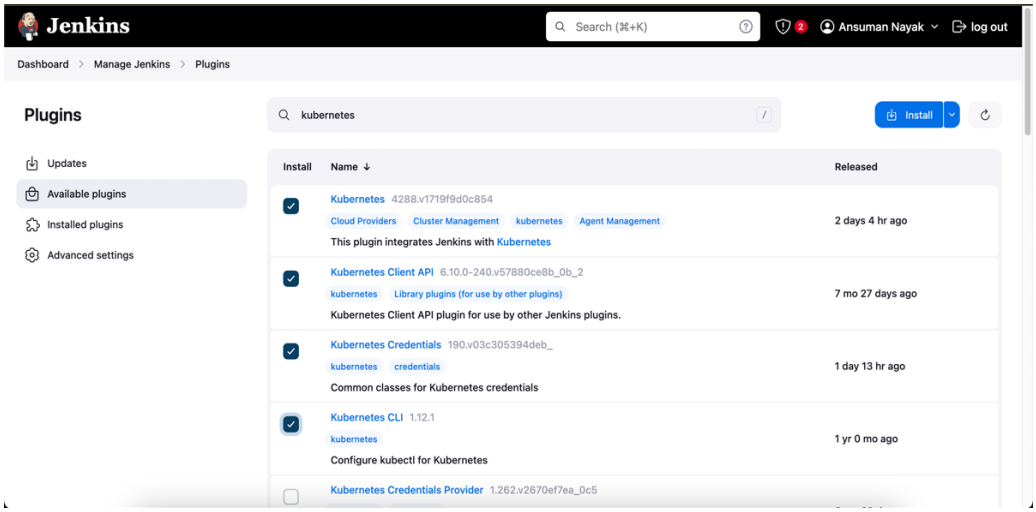
25. You will get the token and the command like below after executing the above command
    - sudo kubeadm join <master-node-ip>:<master-node-port> --token <token> --discovery-token-ca-cert-hash <hash>

    Copy above token and paste in worker node

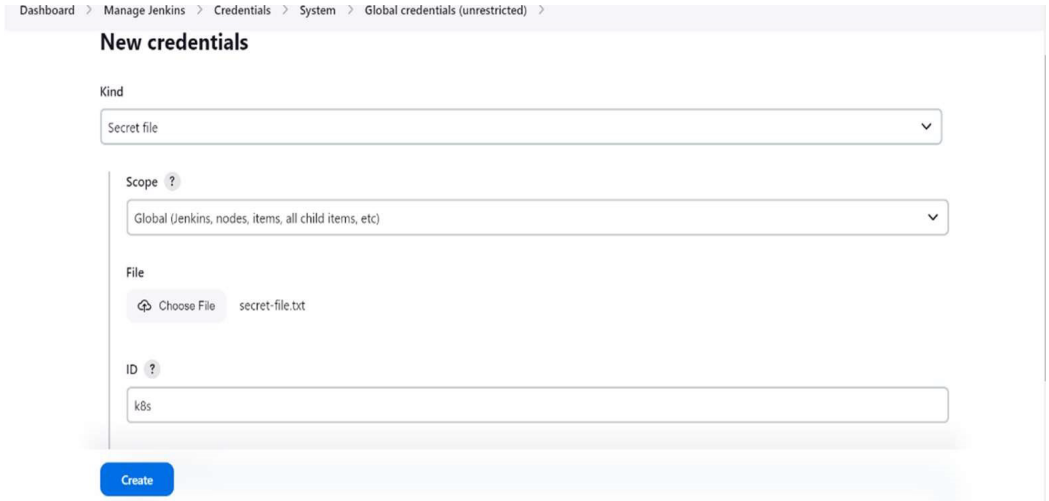
26. Copy the config file from K8 MASTER to the local laptop and save it with a name secret-file.txt and use this at the Kuberenetes credential section.



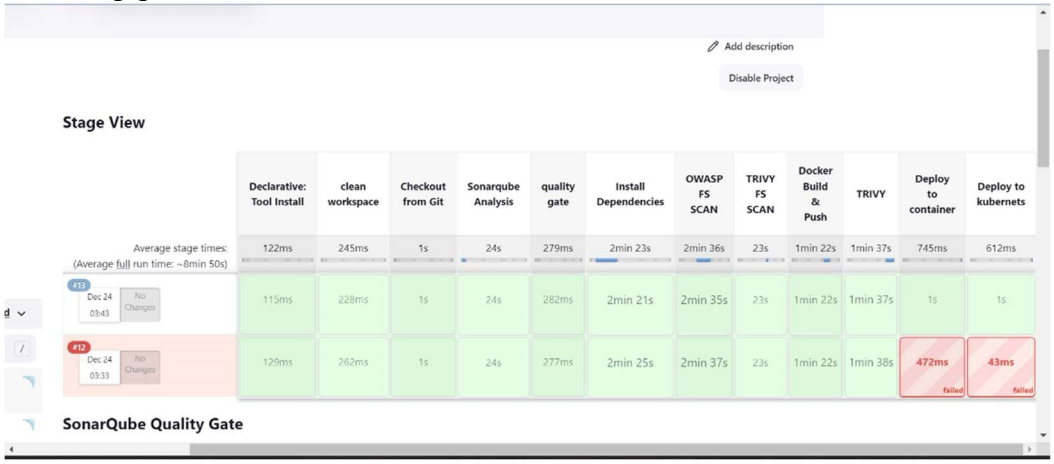
27. Install Kubernetes plugin



28. Go to manage Jenkins → manage credentials → Click on Jenkins global → add credentials.



29. Run the pipeline



Hurrayy!!! We have successfully deployed the CI/CD pipeline. Congratulations, our efforts have paid off.

30. In the Kubernetes cluster give this command

- kubectl get all
- kubectl get svc

31. Access from a Web browser with
    - <public-ip-of-slave:service port>

Please terminate your instance to avoid extra billing cost.

References: https://www.youtube.com/live/mdbS5Hu1NnQ?si=T3uu4VBVhspEQ6PR