DevOps ASSIGNMENT

TEAM 10

2. Developing and deploying a Node.js app from Docker to Kubernetes

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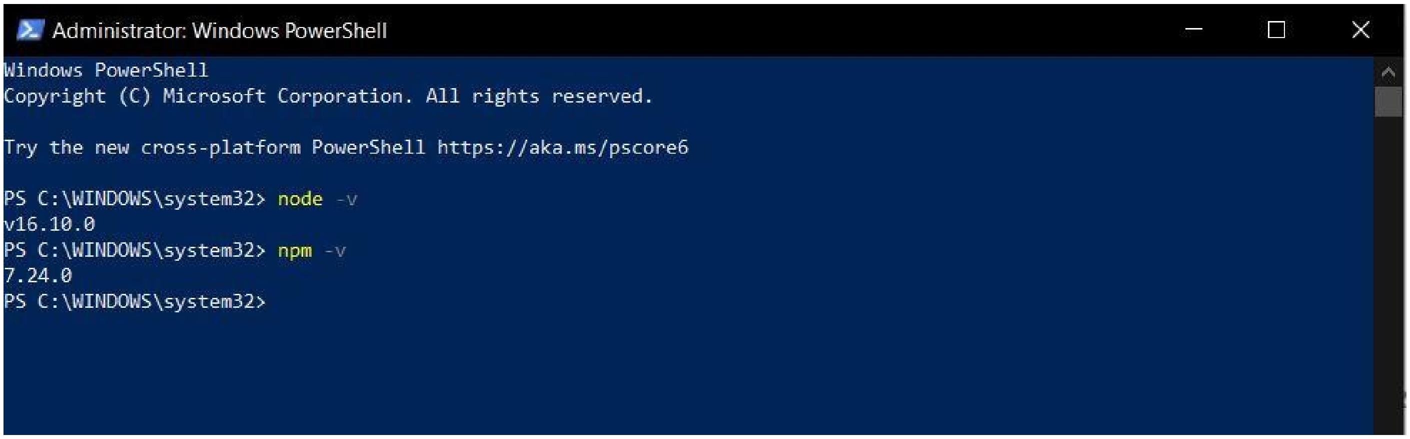
TO:
Dr.Uma S

Docker file link: https://hub.docker.com/r/18bcs026/nodejs-starter

PROCEDURE

Install Node.js and npm



```
Windows PowerShell
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PS C:\WINDOWS\system32> node -v
v16.10.0
PS C:\WINDOWS\system32> npm -v
7.24.0
PS C:\WINDOWS\system32>
```
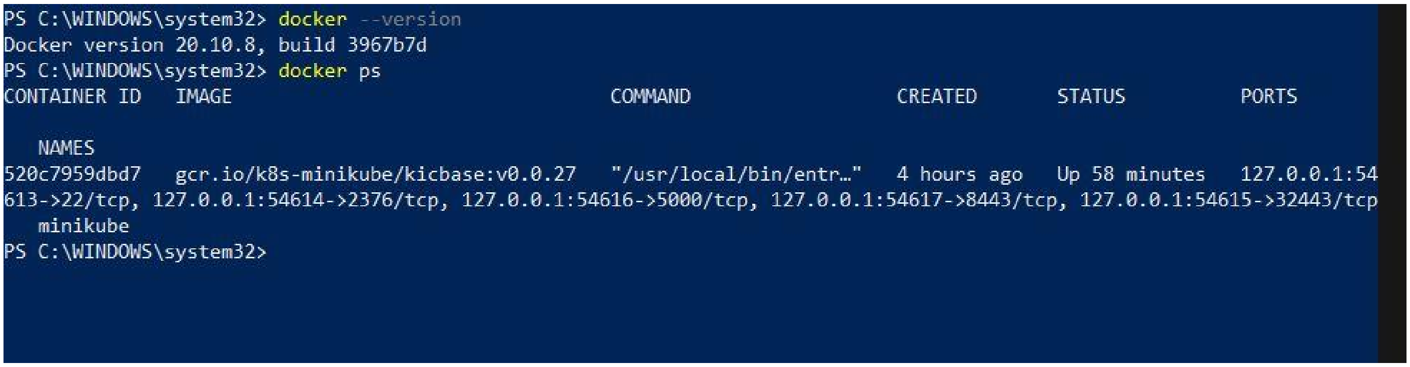
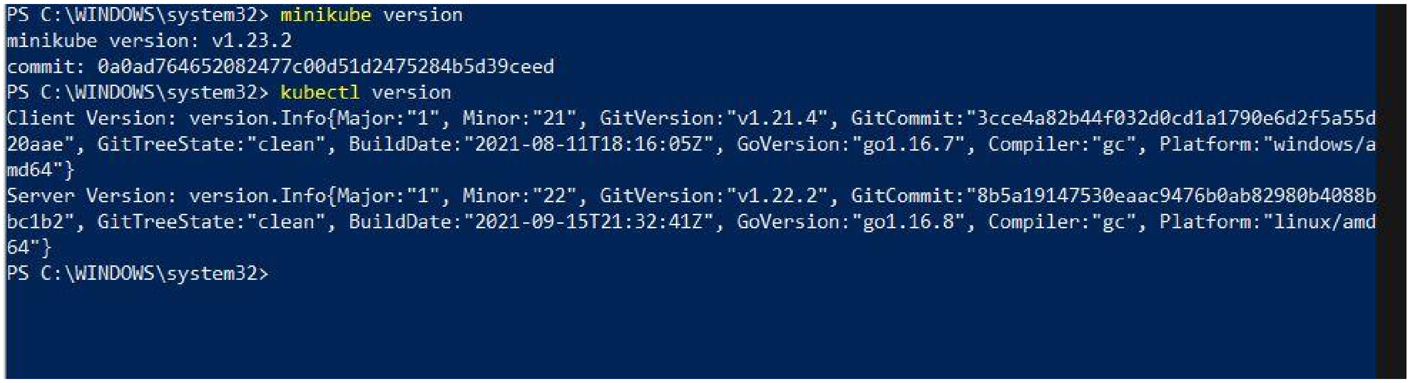

Install Docker



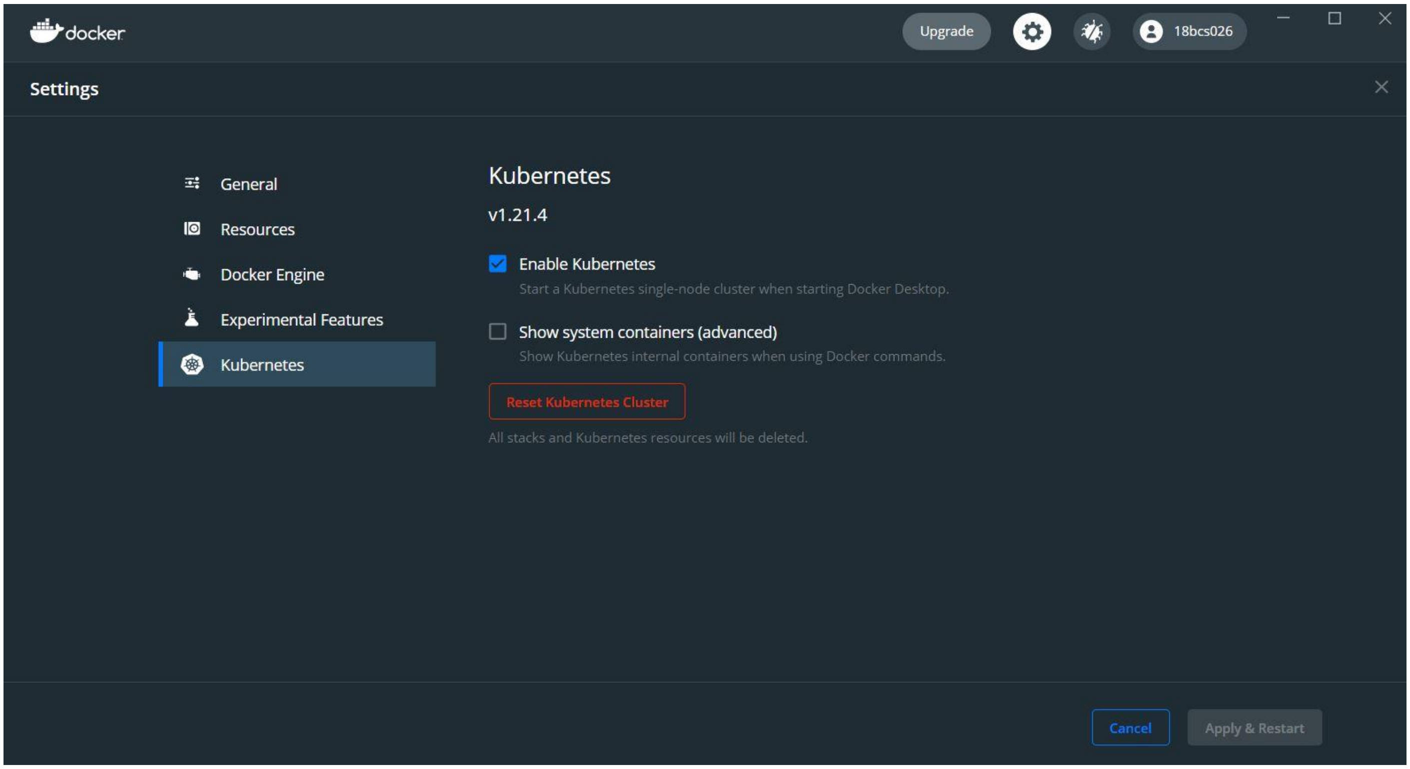
```
PS C:\WINDOWS\system32> docker --version
Docker version 20.10.8, build 3967b7d
PS C:\WINDOWS\system32> docker ps
CONTAINER ID   IMAGE                                 COMMAND                  CREATED       STATUS          PORTS

   NAMES
520c7959dbd7   gcr.io/k8s-minikube/kicbase:v0.0.27   "/usr/local/bin/entr…"   4 hours ago   Up 58 minutes   127.0.0.1:54
613->22/tcp, 127.0.0.1:54614->2376/tcp, 127.0.0.1:54616->5000/tcp, 127.0.0.1:54617->8443/tcp, 127.0.0.1:54615->32443/tcp
   minikube
PS C:\WINDOWS\system32>
```

Minikube and Kubectl installation



```
PS C:\WINDOWS\system32> minikube version
minikube version: v1.23.2
commit: 0a0ad764652082477c00d51d2475284b5d39ceed
PS C:\WINDOWS\system32> kubectl version
Client Version: version.Info{Major:"1", Minor:"21", GitVersion:"v1.21.4", GitCommit:"3cce4a82b44f032d0cd1a1790e6d2f5a55d
20aae", GitTreeState:"clean", BuildDate:"2021-08-11T18:16:05Z", GoVersion:"go1.16.7", Compiler:"gc", Platform:"windows/a
md64"}
Server Version: version.Info{Major:"1", Minor:"22", GitVersion:"v1.22.2", GitCommit:"8b5a19147530eaac9476b0ab82980b4088b
bc1b2", GitTreeState:"clean", BuildDate:"2021-09-15T21:32:41Z", GoVersion:"go1.16.8", Compiler:"gc", Platform:"linux/amd
64"}
PS C:\WINDOWS\system32>
```

Enabled Kubernetes service with Docker



Kubernetes

v1.21.4

☑ Enable Kubernetes

Start a Kubernetes single-node cluster when starting Docker Desktop.

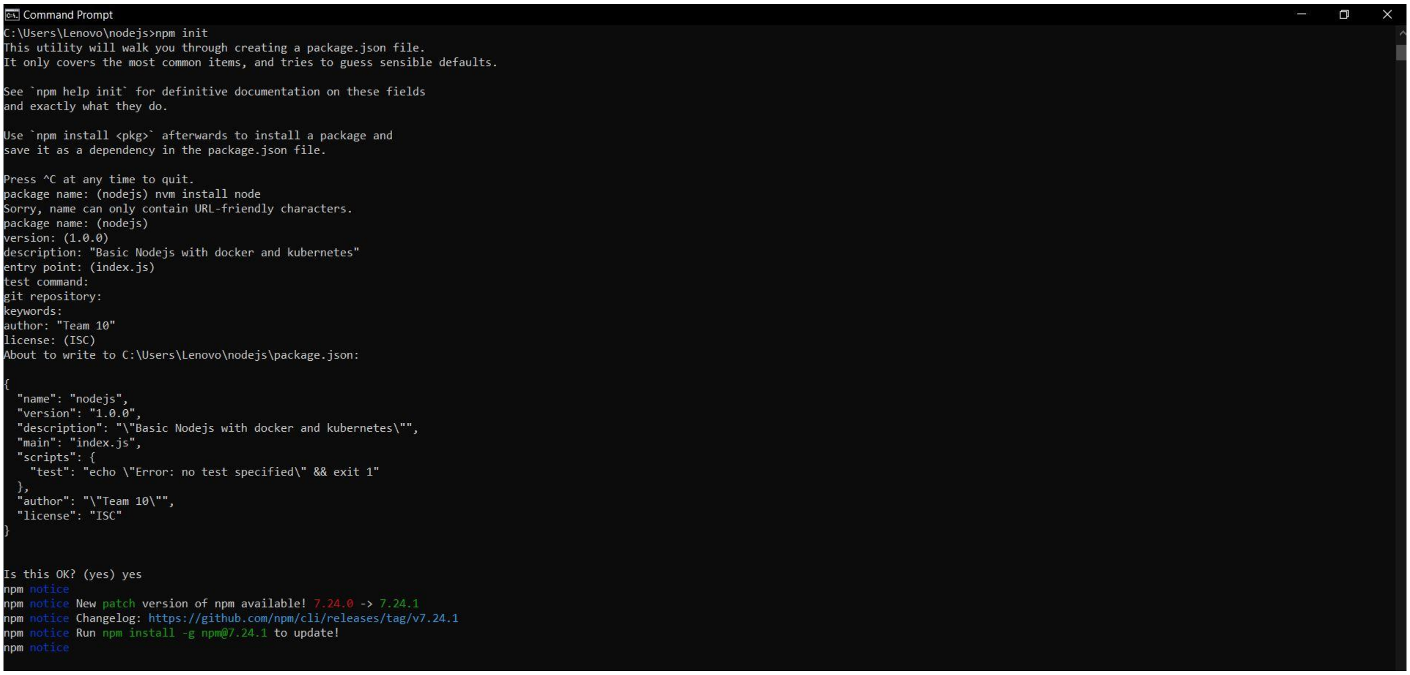
□ Show system containers (advanced)

Show Kubernetes internal containers when using Docker commands.

Reset Kubernetes Cluster

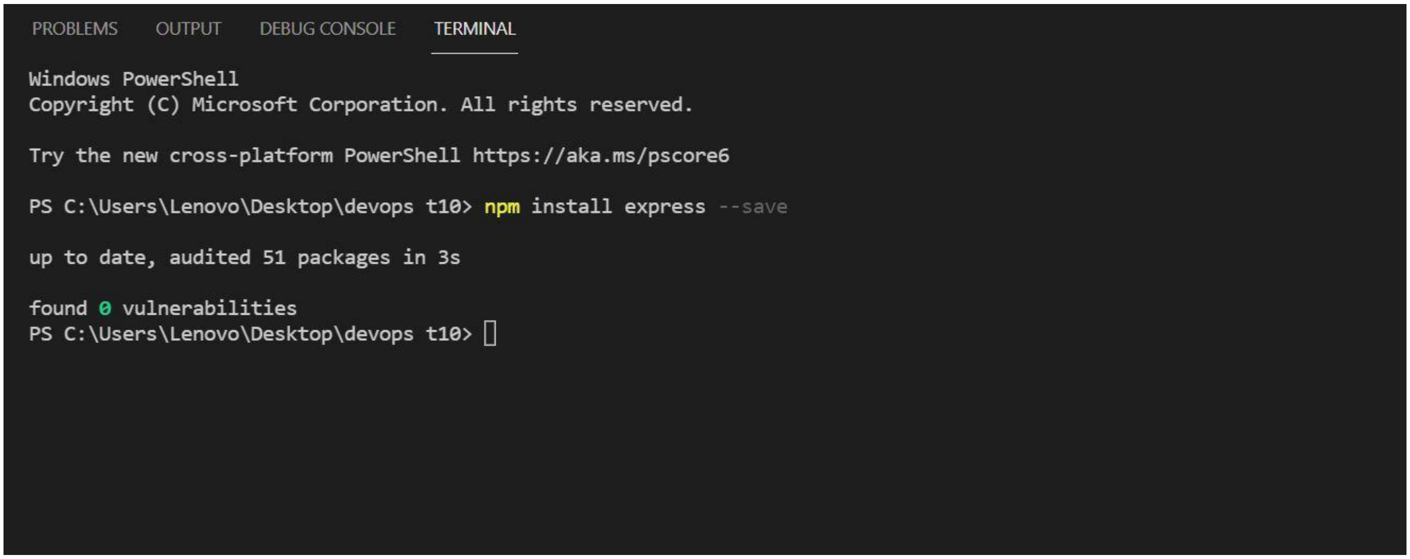
All stacks and Kubernetes resources will be deleted.

Step 1: Make A Separate Directory And Initialize The Node Application



```
C:\Users\Lenovo\nodejs>npm init
This utility will walk you through creating a package.json file.
It only covers the most common items, and tries to guess sensible defaults.

See `npm help init` for definitive documentation on these fields
and exactly what they do.

Use `npm install <pkg>` afterwards to install a package and
save it as a dependency in the package.json file.

Press ^C at any time to quit.
package name: (nodejs) nvm install node
Sorry, name can only contain URL-friendly characters.
package name: (nodejs)
version: (1.0.0)
description: "Basic Nodejs with docker and kubernetes"
entry point: (index.js)
test command:
git repository:
keywords:
author: "Team 10"
license: (ISC)
About to write to C:\Users\Lenovo\nodejs\package.json:

{
  "name": "nodejs",
  "version": "1.0.0",
  "description": "\"Basic Nodejs with docker and kubernetes\"",
  "main": "index.js",
  "scripts": {
    "test": "echo \"Error: no test specified\" && exit 1"
  },
  "author": "\"Team 10\"",
  "license": "ISC"
}


Is this OK? (yes) yes
npm notice
npm notice New patch version of npm available! 7.24.0 -> 7.24.1
npm notice Changelog: https://github.com/npm/cli/releases/tag/v7.24.1
npm notice Run npm install -g npm@7.24.1 to update!
npm notice
```

Step 2: Installing Express



```
Windows PowerShell
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PS C:\Users\Lenovo\Desktop\devops t10> npm install express --save

up to date, audited 51 packages in 3s

found 0 vulnerabilities
PS C:\Users\Lenovo\Desktop\devops t10>
```
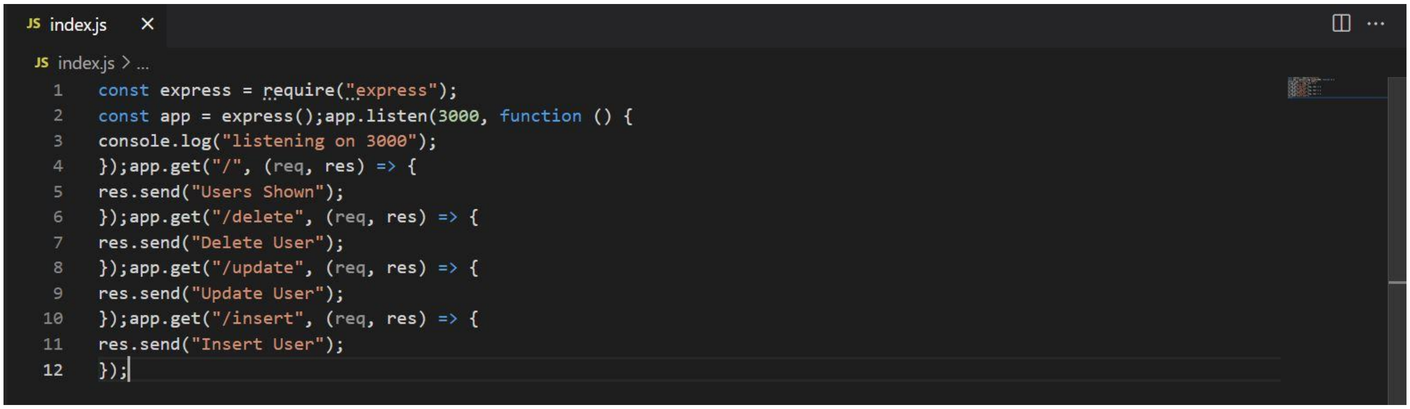

Step 3: Make index.js File And Write Some Code

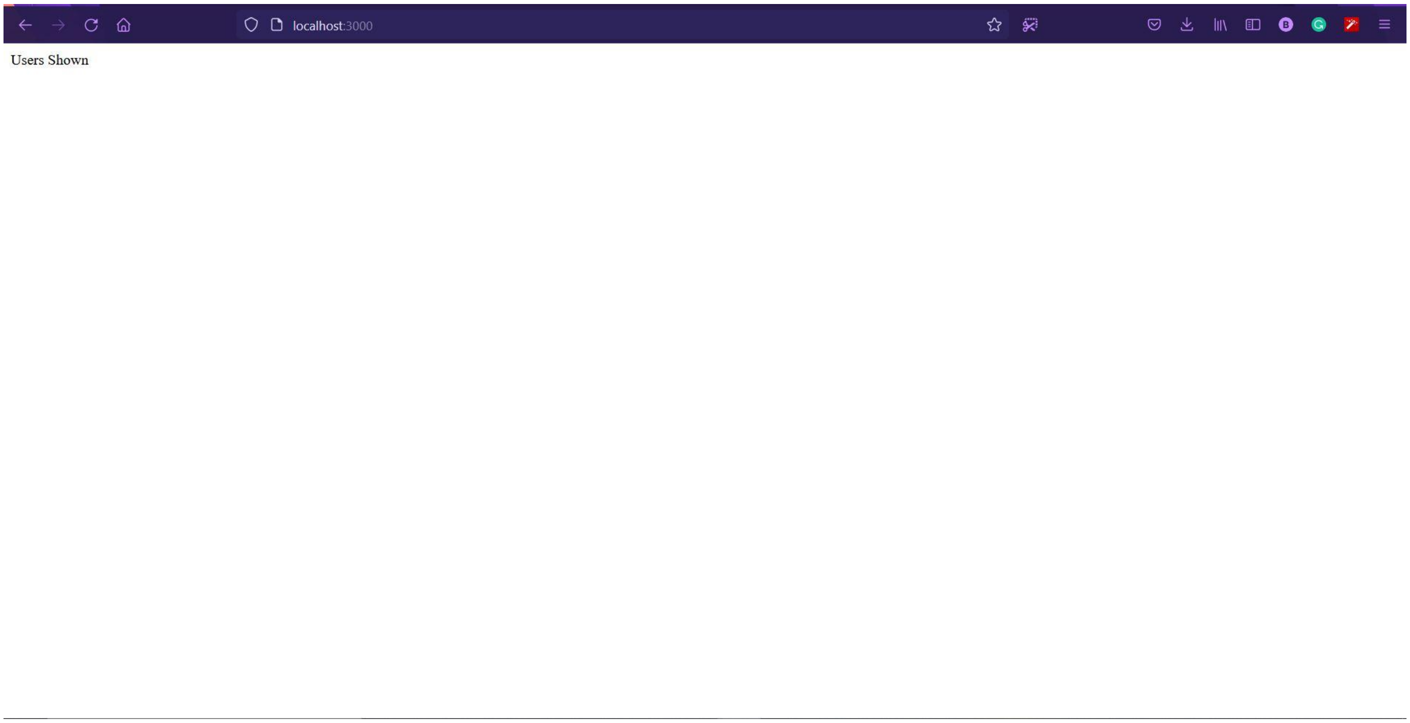


```
const express = require("express");
const app = express();app.listen(3000, function () {
console.log("listening on 3000");
});app.get("/", (req, res) => {
res.send("Users Shown");
});app.get("/delete", (req, res) => {
res.send("Delete User");
});app.get("/update", (req, res) => {
res.send("Update User");
});app.get("/insert", (req, res) => {
res.send("Insert User");
});
```

After writing the code in the index.js file run the following command in the terminal.

$ node index.js

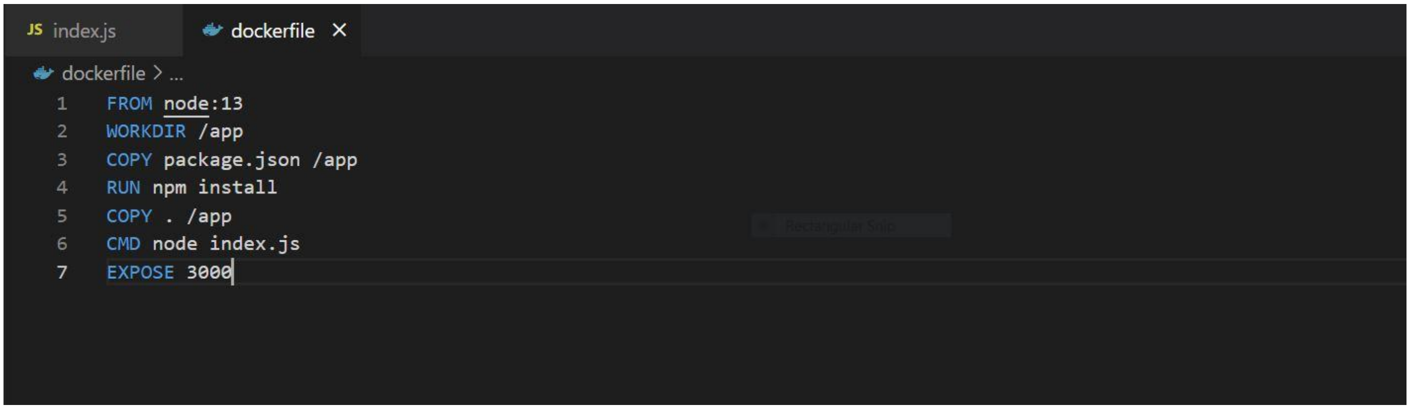
You can now check the server by using the following command and browsing localhost:3000/



Users Shown

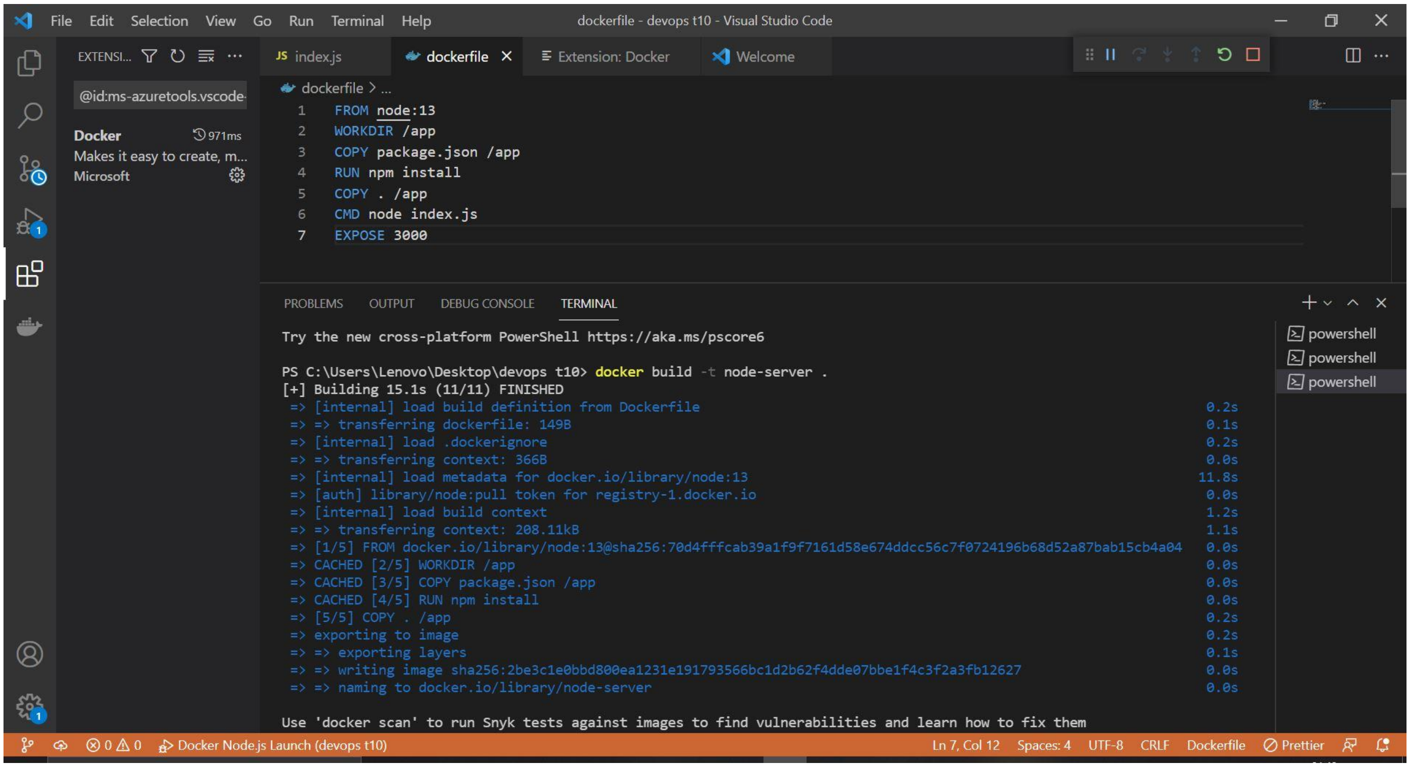
Step 4: Dockerizing The Node Server

For creating the Dockerfile run the following command on terminal: **$ code dockerfile**



```
FROM node:13
WORKDIR /app
COPY package.json /app
RUN npm install
COPY . /app
CMD node index.js
EXPOSE 3000
```

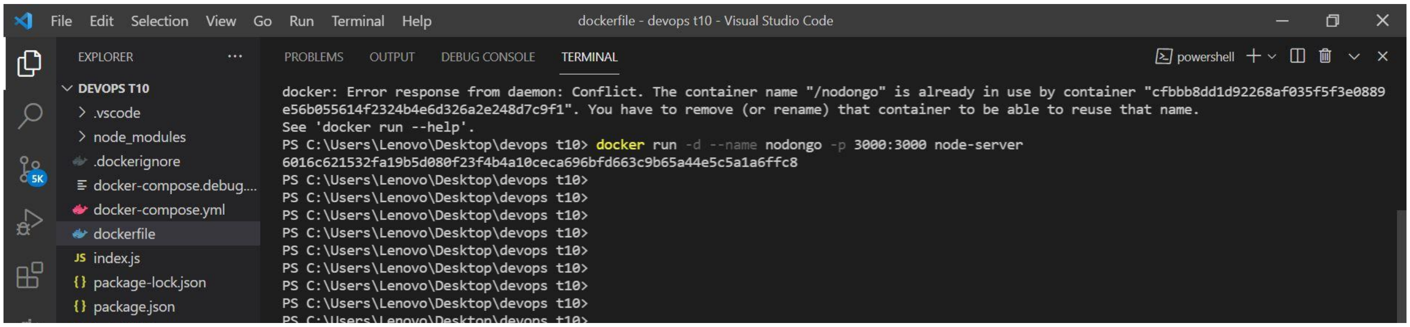
Start building our image by running the following command on terminal: **$ docker build -t node-server .**



```
FROM node:13
WORKDIR /app
COPY package.json /app
RUN npm install
COPY . /app
CMD node index.js
EXPOSE 3000
```

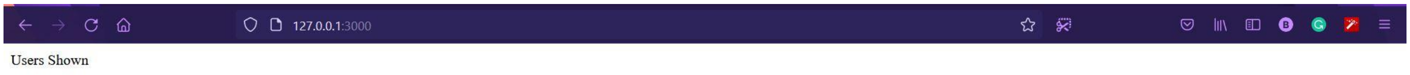
```
Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\Lenovo\Desktop\devops t10> docker build -t node-server .
[+] Building 15.1s (11/11) FINISHED
 => [internal] load build definition from Dockerfile                                             0.2s
 => => transferring dockerfile: 149B                                                             0.1s
 => [internal] load .dockerignore                                                                0.2s
 => => transferring context: 366B                                                                0.0s
 => [internal] load metadata for docker.io/library/node:13                                      11.8s
 => [auth] library/node:pull token for registry-1.docker.io                                      0.0s
 => [internal] load build context                                                                1.2s
 => => transferring context: 208.11kB                                                            1.1s
 => [1/5] FROM docker.io/library/node:13@sha256:70d4fffcab39a1f9f7161d58e674ddcc56c7f0724196b68d52a87bab15cb4a04  0.0s
 => CACHED [2/5] WORKDIR /app                                                                    0.0s
 => CACHED [3/5] COPY package.json /app                                                          0.0s
 => CACHED [4/5] RUN npm install                                                                 0.0s
 => [5/5] COPY . /app                                                                            0.2s
 => exporting to image                                                                           0.2s
 => => exporting layers                                                                          0.1s
 => => writing image sha256:2be3c1e0bbd800ea1231e191793566bc1d2b62f4dde07bbe1f4c3f2a3fb12627     0.0s
 => => naming to docker.io/library/node-server                                                   0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
```

Step 5: Create And Run The Container



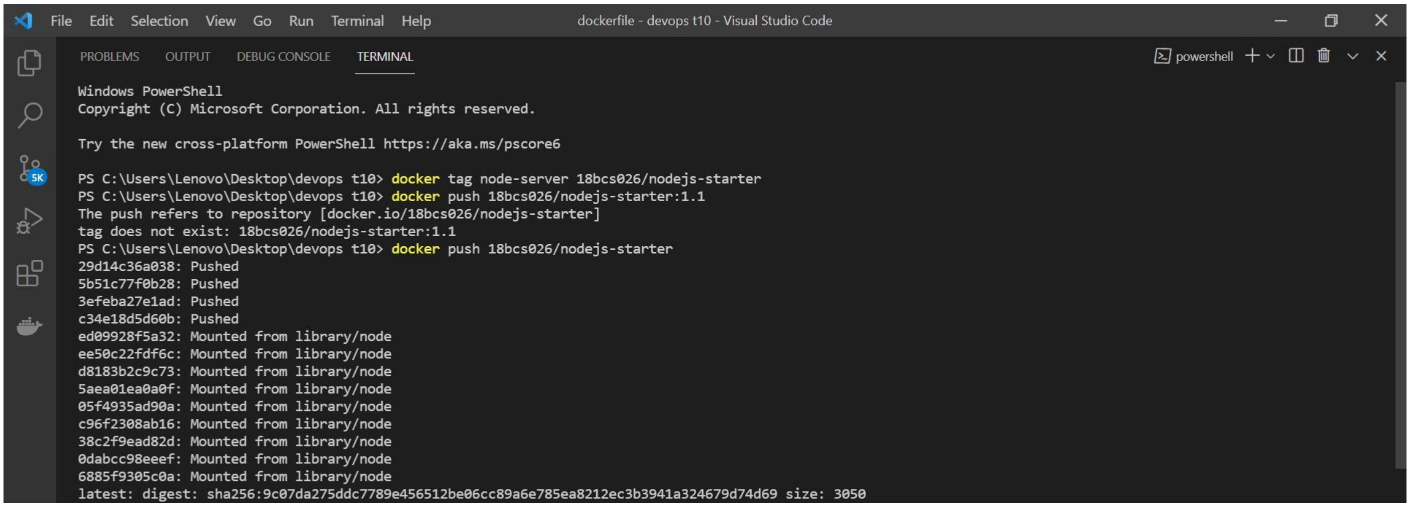
```
docker: Error response from daemon: Conflict. The container name "/nodongo" is already in use by container "cfbbb8dd1d92268af035f5f3e0889
e56b055614f2324b4e6d326a2e248d7c9f1". You have to remove (or rename) that container to be able to reuse that name.
See 'docker run --help'.
PS C:\Users\Lenovo\Desktop\devops t10> docker run -d --name nodongo -p 3000:3000 node-server
6016c621532fa19b5d080f23f4b4a10ceca696bfd663c9b65a44e5c5a1a6ffc8
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
```

Go to the browser and browse the following address **127.0.0.1:3000** to test that it’s running.



Users Shown

Step 6: Upload The Image To Docker Registry Docker Hub



```
Windows PowerShell
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PS C:\Users\Lenovo\Desktop\devops t10> docker tag node-server 18bcs026/nodejs-starter
PS C:\Users\Lenovo\Desktop\devops t10> docker push 18bcs026/nodejs-starter:1.1
The push refers to repository [docker.io/18bcs026/nodejs-starter]
tag does not exist: 18bcs026/nodejs-starter:1.1
PS C:\Users\Lenovo\Desktop\devops t10> docker push 18bcs026/nodejs-starter
29d14c36a038: Pushed
5b51c77f0b28: Pushed
3efeba27e1ad: Pushed
c34e18d5d60b: Pushed
ed09928f5a32: Mounted from library/node
ee50c22fdf6c: Mounted from library/node
d8183b2c9c73: Mounted from library/node
5aea01ea0a0f: Mounted from library/node
05f4935ad90a: Mounted from library/node
c96f2308ab16: Mounted from library/node
38c2f9ead82d: Mounted from library/node
0dabcc98eeef: Mounted from library/node
6885f9305c0a: Mounted from library/node
latest: digest: sha256:9c07da275ddc7789e456512be06cc89a6e785ea8212ec3b3941a324679d74d69 size: 3050
```
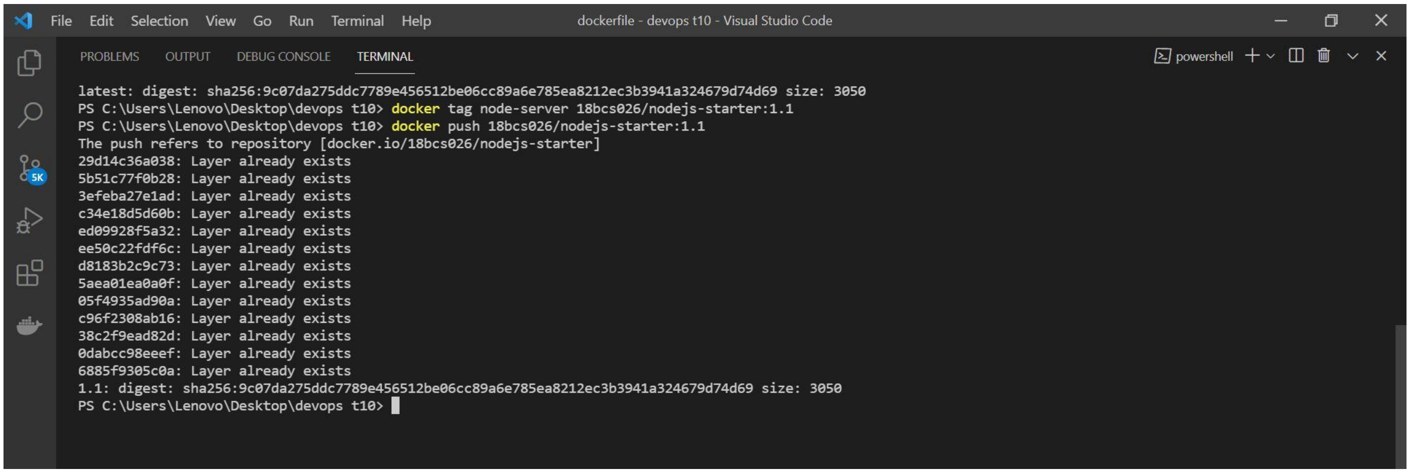
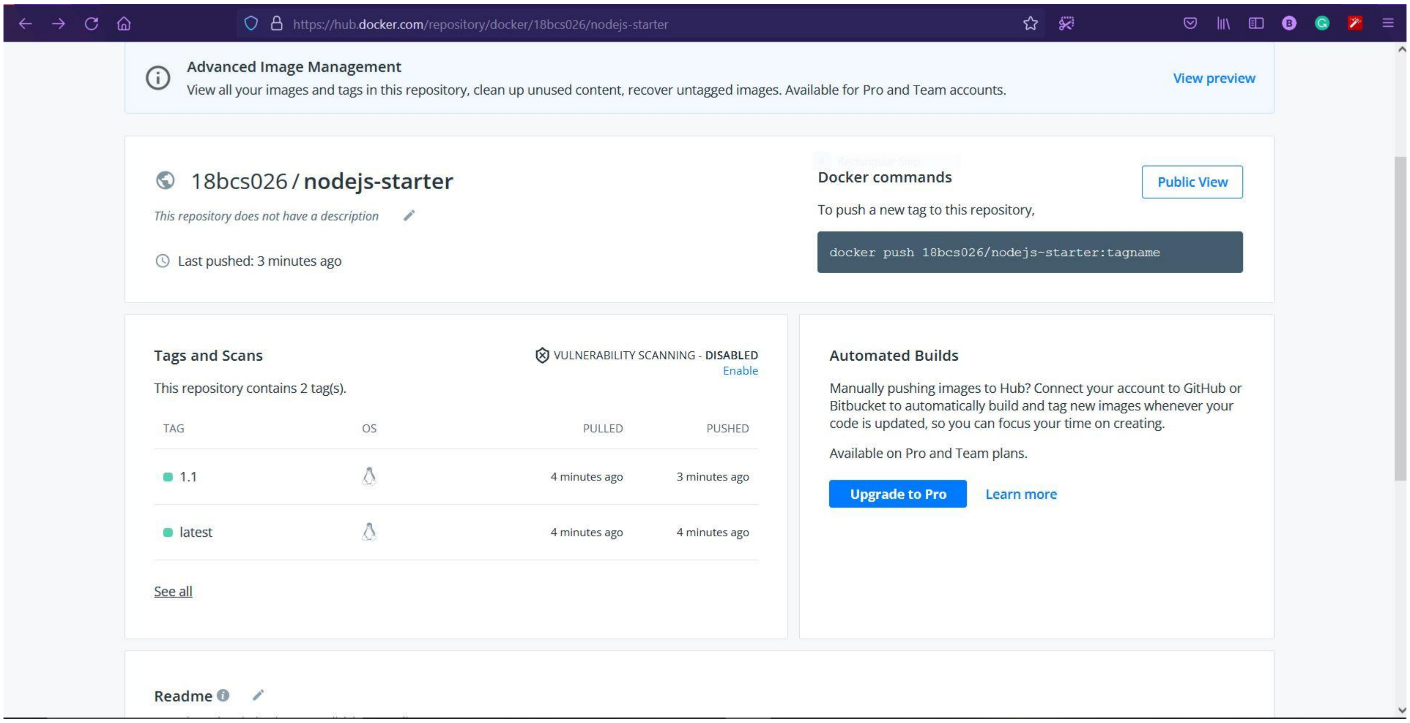



```
latest: digest: sha256:9c07da275ddc7789e456512be06cc89a6e785ea8212ec3b3941a324679d74d69 size: 3050
PS C:\Users\Lenovo\Desktop\devops t10> docker tag node-server 18bcs026/nodejs-starter:1.1
PS C:\Users\Lenovo\Desktop\devops t10> docker push 18bcs026/nodejs-starter:1.1
The push refers to repository [docker.io/18bcs026/nodejs-starter]
29d14c36a038: Layer already exists
5b51c77f0b28: Layer already exists
3efeba27e1ad: Layer already exists
c34e18d5d60b: Layer already exists
ed09928f5a32: Layer already exists
ee50c22fdf6c: Layer already exists
d8183b2c9c73: Layer already exists
5aea01ea0a0f: Layer already exists
05f4935ad90a: Layer already exists
c96f2308ab16: Layer already exists
38c2f9ead82d: Layer already exists
0dabcc98eeef: Layer already exists
6885f9305c0a: Layer already exists
1.1: digest: sha256:9c07da275ddc7789e456512be06cc89a6e785ea8212ec3b3941a324679d74d69 size: 3050
PS C:\Users\Lenovo\Desktop\devops t10>
```


https://hub.docker.com/repository/docker/18bcs026/nodejs-starter

Advanced Image Management

View all your images and tags in this repository, clean up unused content, recover untagged images. Available for Pro and Team accounts.

View preview

18bcs026 / **nodejs-starter**

This repository does not have a description

Last pushed: 3 minutes ago

Docker commands

Public View

To push a new tag to this repository,

```
docker push 18bcs026/nodejs-starter:tagname
```

Tags and Scans

VULNERABILITY SCANNING - **DISABLED**
Enable

This repository contains 2 tag(s).

TAG	OS	PULLED	PUSHED
🟩 1.1	🐧	4 minutes ago	3 minutes ago
🟩 latest	🐧	4 minutes ago	4 minutes ago

See all

Automated Builds

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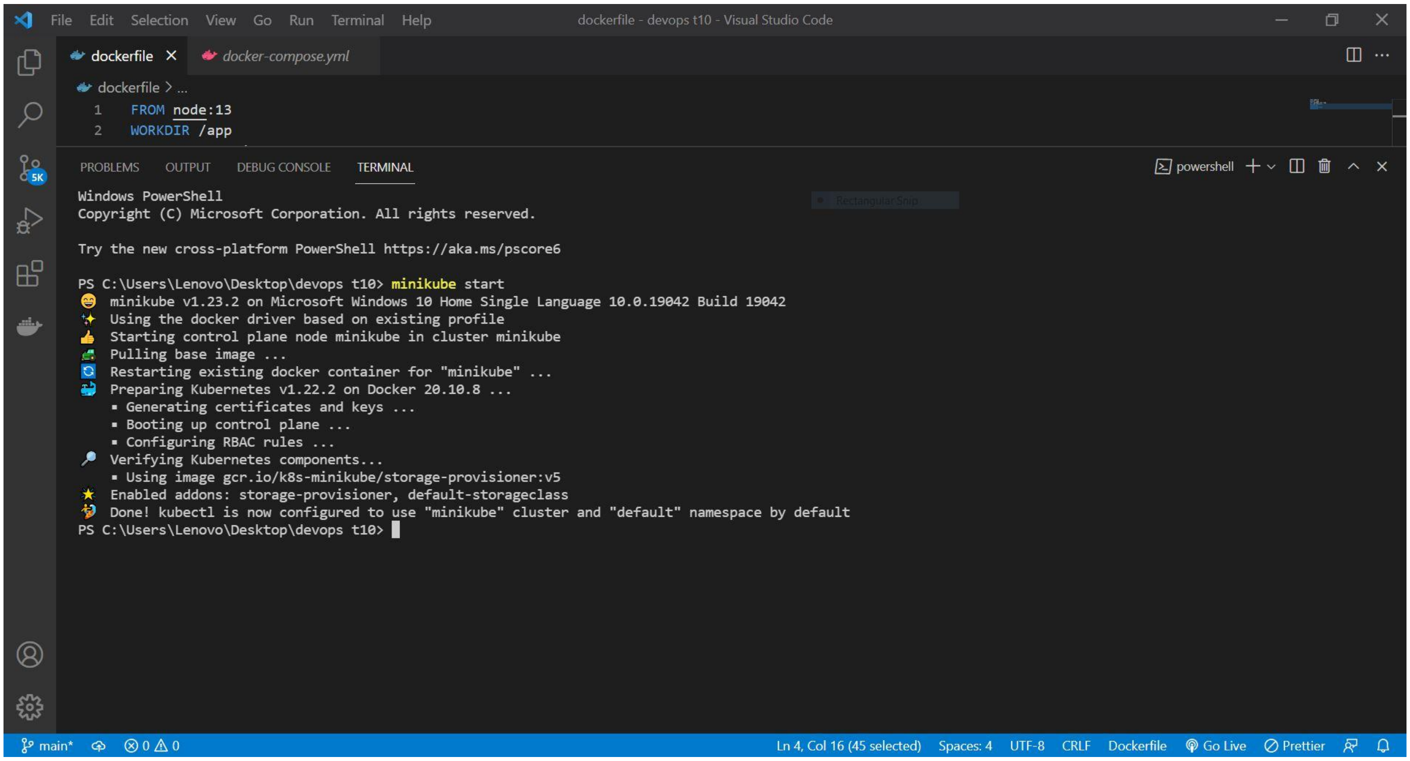
Available on Pro and Team plans.

Upgrade to Pro
Learn more

Readme

Step 7: Start The Kubernetes Cluster



```
FROM node:13
WORKDIR /app
```

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\Lenovo\Desktop\devops t10> minikube start
😄  minikube v1.23.2 on Microsoft Windows 10 Home Single Language 10.0.19042 Build 19042
✨  Using the docker driver based on existing profile
👍  Starting control plane node minikube in cluster minikube
🚜  Pulling base image ...
🔄  Restarting existing docker container for "minikube" ...
🐳  Preparing Kubernetes v1.22.2 on Docker 20.10.8 ...
    ▪ Generating certificates and keys ...
    ▪ Booting up control plane ...
    ▪ Configuring RBAC rules ...
🔎  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
PS C:\Users\Lenovo\Desktop\devops t10> 
```
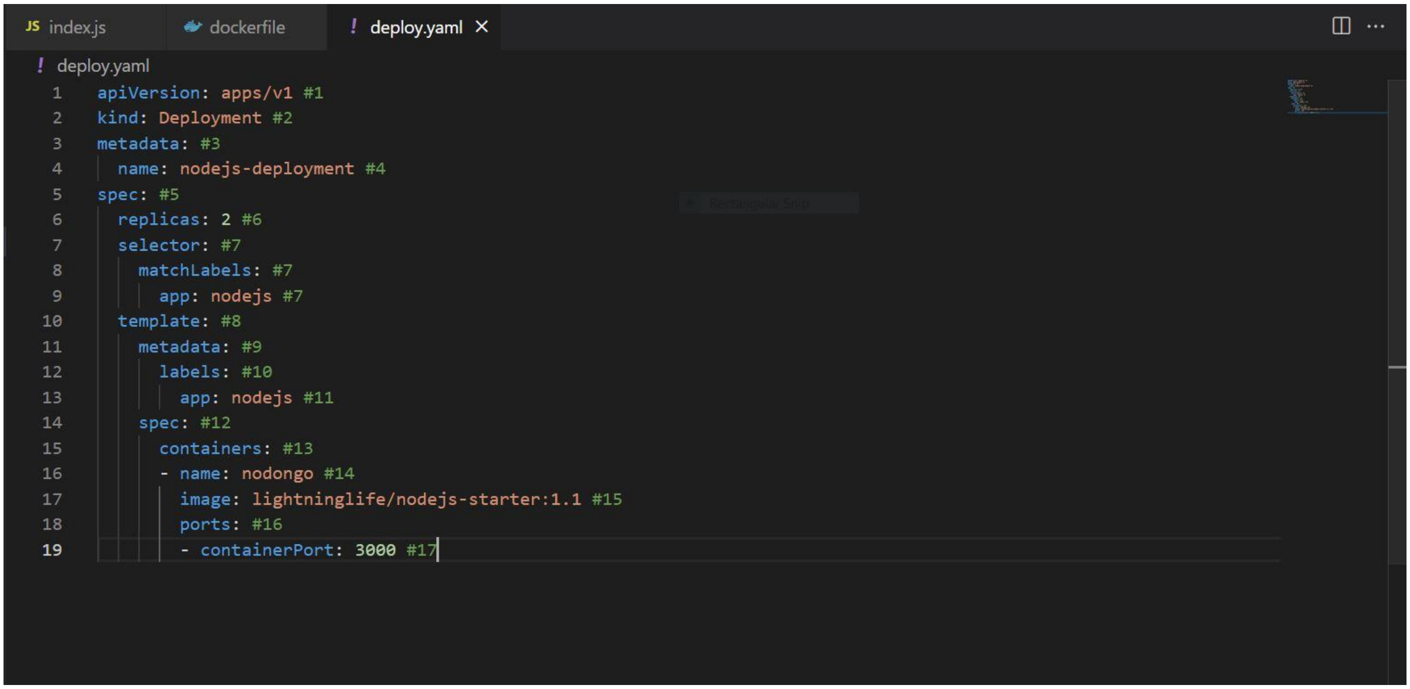
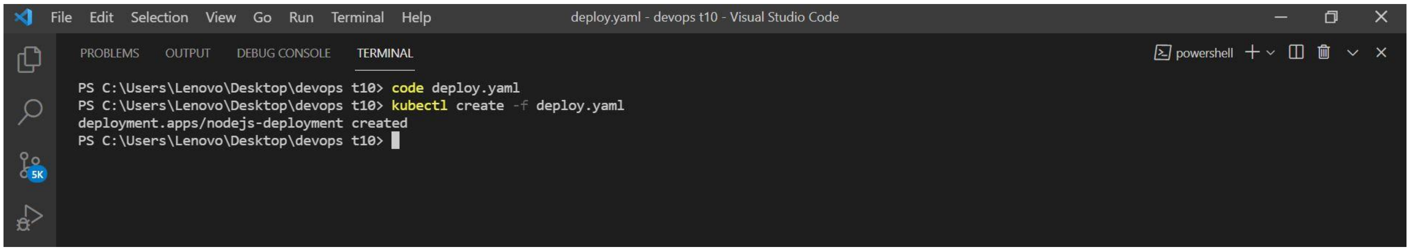

Step 8: Define YAML File To Create A Deployment In Kubernetes Cluster



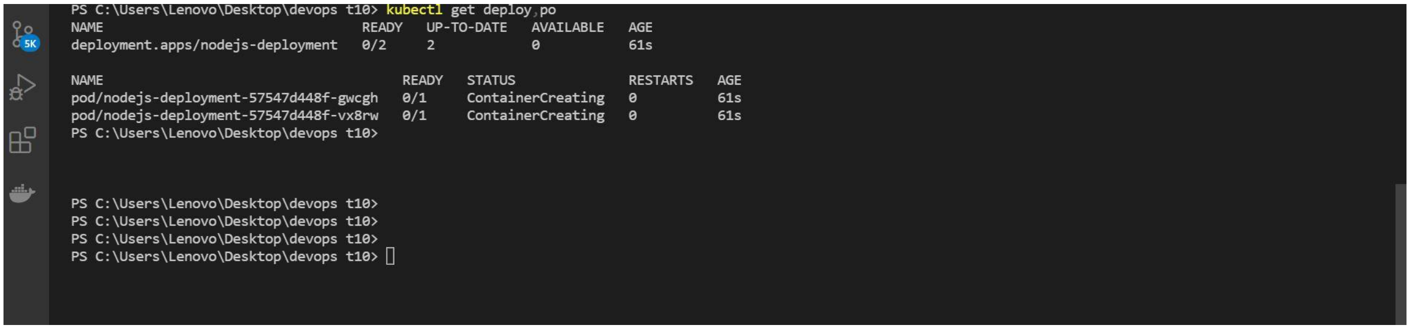
```yaml
apiVersion: apps/v1 #1
kind: Deployment #2
metadata: #3
  name: nodejs-deployment #4
spec: #5
  replicas: 2 #6
  selector: #7
    matchLabels: #7
      app: nodejs #7
  template: #8
    metadata: #9
      labels: #10
        app: nodejs #11
    spec: #12
      containers: #13
      - name: nodongo #14
        image: lightninglife/nodejs-starter:1.1 #15
        ports: #16
        - containerPort: 3000 #17
```

Step 9: Create Deployment In Kubernetes Cluster

create a deployment from this YAML file.
$ kubectl create -f deploy.yaml

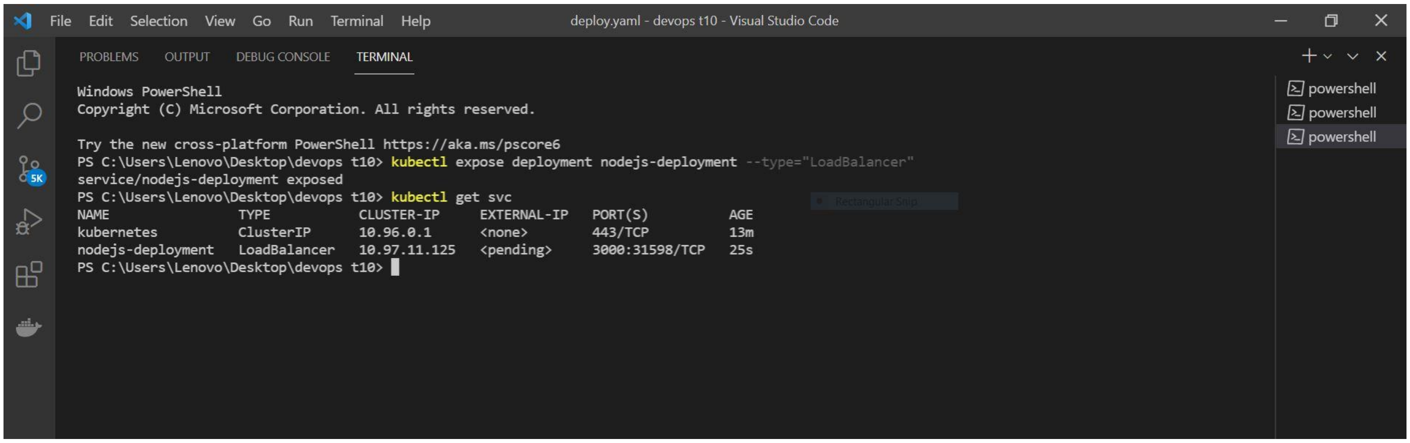


```
PS C:\Users\Lenovo\Desktop\devops t10> code deploy.yaml
PS C:\Users\Lenovo\Desktop\devops t10> kubectl create -f deploy.yaml
deployment.apps/nodejs-deployment created
PS C:\Users\Lenovo\Desktop\devops t10>
```



```
PS C:\Users\Lenovo\Desktop\devops t10> kubectl get deploy,po
NAME                                READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/nodejs-deployment   0/2     2            0           61s

NAME                                     READY   STATUS              RESTARTS   AGE
pod/nodejs-deployment-57547d448f-gwcgh   0/1     ContainerCreating   0          61s
pod/nodejs-deployment-57547d448f-vx8rw   0/1     ContainerCreating   0          61s
PS C:\Users\Lenovo\Desktop\devops t10>



PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
PS C:\Users\Lenovo\Desktop\devops t10>
```

Step 10: Expose The Deployment To The Internet



```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\Lenovo\Desktop\devops t10> kubectl expose deployment nodejs-deployment --type="LoadBalancer"
service/nodejs-deployment exposed
PS C:\Users\Lenovo\Desktop\devops t10> kubectl get svc
NAME                TYPE           CLUSTER-IP     EXTERNAL-IP   PORT(S)          AGE
kubernetes          ClusterIP      10.96.0.1      <none>        443/TCP          13m
nodejs-deployment   LoadBalancer   10.97.11.125   <pending>     3000:31598/TCP   25s
PS C:\Users\Lenovo\Desktop\devops t10>
```
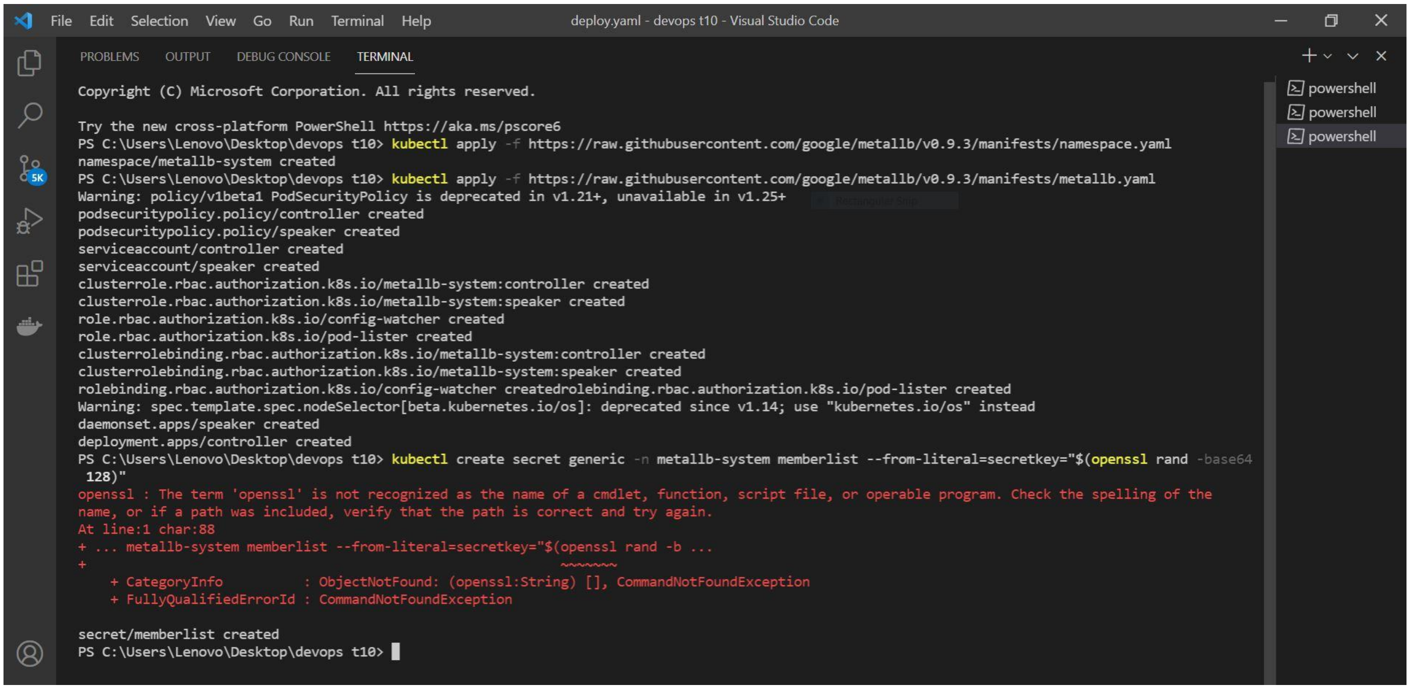

Step 11: Using MetalLB In Your Minikube Environment


File Edit Selection View Go Run Terminal Help
deploy.yaml - devops t10 - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
powershell
powershell
powershell

```
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Try the new cross-platform PowerShell https://aka.ms/pscore6
PS C:\Users\Lenovo\Desktop\devops t10> kubectl apply -f https://raw.githubusercontent.com/google/metallb/v0.9.3/manifests/namespace.yaml
namespace/metallb-system created
PS C:\Users\Lenovo\Desktop\devops t10> kubectl apply -f https://raw.githubusercontent.com/google/metallb/v0.9.3/manifests/metallb.yaml
Warning: policy/v1beta1 PodSecurityPolicy is deprecated in v1.21+, unavailable in v1.25+
podsecuritypolicy.policy/controller created
podsecuritypolicy.policy/speaker created
serviceaccount/controller created
serviceaccount/speaker created
clusterrole.rbac.authorization.k8s.io/metallb-system:controller created
clusterrole.rbac.authorization.k8s.io/metallb-system:speaker created
role.rbac.authorization.k8s.io/config-watcher created
role.rbac.authorization.k8s.io/pod-lister created
clusterrolebinding.rbac.authorization.k8s.io/metallb-system:controller created
clusterrolebinding.rbac.authorization.k8s.io/metallb-system:speaker created
rolebinding.rbac.authorization.k8s.io/config-watcher createdrolebinding.rbac.authorization.k8s.io/pod-lister created
Warning: spec.template.spec.nodeSelector[beta.kubernetes.io/os]: deprecated since v1.14; use "kubernetes.io/os" instead
daemonset.apps/speaker created
deployment.apps/controller created
PS C:\Users\Lenovo\Desktop\devops t10> kubectl create secret generic -n metallb-system memberlist --from-literal=secretkey="$(openssl rand -base64
 128)"
openssl : The term 'openssl' is not recognized as the name of a cmdlet, function, script file, or operable program. Check the spelling of the
name, or if a path was included, verify that the path is correct and try again.
At line:1 char:88
+ ... metallb-system memberlist --from-literal=secretkey="$(openssl rand -b ...
+                                                          ~~~~~~~
    + CategoryInfo          : ObjectNotFound: (openssl:String) [], CommandNotFoundException
    + FullyQualifiedErrorId : CommandNotFoundException

secret/memberlist created
PS C:\Users\Lenovo\Desktop\devops t10> 
```

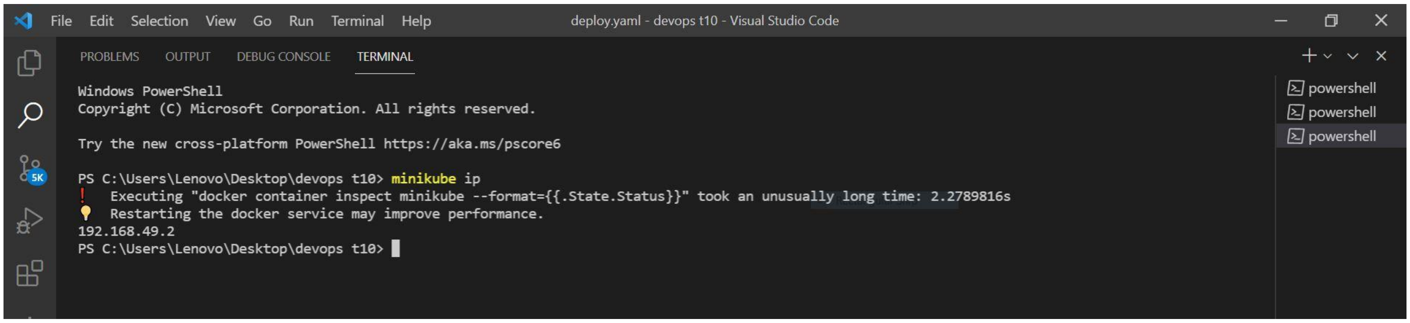
File Edit Selection View Go Run Terminal Help
deploy.yaml - devops t10 - Visual Studio Code
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
powershell
powershell
powershell

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\Lenovo\Desktop\devops t10> minikube ip
!    Executing "docker container inspect minikube --format={{.State.Status}}" took an unusually long time: 2.2789816s
💡    Restarting the docker service may improve performance.
192.168.49.2
PS C:\Users\Lenovo\Desktop\devops t10> 
```
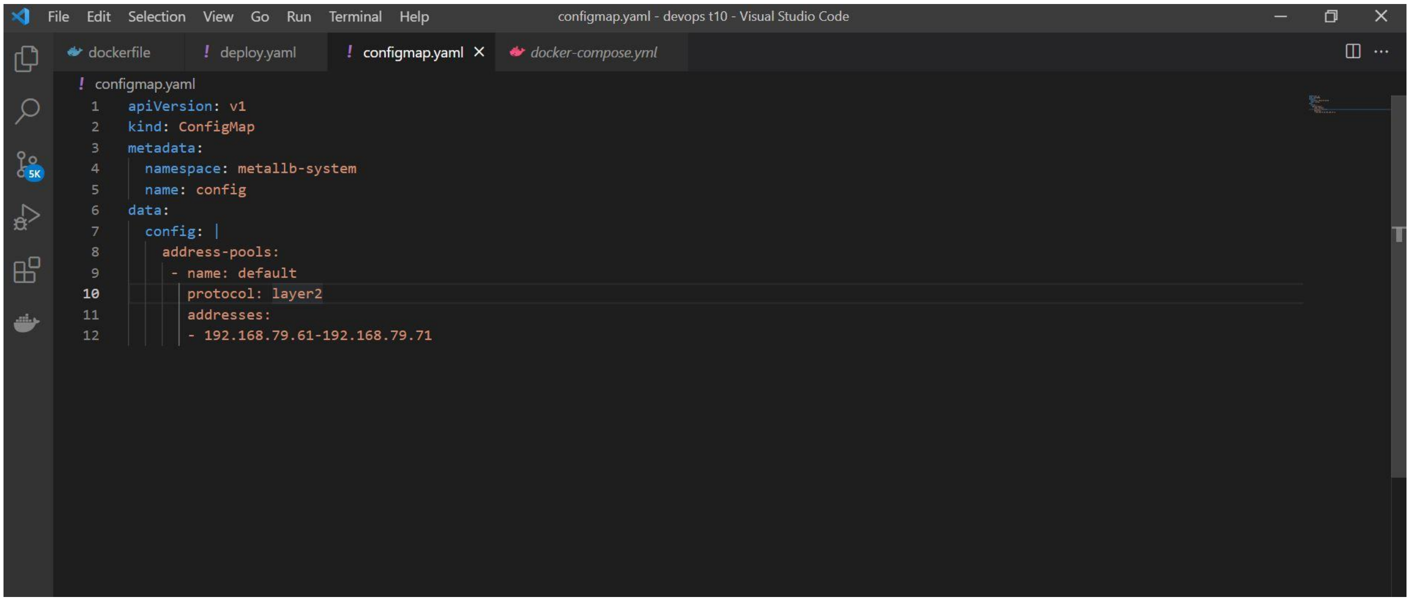

create a config map for the address pool by running the following command: **$ code configmap.yaml**

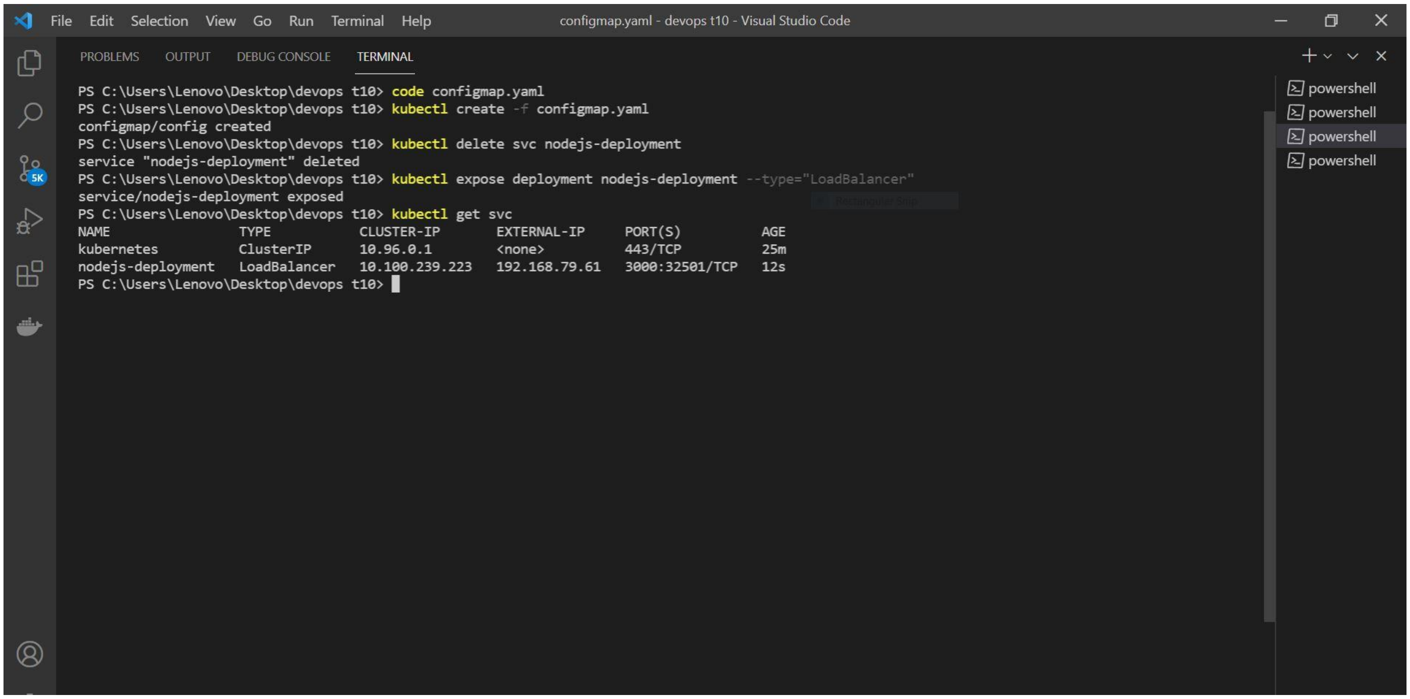

File Edit Selection View Go Run Terminal Help
configmap.yaml - devops t10 - Visual Studio Code
dockerfile
deploy.yaml
configmap.yaml
docker-compose.yml
configmap.yaml

```yaml
apiVersion: v1
kind: ConfigMap
metadata:
  namespace: metallb-system
  name: config
data:
  config: |
    address-pools:
    - name: default
      protocol: layer2
      addresses:
      - 192.168.79.61-192.168.79.71
```

In this configuration, MetalLB is instructed to hand out addresses from **192.168.79.61** to **192.168.79.71**. After that, we'll create a config map in the metallb-system namespace.

```
$ kubectl create -f configmap.
$ yaml kubectl delete svc nodejs-deployment
$ kubectl expose deployment nodejs-deployment--type="LoadBalancer"
```

Now that's done, you'll be getting External IP.



```
PS C:\Users\Lenovo\Desktop\devops t10> code configmap.yaml
PS C:\Users\Lenovo\Desktop\devops t10> kubectl create -f configmap.yaml
configmap/config created
PS C:\Users\Lenovo\Desktop\devops t10> kubectl delete svc nodejs-deployment
service "nodejs-deployment" deleted
PS C:\Users\Lenovo\Desktop\devops t10> kubectl expose deployment nodejs-deployment --type="LoadBalancer"
service/nodejs-deployment exposed
PS C:\Users\Lenovo\Desktop\devops t10> kubectl get svc
NAME                TYPE           CLUSTER-IP       EXTERNAL-IP     PORT(S)          AGE
kubernetes          ClusterIP      10.96.0.1        <none>          443/TCP          25m
nodejs-deployment   LoadBalancer   10.100.239.223   192.168.79.61   3000:32501/TCP   12s
PS C:\Users\Lenovo\Desktop\devops t10>
```

"Thank you"

***************************** END *****************************