DevOps Final Capstone Project

AGENDA

Fundamentals

Github & Development environment

Architectural Diagram

Infrastructure-as-Code

Terraform main.tf

Terraform Modules - Jenkins

Container Technologies

Dockerfile

Dockerhub Repo

Kubernetes

k9s

CI/CD

Demo

Github & Jenkins

Jenkinsfile

Webapp deployment

Observability systems

Fluentd, prometheus, grafana

Grafana dashboard and query

Fundamentals

Fundamentals

https://github.com/Veronaz/DevopsFinalCapstonProject

Development Env

see README.md for details

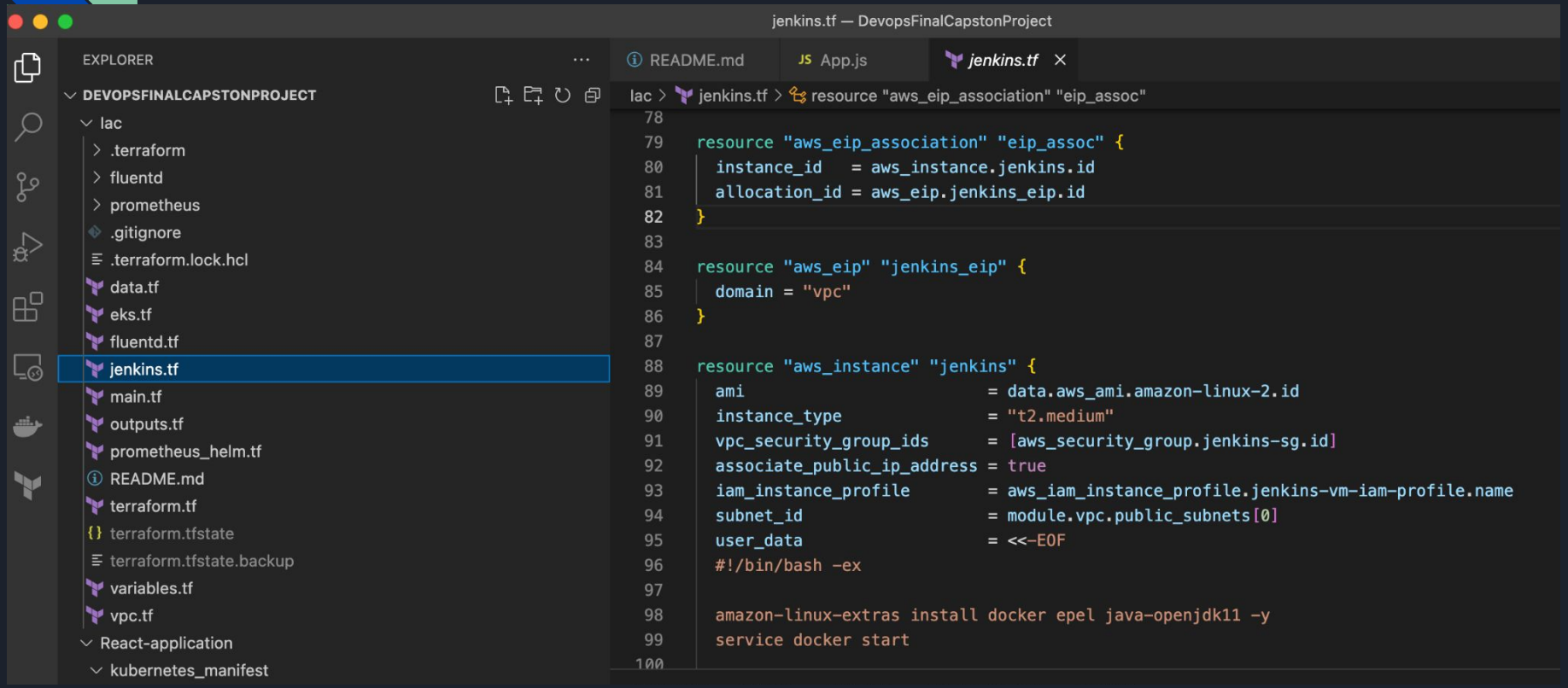
1. Awscli
2. Git
3. Terraform ‘’tfswitch’
4. Node.js
5. Kubectl
6. Session manager
7. Docker

Infrastructure -as-Code

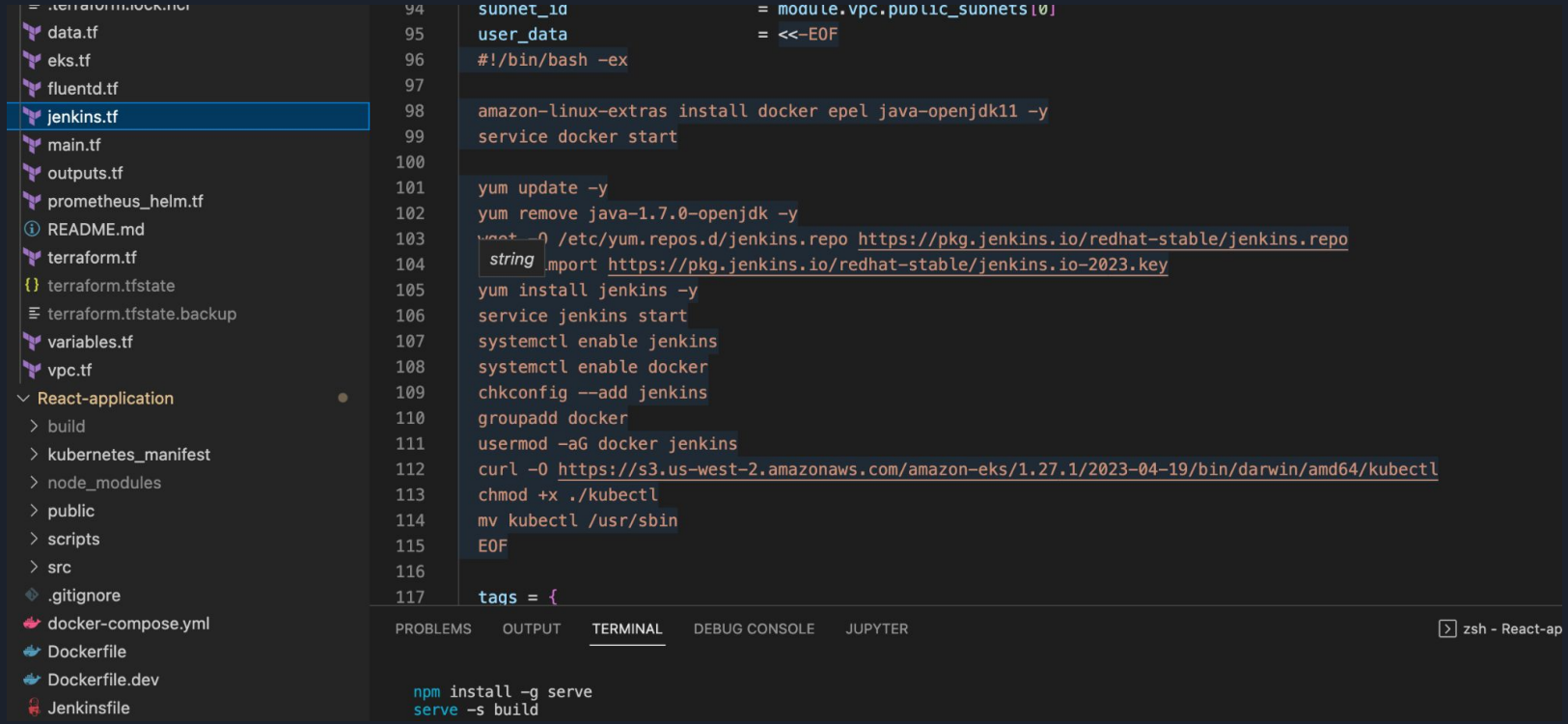
Use infrastructure-as-Code technology (e.g.Terraform) to deploy infrastructure

1. Use infrastructure-as-code configuration
2. files for declarative deployment of infrastructure
3. Use configuration management tools such as Ansible to automate configuration of remote servers

Terraform Modules - Jenkins



Terraform Modules - Jenkins



Container Technologies

Build optimized Docker images

1. Deploy apps in Kubernetes cluster
2. Leverage core Kubernetes resources
    a. Deployments
    b. Services
    c. Load balancers
    d. Volumes
    e. Ingress
3. Leverage cloud managed Kubernetes services - e.g. AWS EKS

Dockerfile

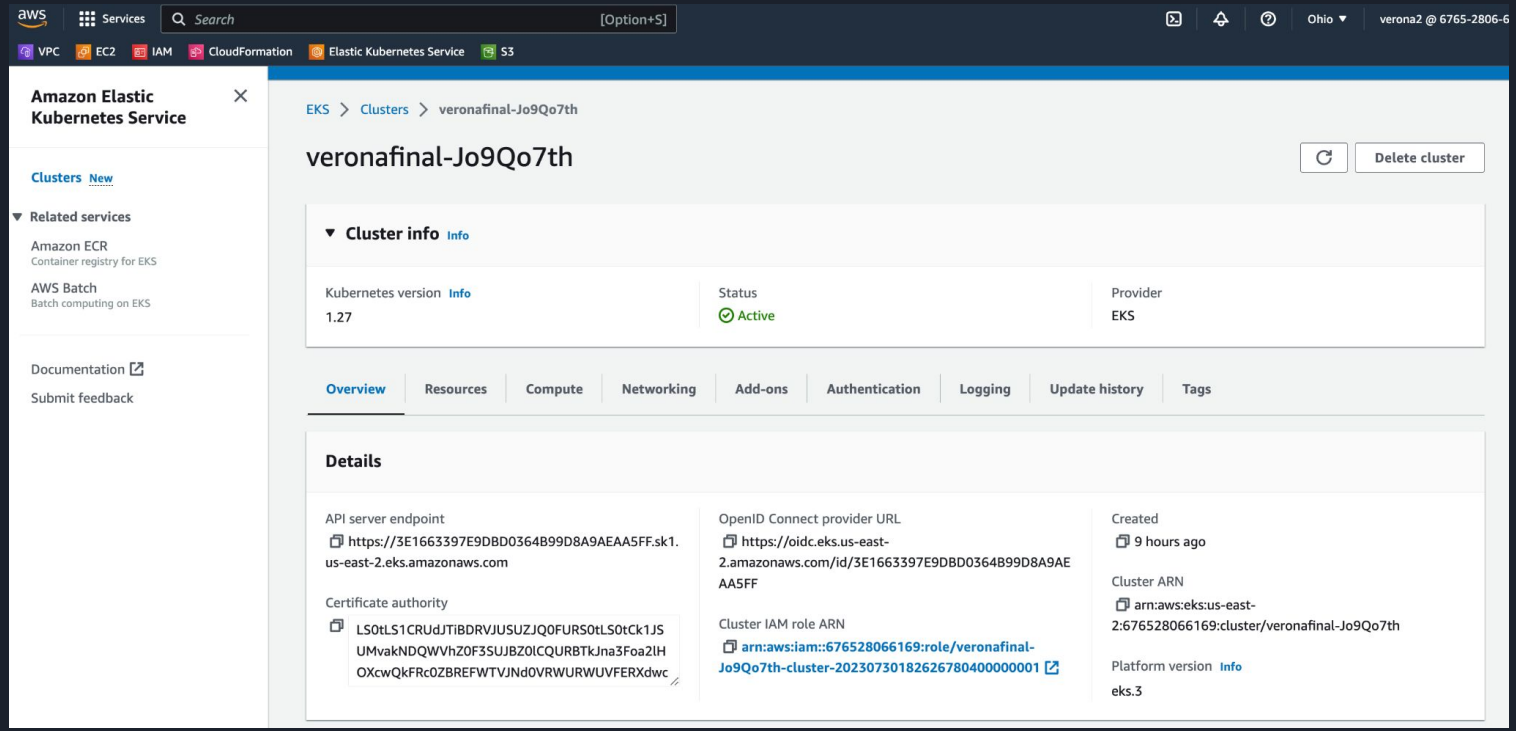
Multiple stage build

React-application > Dockerfile > ...

```
1   FROM node:16-alpine as base
2   WORKDIR '/app'
3   COPY package.json .
4   RUN npm install
5   COPY . .
6   RUN npm run build
7
8   FROM base as test
9   ENTRYPOINT npm run test
10
11  FROM nginx as runtime
12  COPY --from=base /app/build /usr/share/nginx/html
```

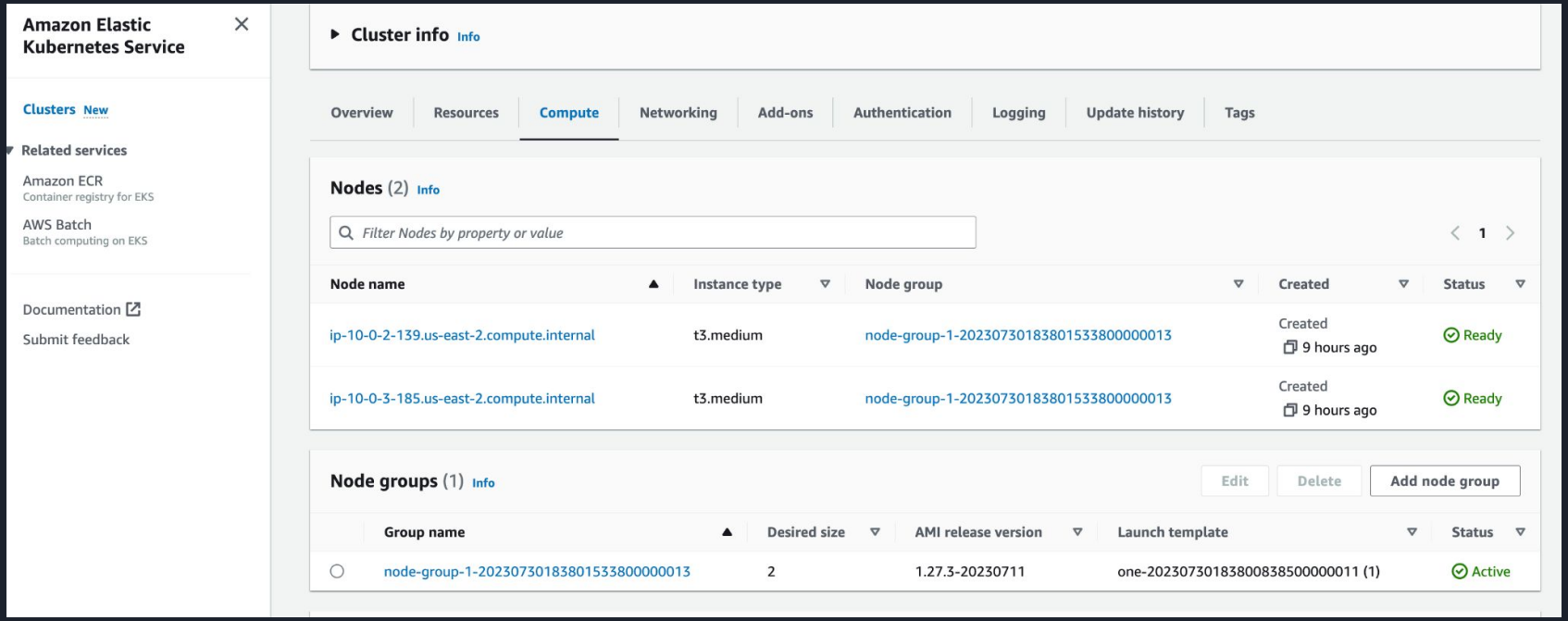
Kubernetes (AWS-EKS)

Cluster

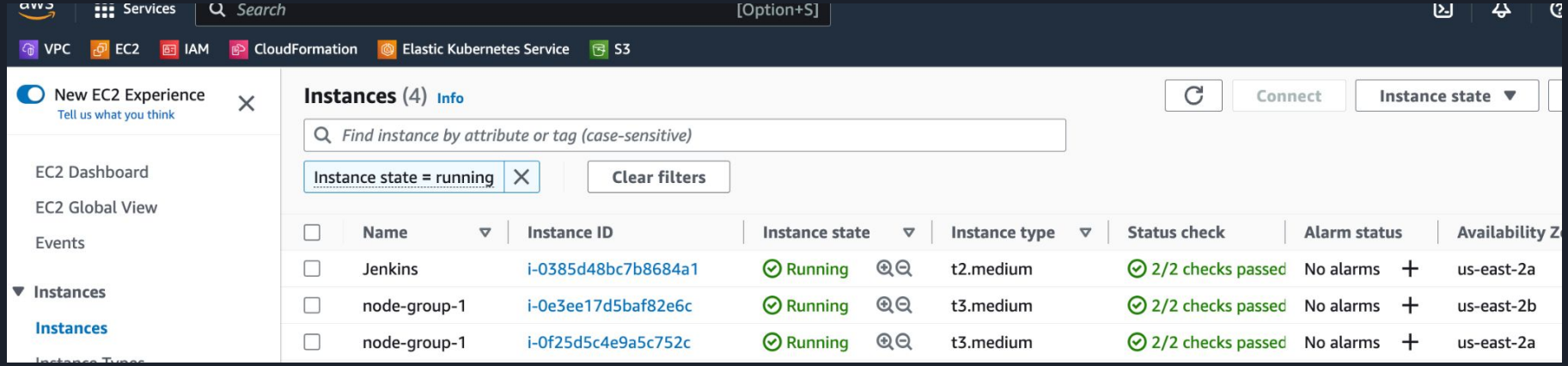


Kubernetes (AWS-EKS)

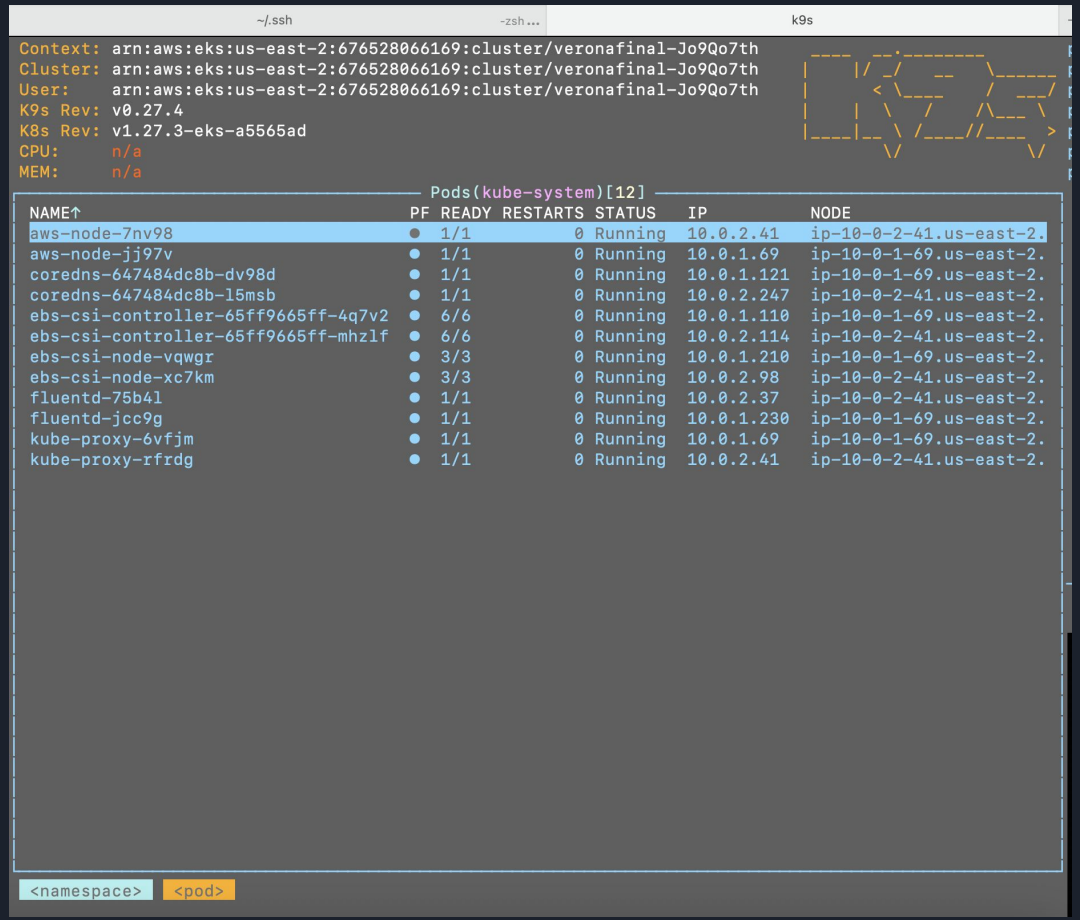
Nodes



AWS VMs


Services
Search
[Option+S]
VPC
EC2
IAM
CloudFormation
Elastic Kubernetes Service
S3
New EC2 Experience
Tell us what you think
EC2 Dashboard
EC2 Global View
Events
Instances
Instances
Instances (4) Info
Connect
Instance state
Find instance by attribute or tag (case-sensitive)
Instance state = running
Clear filters
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Z
Jenkins
i-0385d48bc7b8684a1
Running
t2.medium
2/2 checks passed
No alarms
us-east-2a
node-group-1
i-0e3ee17d5baf82e6c
Running
t3.medium
2/2 checks passed
No alarms
us-east-2b
node-group-1
i-0f25d5c4e9a5c752c
Running
t3.medium
2/2 checks passed
No alarms
us-east-2a

k9s


~/.ssh
-zsh ...
k9s
Context: arn:aws:eks:us-east-2:676528066169:cluster/veronafinal-Jo9Qo7th
Cluster: arn:aws:eks:us-east-2:676528066169:cluster/veronafinal-Jo9Qo7th
User: arn:aws:eks:us-east-2:676528066169:cluster/veronafinal-Jo9Qo7th
K9s Rev: v0.27.4
K8s Rev: v1.27.3-eks-a5565ad
CPU: n/a
MEM: n/a
Pods(kube-system)[12]
NAME↑ PF READY RESTARTS STATUS IP NODE
aws-node-7nv98 1/1 0 Running 10.0.2.41 ip-10-0-2-41.us-east-2.
aws-node-jj97v 1/1 0 Running 10.0.1.69 ip-10-0-1-69.us-east-2.
coredns-647484dc8b-dv98d 1/1 0 Running 10.0.1.121 ip-10-0-1-69.us-east-2.
coredns-647484dc8b-l5msb 1/1 0 Running 10.0.2.247 ip-10-0-2-41.us-east-2.
ebs-csi-controller-65ff9665ff-4q7v2 6/6 0 Running 10.0.1.110 ip-10-0-1-69.us-east-2.
ebs-csi-controller-65ff9665ff-mhzlf 6/6 0 Running 10.0.2.114 ip-10-0-2-41.us-east-2.
ebs-csi-node-vqwgr 3/3 0 Running 10.0.1.210 ip-10-0-1-69.us-east-2.
ebs-csi-node-xc7km 3/3 0 Running 10.0.2.98 ip-10-0-2-41.us-east-2.
fluentd-75b4l 1/1 0 Running 10.0.2.37 ip-10-0-2-41.us-east-2.
fluentd-jcc9g 1/1 0 Running 10.0.1.230 ip-10-0-1-69.us-east-2.
kube-proxy-6vfjm 1/1 0 Running 10.0.1.69 ip-10-0-1-69.us-east-2.
kube-proxy-rfrdg 1/1 0 Running 10.0.2.41 ip-10-0-2-41.us-east-2.
<namespace>
<pod>

CI/CD

Use CI/CD tools - e.g. Jenkins - to build and automate software and application code pipelines

1. Build pipelines with CI/CD configuration files - e.g. Jenkinsfile and declarative pipeline syntax
2. Install and manage CI/CD plugins whereapplicable - e.g. Jenkins plugins such as Docker plugin
3. Knowledge of alternative CI/CD tools other than the one used and understand the similarities and differences - e.g. GitHub Actions
4. Successfully deploy an app through multiple development stages and environments using CI/CD - e.g. dev, staging, prod and pulling source code from branches such as main

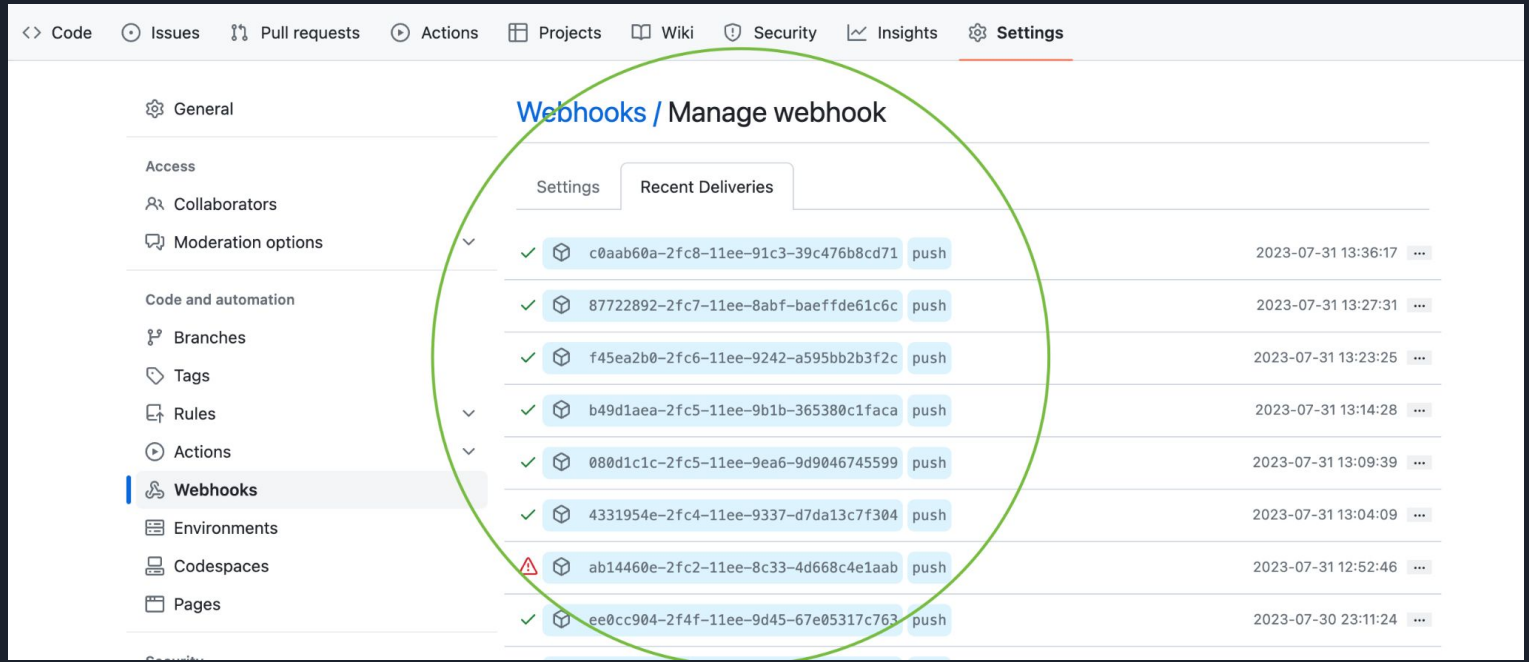
Jenkins Tokens for Github and plugins

Credentials

T	P	Store ↓	Domain	ID	Name
		System	(global)	18c03192-4ed6-481d-806f-c3956496a262	18c03192-4ed6-481d-806f-c3956496a262
		System	(global)	github-access	
		System	(global)	github	
		System	(global)	dockerhub	dockerhub's token
		System	(global)	aws-iam	AKIAZ3BBXBZ432QVR7TC (aws-iam-verona2)

Github & Jenkins

Github webhook for triggering Jenkins CD process when commits



Github & Jenkins & Dockerhub repo

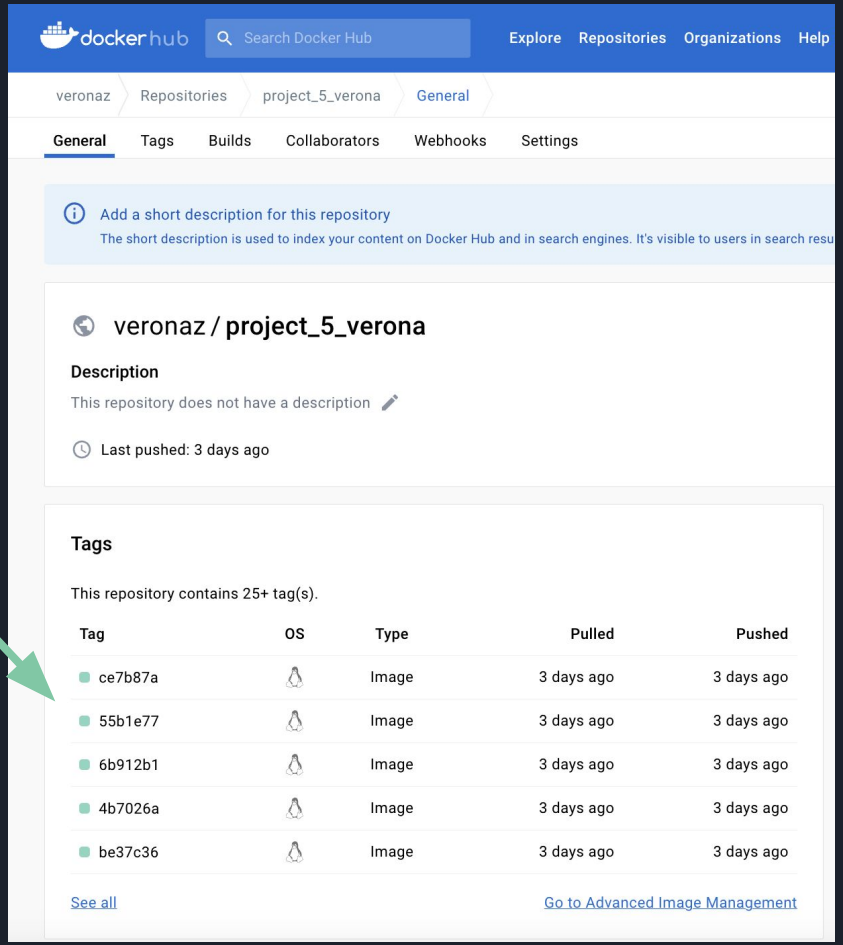
Build docker image and push to docker repo using Jenkins

```
pipeline {
    agent any

    stages {
        stage('Build') {
            steps {
                script {
                    dir ("React-application") {
                        sh("echo Get current git hash")
                        sh("printenv")
                        gitHash = sh(script: "git rev-parse --short HEAD | tr -d '\n'",returnStdout: true)

                        sh("docker build --target runtime . -t veronaz/project_5_verona:${gitHash}")
                        sh("docker build --target test . -t veronaz/project_5_verona_test:${gitHash}")

                    }
                }
            }
        }
```

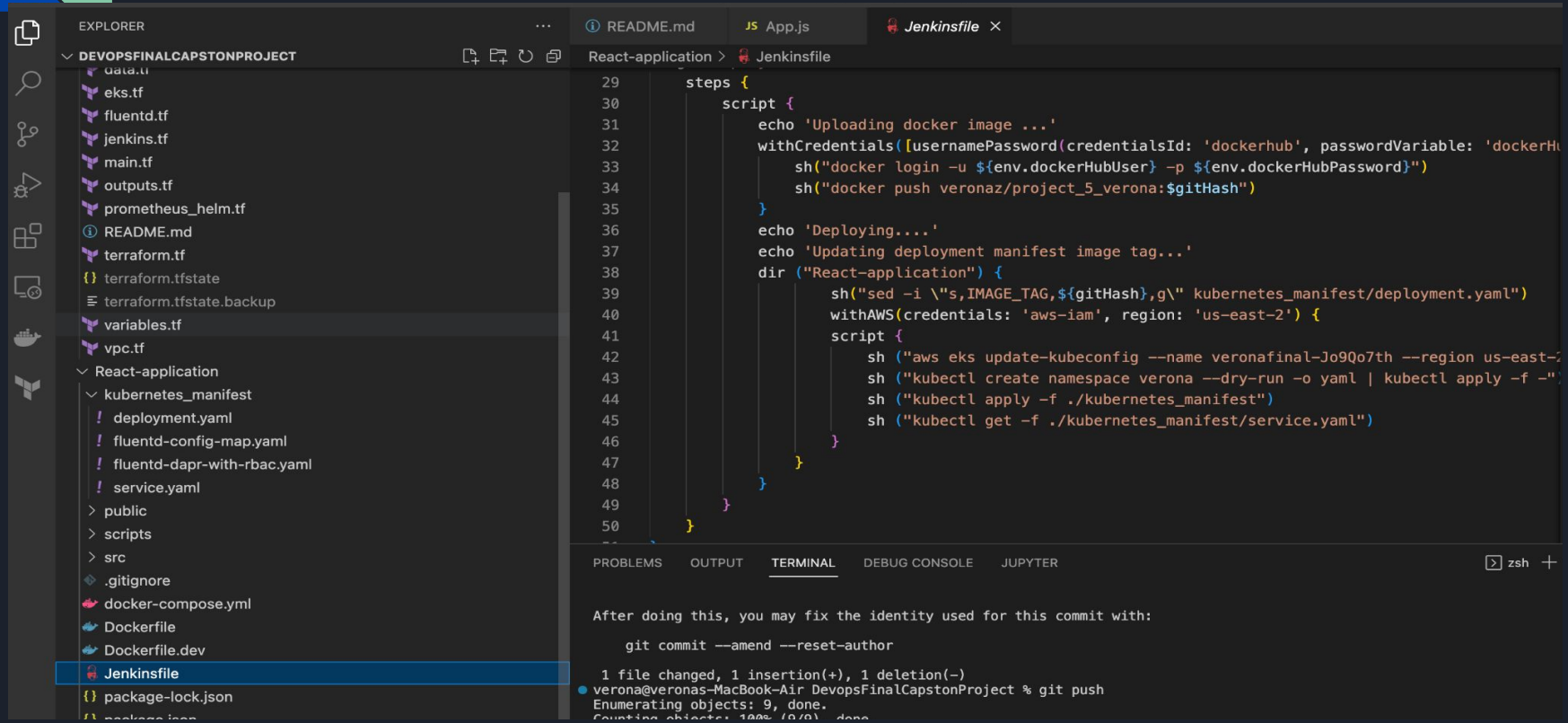
Dockerhub repo

With Git commit hash

$githash



Jenkinsfile

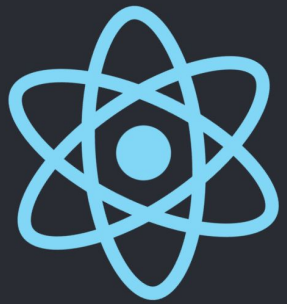


Jenkinsfile

Kubernetes (aws eks)

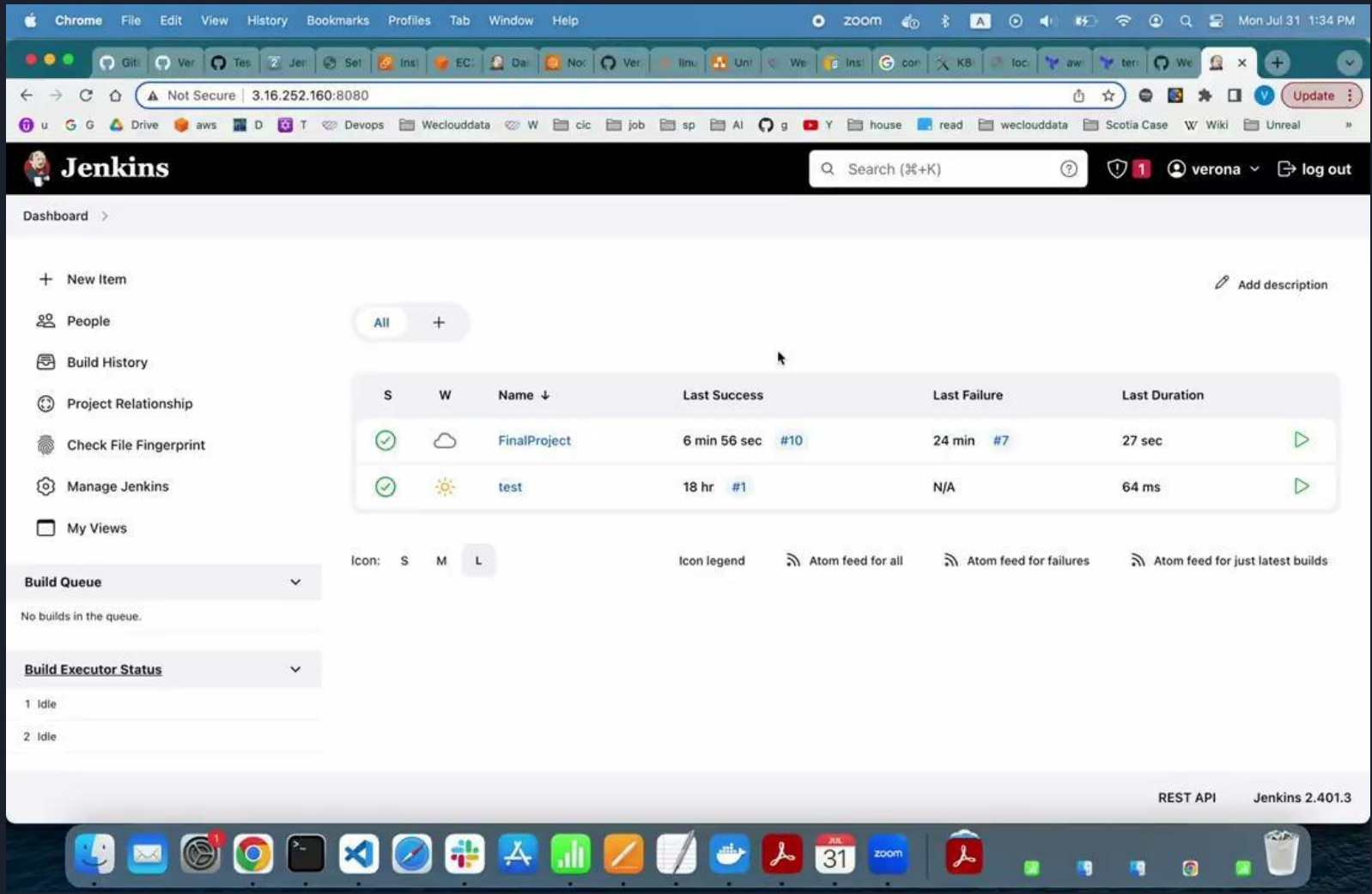
```
script {
    sh ("aws eks update-kubeconfig --name veronafinal-Jo9Qo7th --region us-east-
    sh ("kubectl create namespace verona --dry-run -o yaml | kubectl apply -f -"
    sh ("kubectl apply -f ./kubernetes_manifest")
    sh ("kubectl get -f ./kubernetes_manifest/service.yaml")
}
```

Webapp deployment demo

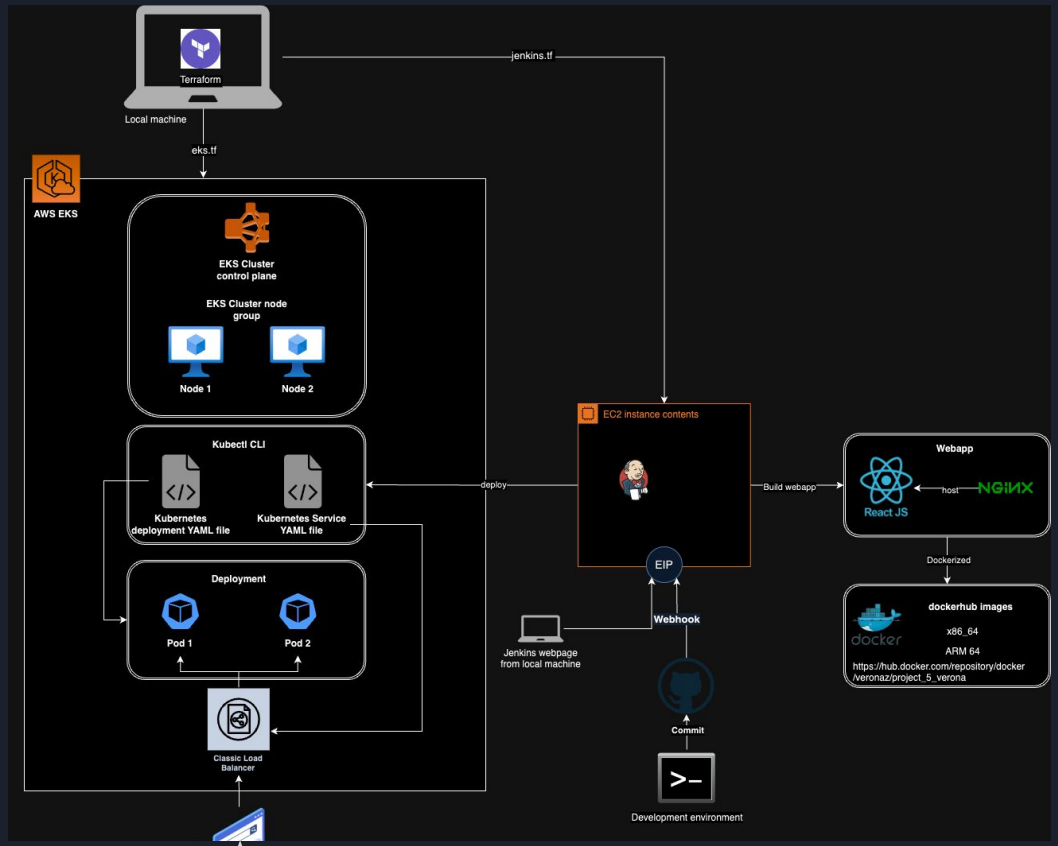


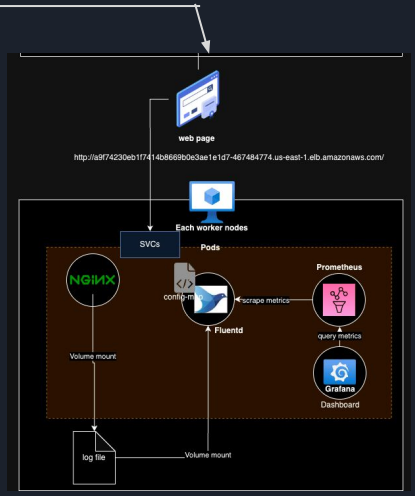
Hi there, this is Verona!

Learn React


Chrome File Edit View History Bookmarks Profiles Tab Window Help
Mon Jul 31 1:34 PM
Not Secure 3.16.252.160:8080
Update
Jenkins
Search (⌘+K)
1
verona
log out
Dashboard
New Item
People
Build History
Project Relationship
Check File Fingerprint
Manage Jenkins
My Views
Add description
All
S
W
Name ↓
Last Success
Last Failure
Last Duration
FinalProject
6 min 56 sec #10
24 min #7
27 sec
test
18 hr #1
N/A
64 ms
Icon: S M L
Icon legend
Atom feed for all
Atom feed for failures
Atom feed for just latest builds
Build Queue
No builds in the queue.
Build Executor Status
1 Idle
2 Idle
REST API
Jenkins 2.401.3

Architectural Diagram





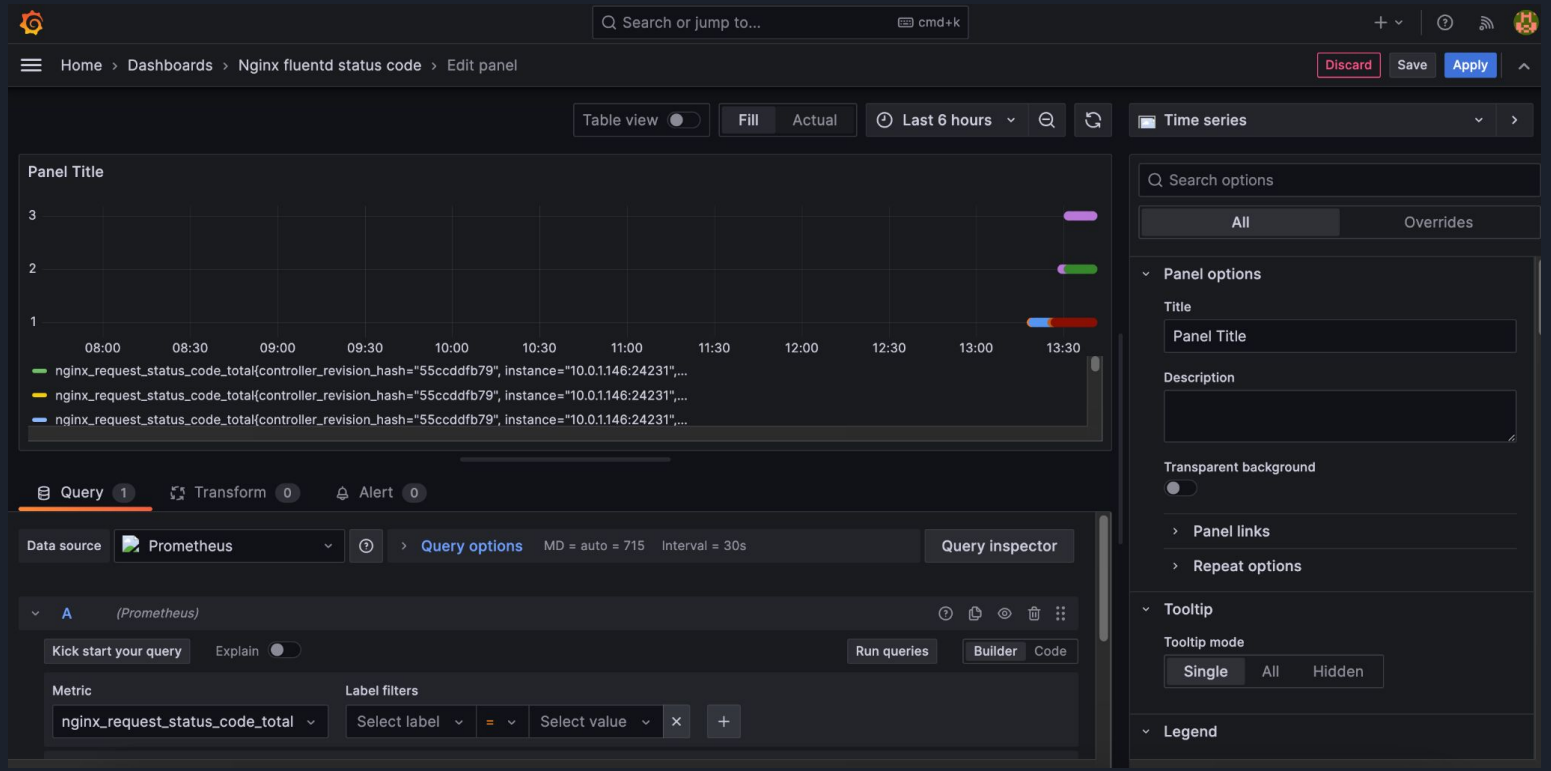
Observability systems

Set up monitoring and logging systems

e.g. FluentD, ELK, Prometheus

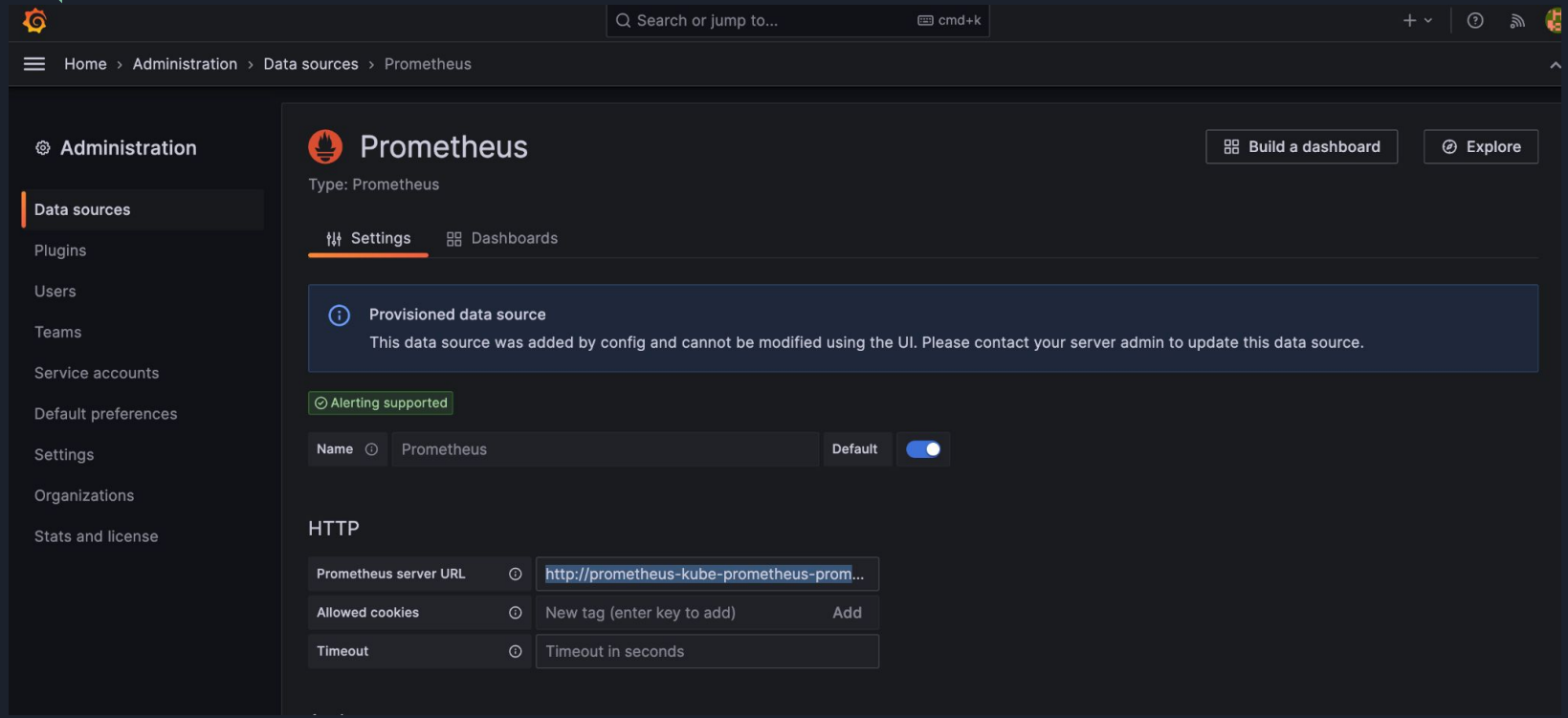
1. Leverage UI/dashboard tools to monitor the infrastructure & app status - e.g. Grafana

Fluentd(nginx), prometheus, grafana

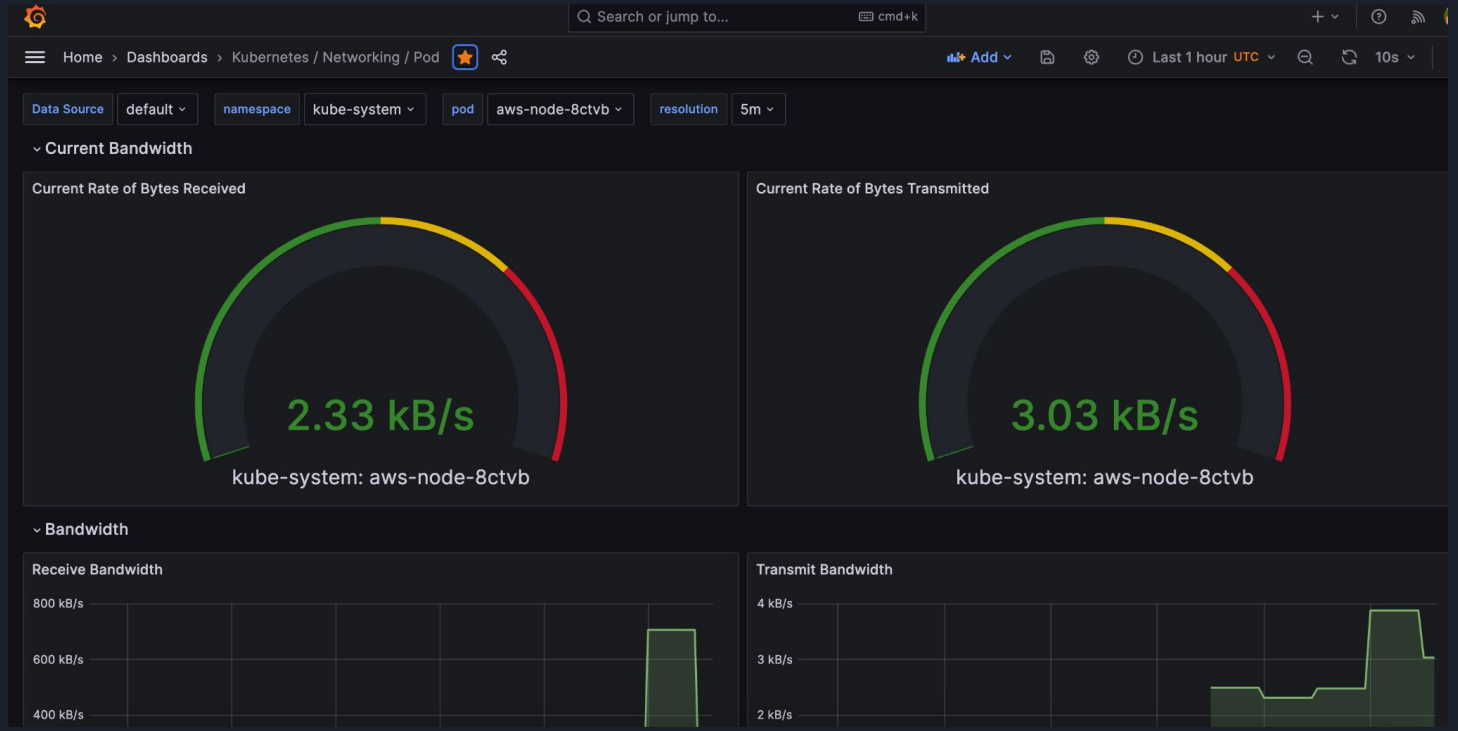


Grafana & Prometheus

Added data source (prometheus) in Grafana console



Grafana Dashboard



Appendix - Final presentation

Presentation of the DevOps project 15%

1. Architecture diagrams of project components
2. Clearly communicate and articulate project goals, objectives and results to faculty and peers
3. Describe limitations of project design and make recommend recommendations for improvements
4. Ability to lead and answer Q&A session