

Project

1. Setup Minikube and Git Repository

Start Minikube:

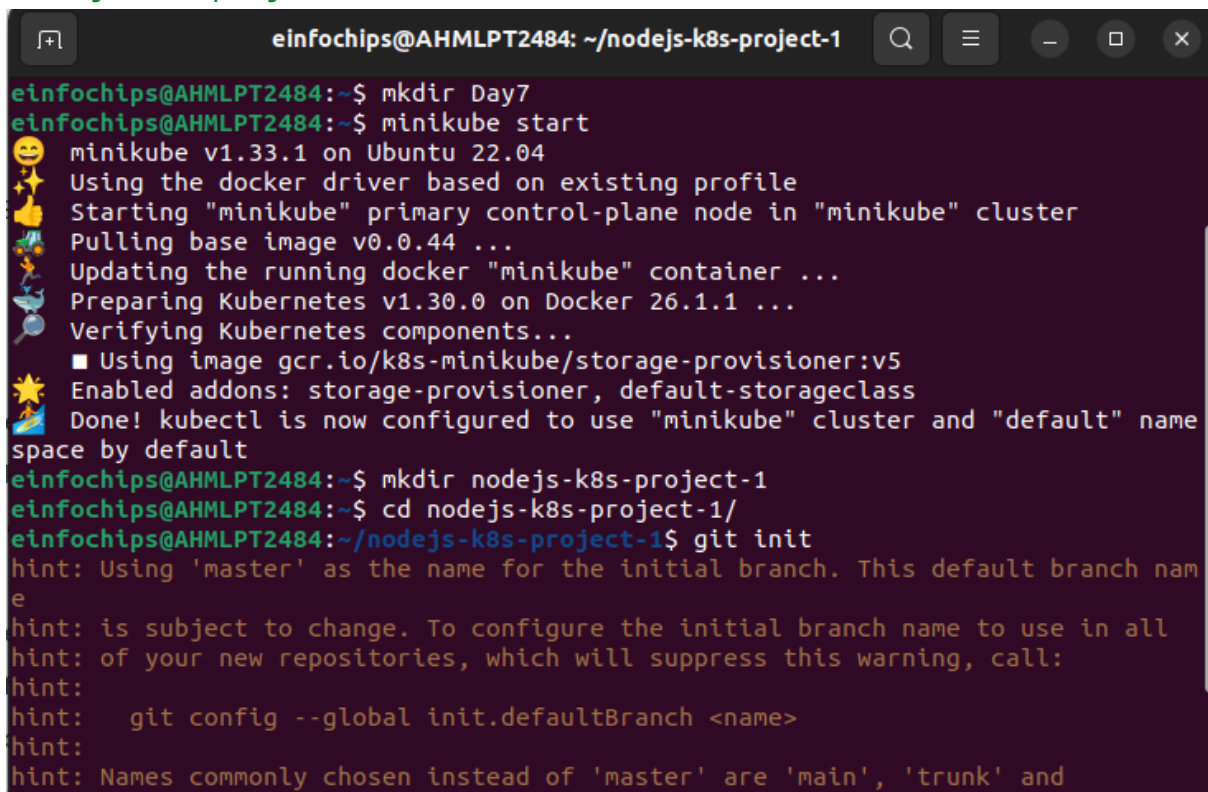
```
minikube start
```

1.2 Set Up Git Repository

Create a new directory for your project:

```
mkdir nodejs-k8s-project
```

```
cd nodejs-k8s-project
```

A terminal window titled 'einfochips@AHMLPT2484: ~/nodejs-k8s-project-1' showing the execution of several commands. The first command is 'mkdir Day7'. The second is 'minikube start', which outputs a series of status messages including 'minikube v1.33.1 on Ubuntu 22.04', 'Using the docker driver based on existing profile', 'Starting "minikube" primary control-plane node in "minikube" cluster', 'Pulling base image v0.0.44 ...', 'Updating the running docker "minikube" container ...', 'Preparing Kubernetes v1.30.0 on Docker 26.1.1 ...', 'Verifying Kubernetes components...', 'Using image gcr.io/k8s-minikube/storage-provisioner:v5', 'Enabled addons: storage-provisioner, default-storageclass', and 'Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default'. The third command is 'mkdir nodejs-k8s-project-1'. The fourth is 'cd nodejs-k8s-project-1/'. The fifth is 'git init', which outputs a hint about using 'master' as the initial branch name and provides instructions on how to configure the default branch name globally using 'git config --global init.defaultBranch <name>'.

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
einfochips@AHMLPT2484:~$ mkdir Day7
einfochips@AHMLPT2484:~$ minikube start
🐣 minikube v1.33.1 on Ubuntu 22.04
🌟 Using the docker driver based on existing profile
👍 Starting "minikube" primary control-plane node in "minikube" cluster
📡 Pulling base image v0.0.44 ...
🔄 Updating the running docker "minikube" container ...
🔧 Preparing Kubernetes v1.30.0 on Docker 26.1.1 ...
🔍 Verifying Kubernetes components...
   ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
🌟 Enabled addons: storage-provisioner, default-storageclass
🏠 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
einfochips@AHMLPT2484:~$ mkdir nodejs-k8s-project-1
einfochips@AHMLPT2484:~$ cd nodejs-k8s-project-1/
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git init
hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:   git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
```

Initialize Git repository:

```
git init
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
Pulling base image v0.0.44 ...
Updating the running docker "minikube" container ...
Preparing Kubernetes v1.30.0 on Docker 26.1.1 ...
Verifying Kubernetes components...
  ■ Using image gcr.io/k8s-minikube/storage-provisioner:v5
Enabled addons: storage-provisioner, default-storageclass
Done! kubectl is now configured to use "minikube" cluster and "default" name
space by default
einfochips@AHMLPT2484:~$ mkdir nodejs-k8s-project-1
einfochips@AHMLPT2484:~$ cd nodejs-k8s-project-1/
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git init
hint: Using 'master' as the name for the initial branch. This default branch nam
e
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:   git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:   git branch -m <name>
Initialized empty Git repository in /home/einfochips/nodejs-k8s-project-1/.git/
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$
```

Create a **.gitignore** file:

```
node_modules/
.env
```

Add and commit initial changes:

```
git add .
git commit -m "Initial commit"
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano .gitignore
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git add .
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git commit -m "Initial commit"
[master (root-commit) 27394f1] Initial commit
1 file changed, 2 insertions(+)
create mode 100644 .gitignore
```

2. Develop a Node.js Application

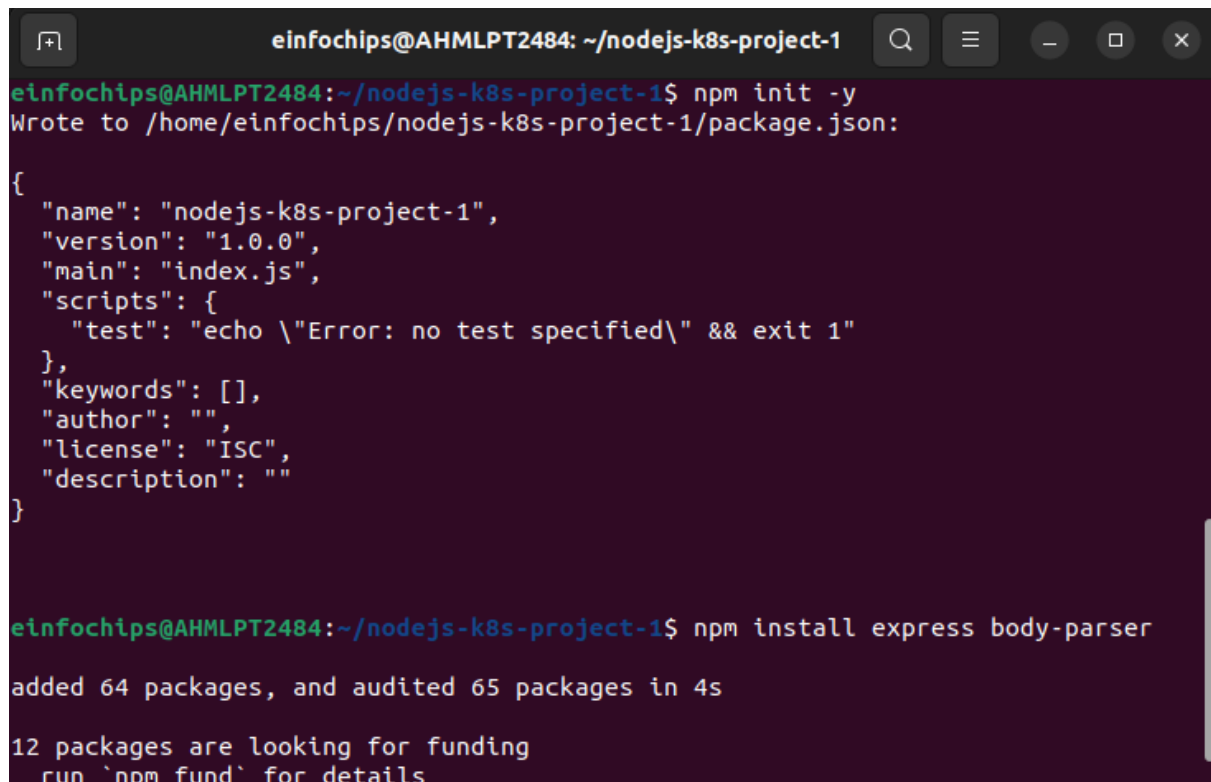
2.1 Create the Node.js App

Initialize the Node.js project:

```
npm init -y
```

Install necessary packages:

```
npm install express body-parser
```

A terminal window with a dark background. The title bar shows 'einfochips@AHMLPT2484: ~/nodejs-k8s-project-1'. The prompt is 'einfochips@AHMLPT2484:~/nodejs-k8s-project-1\$'. The first command is 'npm init -y', followed by the output 'Wrote to /home/einfochips/nodejs-k8s-project-1/package.json:'. Then, a JSON object is displayed for the package.json file. The second command is 'npm install express body-parser', followed by the output 'added 64 packages, and audited 65 packages in 4s' and '12 packages are looking for funding run `npm fund` for details'.

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ npm init -y
Wrote to /home/einfochips/nodejs-k8s-project-1/package.json:

{
  "name": "nodejs-k8s-project-1",
  "version": "1.0.0",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "keywords": [],
  "author": "",
  "license": "ISC",
  "description": ""
}

einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ npm install express body-parser

added 64 packages, and audited 65 packages in 4s

12 packages are looking for funding
run `npm fund` for details
```

Create `app.js`:

```
const express = require('express');
const bodyParser = require('body-parser');
const app = express();
const PORT = process.env.PORT || 3000;

app.use(bodyParser.json());

app.get('/', (req, res) => {
  res.send('Hello, World!');
});

app.listen(PORT, () => {
  console.log(`Server is running on port ${PORT}`);
});
```

Update **package.json** to include a start script:

```
"scripts": {  
  "start": "node app.js"  
}
```

2.2 Commit the Node.js Application

Add and commit changes:

```
git add .  
git commit -m "Add Node.js application code"
```

3. Create Dockerfile and Docker Compose

3.1 Create a Dockerfile

Add **Dockerfile**:

```
# Use official Node.js image  
FROM node:18  
  
# Set the working directory  
WORKDIR /usr/src/app  
  
# Copy package.json and package-lock.json  
COPY package*.json ./  
  
# Install dependencies  
RUN npm install  
  
# Copy the rest of the application code  
COPY . .  
  
# Expose the port on which the app runs  
EXPOSE 3000  
  
# Command to run the application  
CMD [ "npm", "start" ]
```

Create a **.dockerignore** file:

```
node_modules
.npm
```

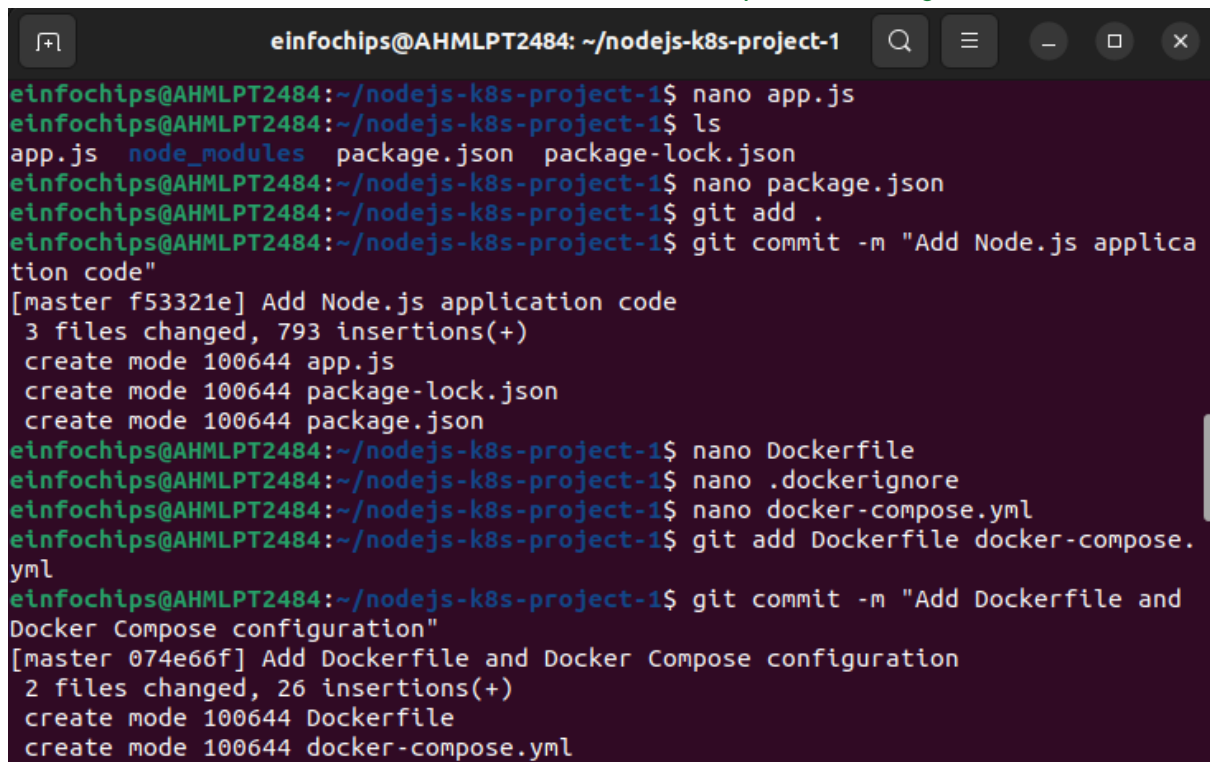
3.2 Create **docker-compose.yml** (optional for local testing)

Add **docker-compose.yml**:

```
version: '3'
services:
  app:
    build: .
    ports:
      - "3000:3000"
```

Add and commit changes:

```
git add Dockerfile docker-compose.yml
git commit -m "Add Dockerfile and Docker Compose configuration"
```

A terminal window titled 'einfochips@AHMLPT2484: ~/nodejs-k8s-project-1' showing a series of commands and their outputs. The user creates 'app.js', 'package.json', and 'package-lock.json', then adds them to git. Next, they create 'Dockerfile', '.dockerignore', and 'docker-compose.yml', and commit these changes. The terminal output shows the file creation details and the commit message 'Add Dockerfile and Docker Compose configuration'.

```
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano app.js
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ ls
app.js  node_modules  package.json  package-lock.json
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano package.json
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git add .
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git commit -m "Add Node.js application code"
[master f53321e] Add Node.js application code
 3 files changed, 793 insertions(+)
 create mode 100644 app.js
 create mode 100644 package-lock.json
 create mode 100644 package.json
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano Dockerfile
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano .dockerignore
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano docker-compose.yml
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git add Dockerfile docker-compose.yml
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git commit -m "Add Dockerfile and Docker Compose configuration"
[master 074e66f] Add Dockerfile and Docker Compose configuration
 2 files changed, 26 insertions(+)
 create mode 100644 Dockerfile
 create mode 100644 docker-compose.yml
```

4. Build and Push Docker Image

4.1 Build Docker Image

Build the Docker image:

```
docker build -t nodejs-app:latest .
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ docker build -t nodejs-app:latest .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
                Install the buildx component to build images with BuildKit:
                https://docs.docker.com/go/buildx/

Sending build context to Docker daemon  111.6kB
Step 1/7 : FROM node:18
18: Pulling from library/node
e9aef93137af: Already exists
58b365fa3e8d: Already exists
3dbed71fc544: Already exists
ae70830af8b6: Already exists
1f71b6c97853: Pull complete
4d7c4784eca1: Pull complete
61f933734525: Pull complete
d55564cf740f: Pull complete
Digest: sha256:aabbaf118c7c0a6e9a3bda69bd2a94b0f6c4150bf80c501ef1c87ffcb5687365
Status: Downloaded newer image for node:18
--> 687dbc8c3350
Step 2/7 : WORKDIR /usr/src/app
--> Running in f825256d9e35
Removing intermediate container f825256d9e35
```

4.2 Push Docker Image to Docker Hub

Tag and push the image:

```
docker tag nodejs-app:latest your-dockerhub-username/nodejs-app:latest
docker push your-dockerhub-username/nodejs-app:latest
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
12 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
npm notice
npm notice New minor version of npm available! 10.7.0 -> 10.8.2
npm notice Changelog: https://github.com/npm/cli/releases/tag/v10.8.2
npm notice To update run: npm install -g npm@10.8.2
npm notice
Removing intermediate container 12df0c3f3092
--> 7bee0fb212c4
Step 5/7 : COPY . .
--> cff39ce385da
Step 6/7 : EXPOSE 3000
--> Running in 8fb45c59e21a
Removing intermediate container 8fb45c59e21a
--> df0f707ba62f
Step 7/7 : CMD [ "npm", "start" ]
--> Running in 27002375f0da
Removing intermediate container 27002375f0da
--> 43203f6472d7
Successfully built 43203f6472d7
Successfully tagged nodejs-app:latest
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
Removing intermediate container 27002375f0da
--> 43203f6472d7
Successfully built 43203f6472d7
Successfully tagged nodejs-app:latest
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ docker tag nodejs-app:latest poona
m02/nodejs-app:latest
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ docker push poonam02/nodejs-app:la
test
The push refers to repository [docker.io/poonam02/nodejs-app]
6796ca11c2a1: Pushed
3625abc2cc09: Pushed
b27abd28d480: Pushed
fa7ccb41dfa7: Pushed
0970e1a837f7: Mounted from library/node
d4061df7c236: Mounted from library/node
9487e6e19e60: Mounted from library/node
6ef00066aa6f: Mounted from library/node
b11bb163e263: Mounted from library/node
b779a72428fa: Mounted from library/node
8ada682d3780: Mounted from library/node
15bb10f9bb3a: Mounted from library/node
latest: digest: sha256:8df3ef2921195a0b9a0ebceba9c674cd5c6fe090fcac7a0757d49e96f
59eff03 size: 2839
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$
```

Add and commit changes:

```
git add .
git commit -m "Build and push Docker image"
```

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git add .
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git commit -m "Build and push Dock
er image"
[master 9d6b3b1] Build and push Docker image
1 file changed, 2 insertions(+)
create mode 100644 .dockerignore
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ nano kubernetes/deployment.yaml
```

5. Create Kubernetes Configurations

5.1 Create Kubernetes Deployment

Create **kubernetes/deployment.yaml**:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nodejs-app-deployment
spec:
  replicas: 2
  selector:
```

```

    matchLabels:
      app: nodejs-app
  template:
    metadata:
      labels:
        app: nodejs-app
    spec:
      containers:
        - name: nodejs-app
          image: your-dockerhub-username/nodejs-app:latest
          ports:
            - containerPort: 3000
          env:
            - name: PORT
              valueFrom:
                configMapKeyRef:
                  name: app-config
                  key: PORT
            - name: NODE_ENV
              valueFrom:
                secretKeyRef:
                  name: app-secrets
                  key: NODE_ENV

```

5.2 Create ConfigMap and Secret

Create **kubernetes/configmap.yaml**:

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: app-config
data:
  PORT: "3000"

```

Create **kubernetes/secret.yaml**:

```

apiVersion: v1
kind: Secret
metadata:
  name: app-secrets
type: Opaque
data:
  NODE_ENV: cHJvZHVjdGlvbmFs # Base64 encoded value for "production"

```


Add and commit Kubernetes configurations:

```
git add kubernetes/  
git commit -m "Add Kubernetes deployment, configmap, and secret"
```

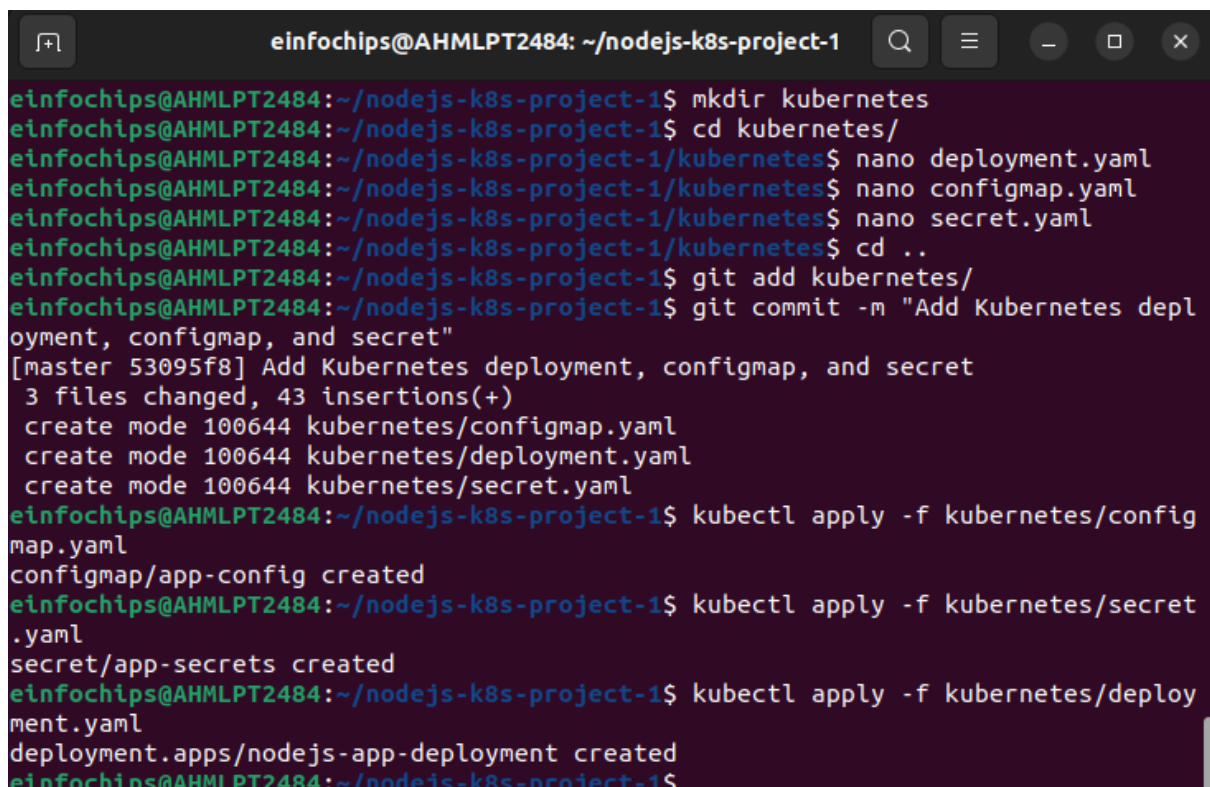
5.3 Apply Kubernetes Configurations

Apply the ConfigMap and Secret:

```
kubectl apply -f kubernetes/configmap.yaml  
kubectl apply -f kubernetes/secret.yaml
```

Apply the Deployment:

```
kubectl apply -f kubernetes/deployment.yaml
```

A terminal window titled 'einfochips@AHMLPT2484: ~/nodejs-k8s-project-1' showing a series of commands and their outputs. The user creates a 'kubernetes' directory, navigates into it, and creates three YAML files: 'deployment.yaml', 'configmap.yaml', and 'secret.yaml' using 'nano'. They then add these files to a git repository and commit them with the message 'Add Kubernetes deployment, configmap, and secret'. Finally, they use 'kubectl apply' to create the ConfigMap, Secret, and Deployment in the cluster.

```
einfochips@AHMLPT2484: ~/nodejs-k8s-project-1  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ mkdir kubernetes  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ cd kubernetes/  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1/kubernetes$ nano deployment.yaml  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1/kubernetes$ nano configmap.yaml  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1/kubernetes$ nano secret.yaml  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1/kubernetes$ cd ..  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git add kubernetes/  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ git commit -m "Add Kubernetes deployment, configmap, and secret"  
[master 53095f8] Add Kubernetes deployment, configmap, and secret  
3 files changed, 43 insertions(+)  
create mode 100644 kubernetes/configmap.yaml  
create mode 100644 kubernetes/deployment.yaml  
create mode 100644 kubernetes/secret.yaml  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ kubectl apply -f kubernetes/configmap.yaml  
configmap/app-config created  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ kubectl apply -f kubernetes/secret.yaml  
secret/app-secrets created  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$ kubectl apply -f kubernetes/deployment.yaml  
deployment.apps/nodejs-app-deployment created  
einfochips@AHMLPT2484:~/nodejs-k8s-project-1$
```