

Step-by-Step Guide to Deploying a Spring Boot Application with Docker and Kubernetes



1. Initialize and Clone the Repository

Initializes a new Git repository.

Clones the Spring Framework PetClinic project from GitHub.

Code:

```
git init  
git clone "https://github.com/AranganathanPrakash/spring-framework-petclinic"
```

Screenshot:

```
root@Ubuntu:/home/vboxuser/task5.1# git init  
hint: Using 'master' as the name for the initial branch. This default branch name  
      is subject to change. To configure the initial branch name to use in all  
      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/vboxuser/task5.1/.git/
```

2. Navigate to the Project Directory

Moves into the cloned repository folder.

Code:

```
cd spring-framework-petclinic
```

3. Update System Packages

Updates the package list to ensure the latest versions are available.

Code:

```
sudo apt update
```

Screenshot:

```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# sudo apt update
Get:1 https://download.docker.com/linux/ubuntu noble InRelease [48.8 kB]
Ign:2 https://pkg.jenkins.io/debian-stable binary/ InRelease
Hit:3 https://pkg.jenkins.io/debian-stable binary/ Release
Hit:5 http://in.archive.ubuntu.com/ubuntu noble InRelease
Get:6 http://in.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:7 http://security.ubuntu.com/ubuntu noble-security InRelease
Get:8 http://in.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [922 kB]
Fetched 1,223 kB in 5s (270 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

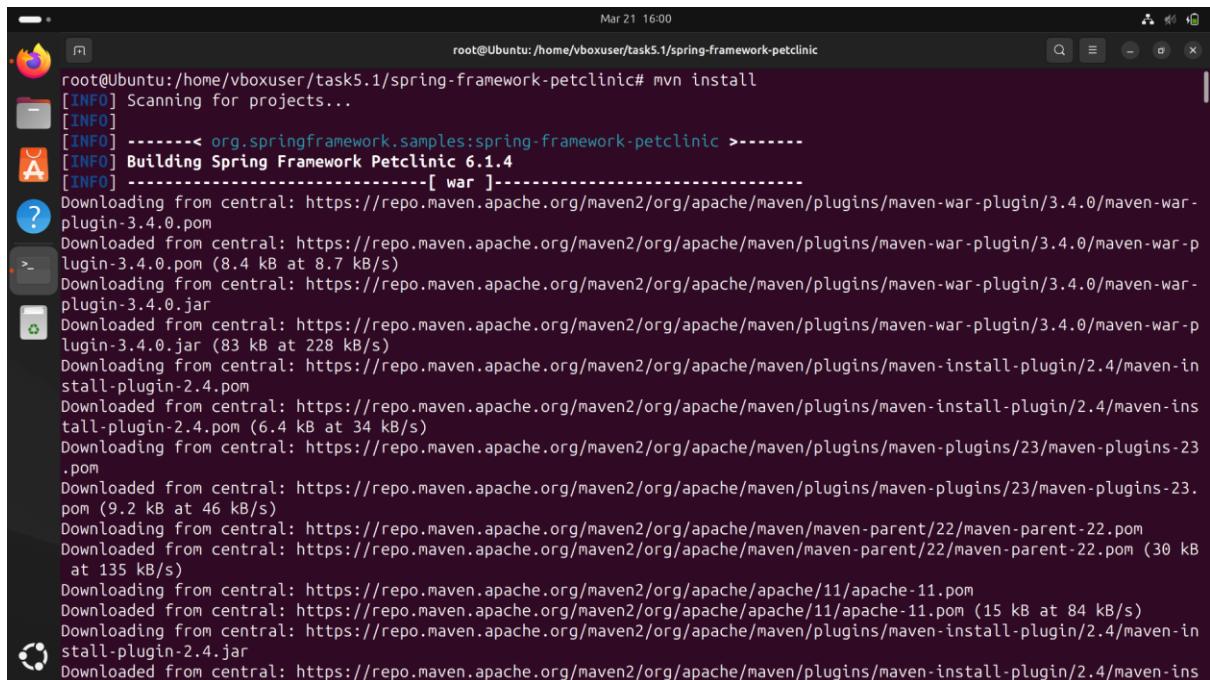
4. Install Maven

Installs Apache Maven, required for building the Spring Boot application.

Code:

```
sudo apt install maven
```

Screenshot:



```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn install
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.springframework.samples:spring-framework-petclinic >-----
[INFO] Building Spring Framework PetClinic 6.1.4
[INFO] -----[ war ]-----
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.pom (8.4 kB at 8.7 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.jar (83 kB at 228 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom (6.4 kB at 34 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom (9.2 kB at 46 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom (30 kB at 135 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom (15 kB at 84 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-inst
```

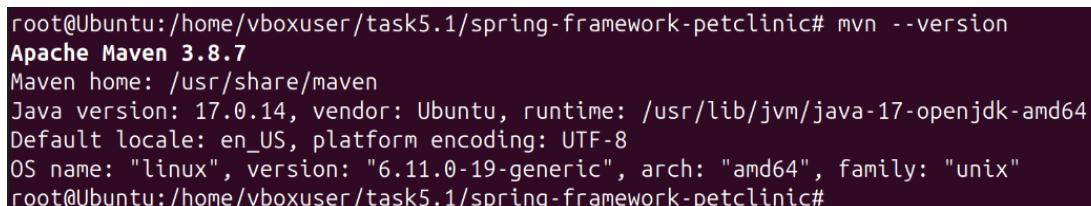
5. Verify Maven Installation

Checks if Maven is installed correctly and displays the version.

Code:

```
mvn --version
```

Screenshot:



```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn --version
Apache Maven 3.8.7
Maven home: /usr/share/maven
Java version: 17.0.14, vendor: Ubuntu, runtime: /usr/lib/jvm/java-17-openjdk-amd64
Default locale: en_US, platform encoding: UTF-8
OS name: "linux", version: "6.11.0-19-generic", arch: "amd64", family: "unix"
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic#
```

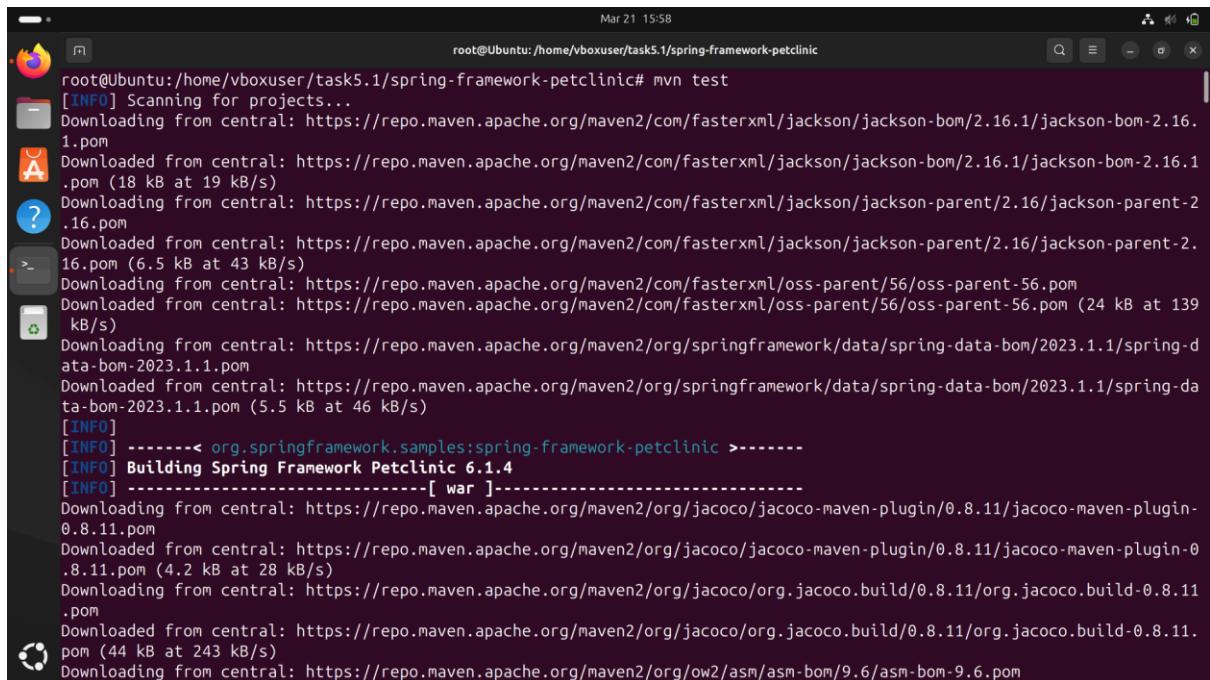
6. Run Tests (Optional)

Executes unit tests to ensure the application works correctly.

Code:

```
mvn test
```

Screenshot:



```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn test
[INFO] Scanning for projects...
Downloading from central: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/jackson-bom/2.16.1/jackson-bom-2.16.1.pom
Downloaded from central: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/jackson-bom/2.16.1/jackson-bom-2.16.1.pom (18 kB at 19 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/jackson-parent/2.16/jackson-parent-2.16.pom
Downloaded from central: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/jackson-parent/2.16/jackson-parent-2.16.pom (6.5 kB at 43 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/com/fasterxml/oss-parent/56/oss-parent-56.pom
Downloaded from central: https://repo.maven.apache.org/maven2/com/fasterxml/oss-parent/56/oss-parent-56.pom (24 kB at 139 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/springframework/data/spring-data-bom/2023.1.1/spring-data-bom-2023.1.1.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/springframework/data/spring-data-bom/2023.1.1/spring-data-bom-2023.1.1.pom (5.5 kB at 46 kB/s)
[INFO]
[INFO] -----< org.springframework.samples:spring-framework-petclinic >-----
[INFO] Building Spring Framework PetClinic 6.1.4
[INFO] -----[ war ]-----
Downloading from central: https://repo.maven.apache.org/maven2/org/jacoco/jacoco-maven-plugin/0.8.11/jacoco-maven-plugin-0.8.11.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/jacoco/jacoco-maven-plugin/0.8.11/jacoco-maven-plugin-0.8.11.pom (4.2 kB at 28 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/jacoco/org.jacoco.build/0.8.11/org.jacoco.build-0.8.11.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/jacoco/org.jacoco.build/0.8.11/org.jacoco.build-0.8.11.pom (44 kB at 243 kB/s)
Downloading from central: https://repo.maven.apache.org/maven2/org/ow2/asm/asm-bom/9.6/asm-bom-9.6.pom
```

7. Clean and Build the Application

mvn clean: Cleans previous builds.

mvn install: Compiles and packages the application.

mvn package: Generates the final JAR/WAR file in the **target/** directory.

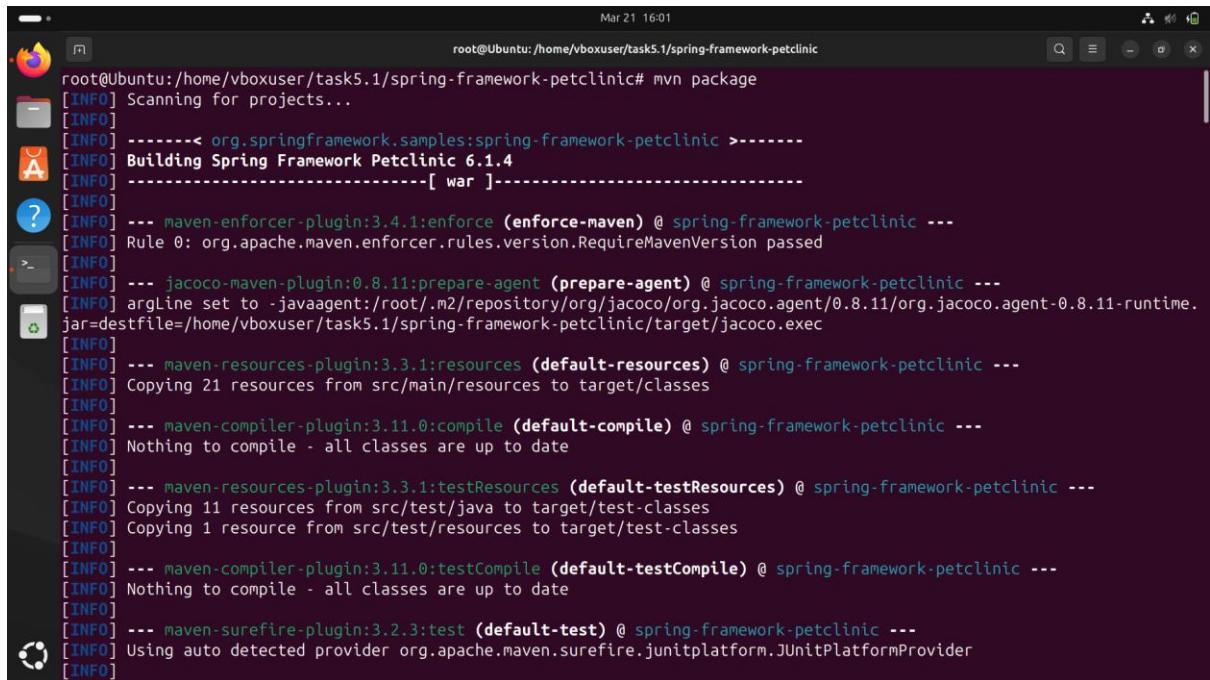
Code:

```
mvn clean
mvn install
mvn package
```

Screenshot:

```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn clean
[INFO] Scanning for projects...
[INFO] -----< org.springframework.samples:spring-framework-petclinic >-----
[INFO] Building Spring Framework PetClinic 6.1.4
[INFO] -----[ war ]-----
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom (3.9 kB at 3.4 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/22/maven-plugins-22.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/22/maven-plugins-22.pom (13 kB at 65 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/21/maven-parent-21.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/21/maven-parent-21.pom (26 kB at 133 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/10/apache-10.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/10/apache-10.pom (15 kB at 89 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar (25 kB at 129 kB/s)
[INFO] --- maven-clean-plugin:2.5:clean (default-clean) @ spring-framework-petclinic ---
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.0.6/maven-plugin-api-2.0.6.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.0.6/maven-plugin-api-2.0.6.pom (1.5 kB at 8.2 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven/2.0.6/maven-2.0.6.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven/2.0.6/maven-2.0.6.pom (9.8 kB at 56 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/5/maven-parent-5.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/5/maven-parent-5.pom (15 kB at 80 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/3/apache-3.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/3/apache-3.pom (3.4 kB at 21 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.0/plexus-utils-3.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.0/plexus-utils-3.0.pom (4.1 kB at 24 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/sonatype/spice/spice-parent/16/spice-parent-16.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/sonatype/spice/spice-parent/16/spice-parent-16.pom (8.4 kB at 44 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.0.6/maven-plugin-api-2.0.6.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.0/plexus-utils-3.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.0.6/maven-plugin-api-2.0.6.jar (13 kB at 58 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.0/plexus-utils-3.0.jar (226 kB at 355 kB/s)
[INFO] Deleting /home/vboxuser/task5.1/spring-framework-petclinic/target
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 4.392 s
[INFO] Finished at: 2025-03-21T15:59:10Z
[INFO] -----
```

```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn install
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.springframework.samples:spring-framework-petclinic >-----
[INFO] Building Spring Framework PetClinic 6.1.4
[INFO] -----[ war ]-----
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.pom (8.4 kB at 8.7 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-war-plugin/3.4.0/maven-war-plugin-3.4.0.jar (83 kB at 228 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom (6.4 kB at 34 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom (9.2 kB at 46 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom (30 kB at 135 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom (15 kB at 84 kB/s)
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.jar
Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-ins
```



A screenshot of a terminal window titled "root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic". The window shows the command "mvn package" being run. The output of the command is displayed, detailing the Maven build process for the "spring-framework-petclinic" project. The log includes messages about scanning for projects, building Spring Framework Petclinic 6.1.4, and various plugin executions like maven-enforcer-plugin, jacoco-maven-plugin, maven-resources-plugin, maven-compiler-plugin, and maven-surefire-plugin.

```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.springframework.samples:spring-framework-petclinic >-----
[INFO] Building Spring Framework Petclinic 6.1.4
[INFO] -----[ war ]-----
[INFO]
[INFO] --- maven-enforcer-plugin:3.4.1:enforce (enforce-maven) @ spring-framework-petclinic ---
[INFO] Rule 0: org.apache.maven.enforcer.rules.version.RequireMavenVersion passed
[INFO]
[INFO] --- jacoco-maven-plugin:0.8.11:prepare-agent (prepare-agent) @ spring-framework-petclinic ---
[INFO] argline set to -javaagent:/root/.m2/repository/org/jacoco/org.jacoco.agent/0.8.11/org.jacoco.agent-0.8.11-runtime.jar=destfile=/home/vboxuser/task5.1/spring-framework-petclinic/target/jacoco.exec
[INFO]
[INFO] --- maven-resources-plugin:3.3.1:resources (default-resources) @ spring-framework-petclinic ---
[INFO] Copying 21 resources from src/main/resources to target/classes
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:compile (default-compile) @ spring-framework-petclinic ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-resources-plugin:3.3.1:testResources (default-testResources) @ spring-framework-petclinic ---
[INFO] Copying 11 resources from src/test/java to target/test-classes
[INFO] Copying 1 resource from src/test/resources to target/test-classes
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:testCompile (default-testCompile) @ spring-framework-petclinic ---
[INFO] Nothing to compile - all classes are up to date
[INFO]
[INFO] --- maven-surefire-plugin:3.2.3:test (default-test) @ spring-framework-petclinic ---
[INFO] Using auto detected provider org.apache.maven.surefire.junitplatform.JUnitPlatformProvider
[INFO]
```

8. Verify the Built Application

Navigates to the `target` folder where the compiled application is stored.

Code:

```
cd target
ls
cd ..
```

9. Login to Docker

Logs into Docker Hub to push container images.

Code:

```
docker login -u sudharsunm
```

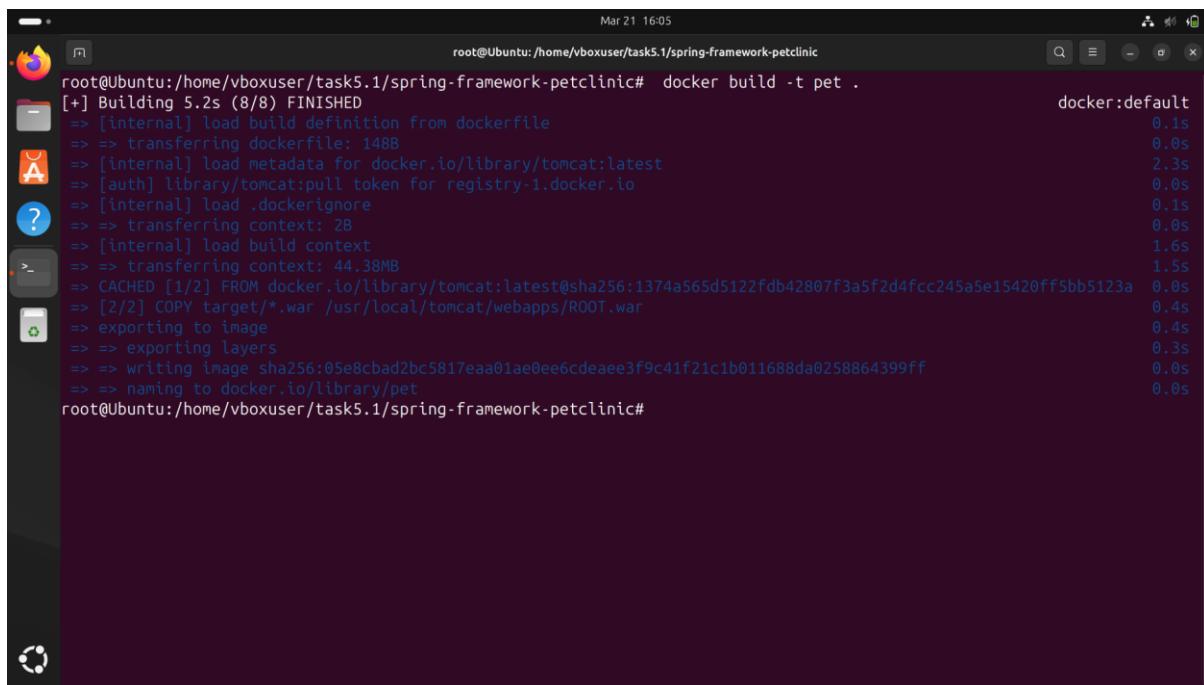
10. Build Docker Image

Builds a Docker image with the tag `pet` from the project directory.

Code:

```
docker build -t pet .
```

Screenshot:



```
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic# docker build -t pet .
[+] Building 5.2s (8/8) FINISHED
  => [internal] load build definition from dockerfile
  => => transferring dockerfile: 148B
  => [internal] load metadata for docker.io/library/tomcat:latest
  => [auth] library/tomcat:pull token for registry-1.docker.io
  => [internal] load .dockerrcignore
  => => transferring context: 2B
  => [internal] load build context
  => => transferring context: 44.38MB
  => CACHED [1/2] FROM docker.io/library/tomcat:latest@sha256:1374a565d5122fdb42807f3a5f2d4fcc245a5e15420ff5bb5123a
  => [2/2] COPY target/*.war /usr/local/tomcat/webapps/ROOT.war
  => exporting to image
  => => exporting layers
  => => writing image sha256:05e8cbad2bc5817eaa01ae0ee6cdeae3f9c41f21c1b011688da0258864399ff
  => => naming to docker.io/library/pet
root@Ubuntu:/home/vboxuser/task5.1/spring-framework-petclinic#
```

11. Tag and Push Image to Docker Hub

Tags the image for Docker Hub.

Pushes the image to your Docker Hub repository.

Code:

```
docker tag pet sudharsunm/pet:latest
```

```
docker push sudharsunm/pet:latest
```

Starts a Minikube cluster for Kubernetes.

Checks if Minikube is running properly.

Code:

```
minikube start
```

```
minikube status
```

13. Verify Kubernetes Nodes

Lists available Kubernetes nodes.

Code:

```
kubectl get nodes
```

ScreenShot:

```
sudharsun@unknown:~$ kubectl get nodes
NAME      STATUS    ROLES      AGE     VERSION
minikube  Ready     control-plane  27h    v1.32.0
sudharsun@unknown:~$ minikube service pets
```

14. Deploy the Application on Kubernetes & Expose the Application

Creates a Kubernetes deployment using your Docker image.

Exposes the deployment as a service, making it accessible via Minikube.

Lists all running pods to verify the deployment is successful.

Code:

```
kubectl create deployment pet --image=sudharsunm/pet --port=8080
```

```
kubectl expose deployment pet --port=8080 --type=NodePort
```

```
kubectl get pods
```

Screenshot:

```
sudharsun@unknown:~$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
pets-76d4bfd6d7-htgfx  1/1     Running   1 (6h32m ago)  24h
springboot-app-77fdd5584f-v4k9n  1/1     Running   0          6h5m
y-7d775945db-s4r72  1/1     Running   2 (6h32m ago)  26h
sudharsun@unknown:~$ kubectl get nodes
NAME      STATUS    ROLES      AGE     VERSION
minikube  Ready     control-plane  27h    v1.32.0
sudharsun@unknown:~$ minikube service pets
|-----|-----|-----|-----|
| NAMESPACE | NAME | TARGET PORT | URL |
|-----|-----|-----|-----|
| default | pets | 8080 | http://192.168.49.2:31546 |
|-----|-----|-----|-----|
👉 Starting tunnel for service pets.
|-----|-----|-----|-----|
| NAMESPACE | NAME | TARGET PORT | URL |
|-----|-----|-----|-----|
| default | pets |  | http://127.0.0.1:34115 |
|-----|-----|-----|-----|
👉 Opening service default/pets in default browser...
👉 http://127.0.0.1:34115
❗ Because you are using a Docker driver on linux, the terminal needs to be open to run it.
```

16. Access the Application

Opens the application in the browser via Minikube.

Code:

```
minikube service pet
```

Screenshot:

