

# Birla Institute of Technology and Science, Pilani



## INTRODUCTION TO DEVOPS

Assignment – Part A (Pre Mid Sem)

Group No - 3

Topic: DevOps Project

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## Table of Contents

<b>Table of Contents .....</b>	<b>2</b>
<b>Part – A (Project Description) .....</b>	<b>3</b>
Project Title:.....	3
Project Description:.....	3
Features of our webapp: .....	3
Technologies used:.....	3
Tools Used:.....	3
IDEs:.....	3
<b>Project Demo.....</b>	<b>4</b>
Home Page:.....	4
Cart Component: .....	4
Order Confirmation: .....	4
<b>Part – B (DevOps Tools and Practices) .....</b>	<b>5</b>
Source Code Management: .....	5
Repository Link: <a href="https://github.com/2020HS-DevOps-Group3/Shop-Microservices">https://github.com/2020HS-DevOps-Group3/Shop-Microservices</a> .....	5
Branches: .....	5
Workflow: .....	6
Commits:.....	6
<b>Build Management with Maven .....</b>	<b>7</b>
Maven use cases in the project.....	7
Parent Pom.XML: .....	7
<b>Build Tasks with Maven:.....</b>	<b>9</b>
Compilation using Maven (mvn compile):.....	9
Testing using Maven (mvn test):.....	9
Packaging using Maven (mvn package):.....	9
Installing in local .m2 repository using Maven (mvn install):.....	10
Clean up using Maven (mvn clean): .....	10
<b>Code Quality Management using SonarQube .....</b>	<b>11</b>
Link: <a href="https://sonarcloud.io/project/overview?id=2020HS-DevOps-Group3_DevOps-Project">https://sonarcloud.io/project/overview?id=2020HS-DevOps-Group3_DevOps-Project</a> .....	11
Project Status: .....	11
SonarCloud Home Page: .....	11
Code Smells:.....	12
Coverage: .....	12
<b>Automation Testing with Selenium.....</b>	<b>13</b>
Repository Link: <a href="https://github.com/2020HS-DevOps-Group3/SeleniumTests">https://github.com/2020HS-DevOps-Group3/SeleniumTests</a> .....	13
Open Website Test: Initially .....	13
Open Website Test: When backend services registered with Eureka Discovery and Cloud Gateway .....	13
Cart Component: Initially .....	14
Cart Component: Add to Cart .....	14
Order Confirmation: Order Products .....	14
Test Results:.....	15

## Part – A (Project Description)

**Project Title:** Shopping Website with Microservices Architecture

### Project Description:

A Shopping Website with Microservices Architecture with the backend on Java Spring Boot and Frontend in Angular. The objective of our project was to learn about microservices architecture and various design patterns such as circuit breaker, DTOs (Data Transfer Objects) etc. used in making one. How communication between microservices takes place and how to handle a situation in which a service is down.

### Features of our webapp:

1. Core Services
  - a. Product Service: Responsible for product catalog.
  - b. Order Service: Responsible for placing orders, and discounts.
  - c. Payment Service: Responsible for processing payments.
2. Supporting Services
  - a. Gateway/Load Balancer/Reverse Proxy: For routing client-requests.
  - b. Service Registry: Services status and profiling.
3. Frontend Service
  - a. Angular WebApp: For to view and buy the products.

### Technologies used:

1. Frontend: Angular, Typescript, HTML, CSS
2. Backend: Java, Spring Boot
3. Testing: JUnits, Selenium

### Tools Used:

1. GitHub
2. Maven
3. SonarQube
4. Selenium

### IDEs:

1. IntelliJ
2. VS Code

## Project Demo

### Home Page:

A Microservices Shopping Site

HomeOrdersCart


Filters

Form

To

Filter by Price

The Black Google Tee




₹599.00

The Black Google Tee

Add to cartBuy now

Google Tee Green




₹899.00

100% cotton Google t-shirt

Add to cartBuy now

Google Twill Cap



₹299.00

Classic Google cap

Add to cartBuy now

Your cart is Empty.

©Nitin Kumar

### Cart Component:

A Microservices Shopping Site

HomeOrdersCart


Filters

Form

To

Filter by Price

The Black Google Tee




₹599.00

The Black Google Tee

Add to cartBuy now

Google Tee Green




₹899.00

100% cotton Google t-shirt

Add to cartBuy now

Google Twill Cap



₹299.00

Classic Google cap

Add to cartBuy now

Google Tee Green x 4 :  
₹3,596.00

Google Twill Cap x 2 :  
₹598.00

The Black Google Tee  
x 1 : ₹599.00

ClearOrder

Total: ₹4,793.00

©Nitin Kumar

### Order Confirmation:

A Microservices Shopping Site

HomeOrdersCart


Filters

Form

To

Filter by Price

The Black Google Tee




₹599.00

The Black Google Tee

Add to cartBuy now

Google Tee Green




₹899.00

100% cotton Google t-shirt

Add to cartBuy now

Google Twill Cap



₹299.00

Classic Google cap

Add to cartBuy now

Google Tee Green x 3 :  
₹2,697.00

The Black Google Tee  
x 2 : ₹1,198.00

Google Twill Cap x 2 :  
₹598.00

ClearOrder

Total: ₹4,493.00

Success!

You order has been placed successfully

Okay

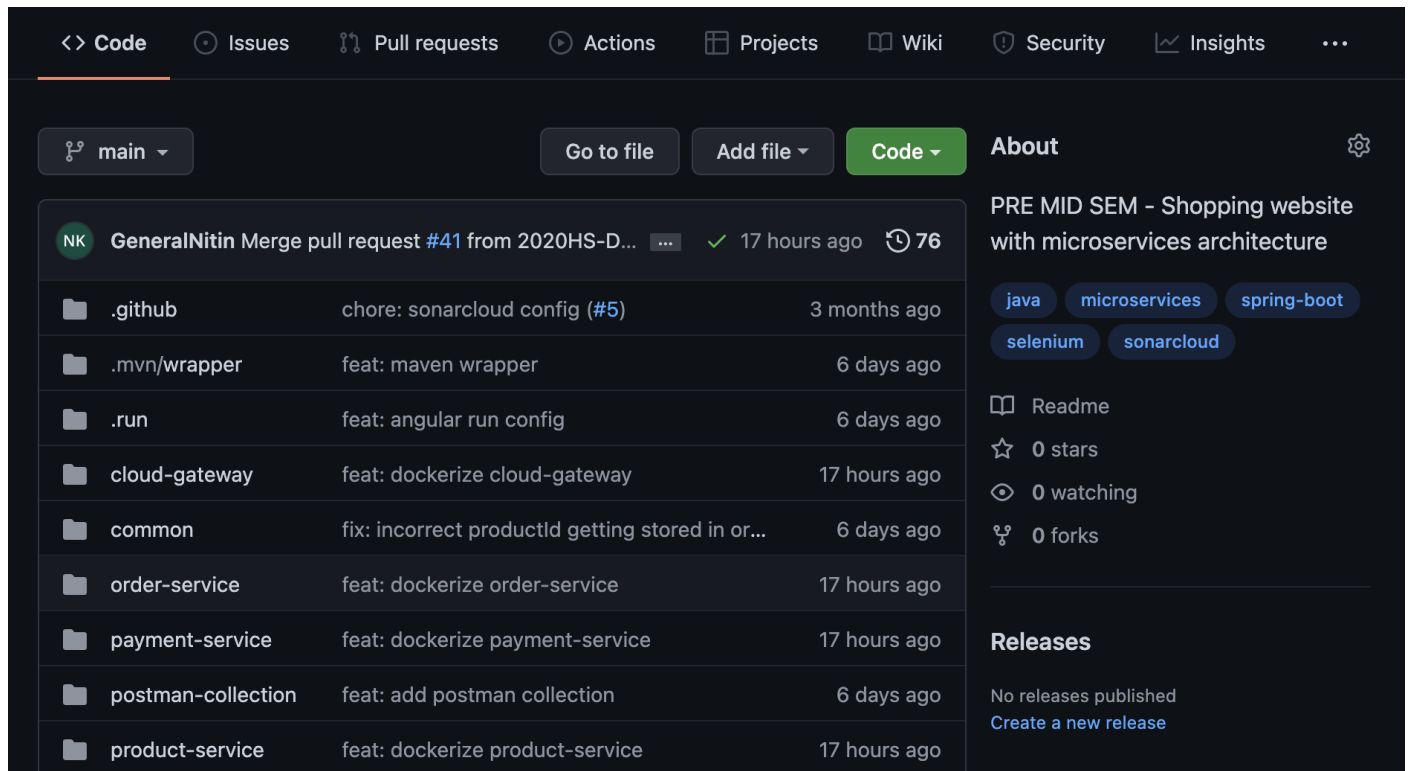
©Nitin Kumar

## Part – B (DevOps Tools and Practices)

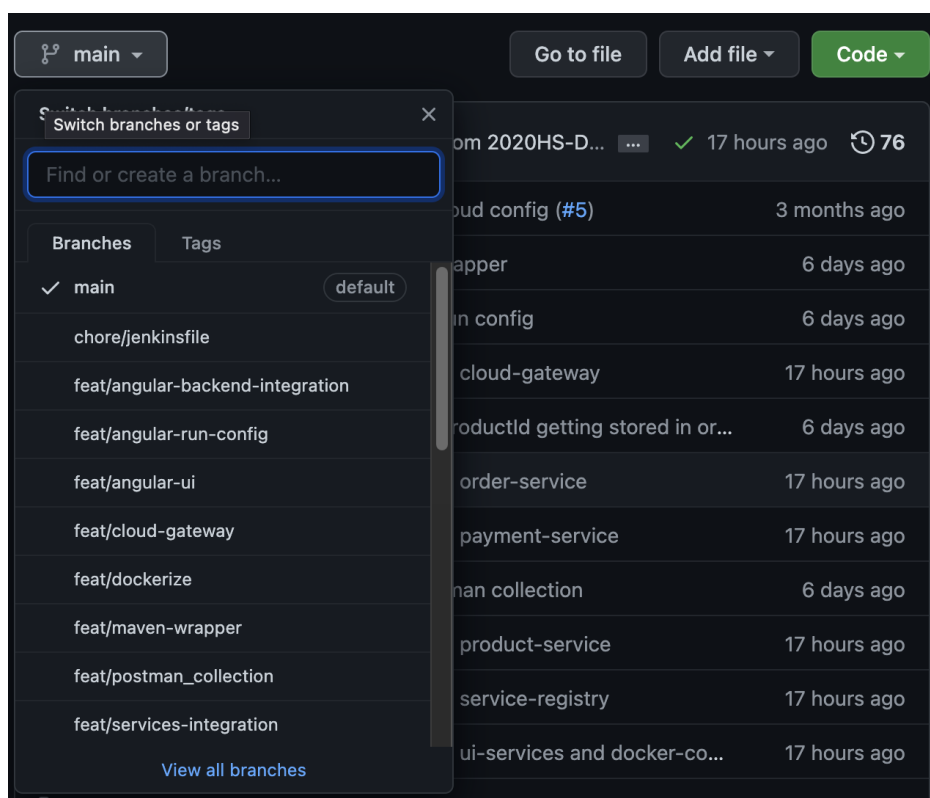
### Source Code Management:

1. Git and GitHub
2. Workflow: Feature Branch Workflow

Repository Link: <https://github.com/2020HS-DevOps-Group3/Shop-Microservices>



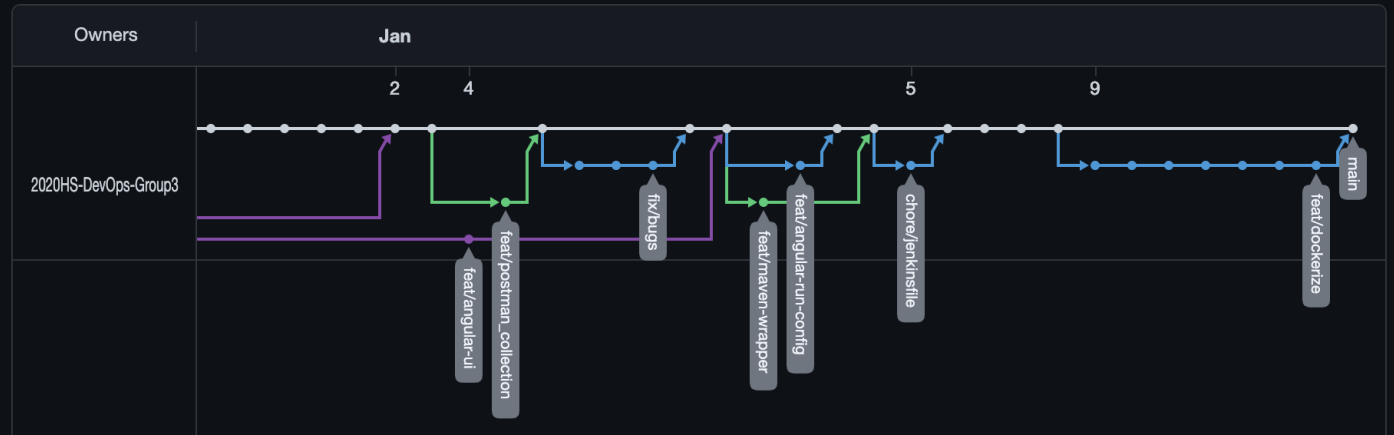
### Branches:



## Workflow:

### Network graph

Timeline of the most recent commits to this repository and its network ordered by most recently pushed to.



## Commits:

main

Commits on Jan 9, 2022

- Merge pull request #41 from 2020HS-DevOps-Group3/feat/dockerize Verified 67fe244
- GeneralNitin committed 17 hours ago ✓
- feat: dockerize ui-services and docker-compose addc7fb
- kumarniti4 committed 17 hours ago ✓
- feat: dockerize service-registry f134ea3
- kumarniti4 committed 17 hours ago
- feat: dockerize product-service f807e49
- kumarniti4 committed 17 hours ago
- feat: dockerize payment-service 61521b9
- kumarniti4 committed 17 hours ago
- feat: dockerize order-service 5d1deb6
- kumarniti4 committed 17 hours ago
- feat: dockerize cloud-gateway 1078991
- kumarniti4 committed 17 hours ago
- fix: could gateway build failure e1119a0
- kumarniti4 committed 18 hours ago ✓

Commits on Jan 5, 2022

- chore: update jenkinsfile Verified c99dd8c
- GeneralNitin committed 5 days ago ✓
- chore: update jenkinsfile Verified bb6c36f
- GeneralNitin committed 5 days ago ✓
- Update Jenkinsfile Verified c6309b6
- GeneralNitin committed 5 days ago ✗
- Merge pull request #40 from 2020HS-DevOps-Group3/chore/jenkinsfile Verified 9cf70ed
- GeneralNitin committed 5 days ago ✗

# Build Management with Maven

Maven use cases in the project.

1. Used Maven as the Build tool for the project
2. Maven helped us in making our build artifacts and managing dependencies.

Parent Pom.XML:

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://maven.apache.org/POM/4.0.0"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/xsd/maven-4.0.0.xsd">
  <modelVersion>4.0.0</modelVersion>

  <parent>
    <artifactId>spring-boot-starter-parent</artifactId>
    <groupId>org.springframework.boot</groupId>
    <version>2.5.5</version>
    <relativePath/>
  </parent>

  <groupId>org.devops</groupId>
  <artifactId>DevOps-Project</artifactId>
  <version>1.0-SNAPSHOT</version>
  <name>DevOps Project</name>
  <description>DevOps Assignment Project</description>
  <packaging>pom</packaging>

  <properties>
    <java.version>11</java.version>
    <maven.compiler.source>11</maven.compiler.source>
    <maven.compiler.target>11</maven.compiler.target>
    <sonar.organization>2020hs-devops-group3</sonar.organization>
    <sonar.host.url>https://sonarcloud.io</sonar.host.url>
  </properties>

  <modules>
    <module>order-service</module>
    <module>payment-service</module>
    <module>service-registry</module>
    <module>product-service</module>
    <module>cloud-gateway</module>
    <module>common</module>
  </modules>

  <dependencies>
    <dependency>
      <groupId>org.springframework.boot</groupId>
      <artifactId>spring-boot-starter-data-jpa</artifactId>
    </dependency>
    <dependency>
      <groupId>org.springframework.boot</groupId>
      <artifactId>spring-boot-starter-web</artifactId>
    </dependency>
    <dependency>
      <groupId>org.springframework.boot</groupId>
```

```

    <artifactId>spring-boot-starter-validation</artifactId>
</dependency>
<dependency>
    <groupId>org.modelmapper</groupId>
    <artifactId>modelmapper</artifactId>
    <version>2.4.5</version>
</dependency>
<dependency>
    <groupId>com.google.guava</groupId>
    <artifactId>guava</artifactId>
    <version>31.0.1-jre</version>
</dependency>
<dependency>
    <groupId>com.h2database</groupId>
    <artifactId>h2</artifactId>
    <scope>runtime</scope>
</dependency>
<dependency>
    <groupId>org.projectlombok</groupId>
    <artifactId>lombok</artifactId>
    <optional>true</optional>
</dependency>
<dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter</artifactId>
    <version>5.8.2</version>
    <scope>test</scope>
</dependency>
<dependency>
    <groupId>org.mockito</groupId>
    <artifactId>mockito-all</artifactId>
    <version>1.10.19</version>
    <scope>test</scope>
</dependency>
<dependency>
    <groupId>org.mockito</groupId>
    <artifactId>mockito-junit-jupiter</artifactId>
    <version>4.2.0</version>
    <scope>test</scope>
</dependency>
<dependency>
    <groupId>org.assertj</groupId>
    <artifactId>assertj-core</artifactId>
    <version>3.21.0</version>
    <scope>test</scope>
</dependency>
</dependencies>
</project>

```



## Build Tasks with Maven:

### Compilation using Maven (mvn compile):

```
[INFO] Copying 1 resource
[INFO] Copying 0 resource
[INFO]
[INFO] --- maven-compiler-plugin:3.8.1:compile (default-compile) @ cloud-gateway ---
[INFO] Nothing to compile - all classes are up to date
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] DevOps Project 1.0-SNAPSHOT ..... SUCCESS [ 0.002 s]
[INFO] common 0.0.1-SNAPSHOT ..... SUCCESS [ 1.327 s]
[INFO] order-service 0.0.1-SNAPSHOT ..... SUCCESS [ 1.116 s]
[INFO] payment-service 0.0.1-SNAPSHOT ..... SUCCESS [ 0.186 s]
[INFO] service-registry 0.0.1-SNAPSHOT ..... SUCCESS [ 0.147 s]
[INFO] product-service 0.0.1-SNAPSHOT ..... SUCCESS [ 0.109 s]
[INFO] cloud-gateway 0.0.1-SNAPSHOT ..... SUCCESS [ 0.455 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 3.690 s
[INFO] Finished at: 2022-01-10T16:28:30+05:30
[INFO] -----
I514807@C02FQ8NQMD6M DevOps-Project %
```

### Testing using Maven (mvn test):

```
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] DevOps Project 1.0-SNAPSHOT ..... SUCCESS [ 0.002 s]
[INFO] common 0.0.1-SNAPSHOT ..... SUCCESS [ 1.428 s]
[INFO] order-service 0.0.1-SNAPSHOT ..... SUCCESS [ 25.387 s]
[INFO] payment-service 0.0.1-SNAPSHOT ..... SUCCESS [ 16.691 s]
[INFO] service-registry 0.0.1-SNAPSHOT ..... SUCCESS [ 9.995 s]
[INFO] product-service 0.0.1-SNAPSHOT ..... SUCCESS [ 13.303 s]
[INFO] cloud-gateway 0.0.1-SNAPSHOT ..... SUCCESS [ 0.631 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:07 min
[INFO] Finished at: 2022-01-10T16:31:14+05:30
[INFO] -----
I514807@C02FQ8NQMD6M DevOps-Project %
```

### Packaging using Maven (mvn package):

```
[INFO] --- maven-jar-plugin:3.2.0:jar (default-jar) @ cloud-gateway ---
[INFO]
[INFO] --- spring-boot-maven-plugin:2.5.5:repackage (repackage) @ cloud-gateway ---
[INFO] Replacing main artifact with repackaged archive
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] DevOps Project 1.0-SNAPSHOT ..... SUCCESS [ 0.003 s]
[INFO] common 0.0.1-SNAPSHOT ..... SUCCESS [ 1.658 s]
[INFO] order-service 0.0.1-SNAPSHOT ..... SUCCESS [ 24.134 s]
[INFO] payment-service 0.0.1-SNAPSHOT ..... SUCCESS [ 13.334 s]
[INFO] service-registry 0.0.1-SNAPSHOT ..... SUCCESS [ 9.819 s]
[INFO] product-service 0.0.1-SNAPSHOT ..... SUCCESS [ 13.351 s]
[INFO] cloud-gateway 0.0.1-SNAPSHOT ..... SUCCESS [ 0.679 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:03 min
[INFO] Finished at: 2022-01-10T16:33:52+05:30
[INFO] -----
I514807@C02FQ8NQMD6M DevOps-Project %
```

## Installing in local .m2 repository using Maven (mvn install):

```
[INFO] --- maven-install-plugin:2.5.2:install (default-install) @ cloud-gateway ---
[INFO] Installing /Users/I514807/LocalDiskC/BITS/DevOps/Assignment/DevOps-Project/cloud-gateway/target/cloud-gateway-0.0.1-SNAPSHOT/cloud-gateway-0.0.1-SNAPSHOT.jar
[INFO] Installing /Users/I514807/LocalDiskC/BITS/DevOps/Assignment/DevOps-Project/cloud-gateway/pom.xml to /Users/I514807/.m2/repository/org/devops/cloud-gateway-0.0.1-SNAPSHOT.pom
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] DevOps Project 1.0-SNAPSHOT ..... SUCCESS [ 13.333 s]
[INFO] common 0.0.1-SNAPSHOT ..... SUCCESS [ 1.499 s]
[INFO] order-service 0.0.1-SNAPSHOT ..... SUCCESS [ 24.799 s]
[INFO] payment-service 0.0.1-SNAPSHOT ..... SUCCESS [ 15.104 s]
[INFO] service-registry 0.0.1-SNAPSHOT ..... SUCCESS [ 10.723 s]
[INFO] product-service 0.0.1-SNAPSHOT ..... SUCCESS [ 14.674 s]
[INFO] cloud-gateway 0.0.1-SNAPSHOT ..... SUCCESS [ 1.210 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:21 min
[INFO] Finished at: 2022-01-10T16:36:48+05:30
[INFO] -----
I514807@C02FQ8NQMD6M DevOps-Project %
```

## Clean up using Maven (mvn clean):

```
[INFO] -----< org.devops:cloud-gateway >-----
[INFO] Building cloud-gateway 0.0.1-SNAPSHOT [7/7]
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- maven-clean-plugin:3.1.0:clean (default-clean) @ cloud-gateway ---
[INFO] Deleting /Users/I514807/LocalDiskC/BITS/DevOps/Assignment/DevOps-Project/cloud-gateway/target
[INFO] -----
[INFO] Reactor Summary:
[INFO]
[INFO] DevOps Project 1.0-SNAPSHOT ..... SUCCESS [ 0.255 s]
[INFO] common 0.0.1-SNAPSHOT ..... SUCCESS [ 0.055 s]
[INFO] order-service 0.0.1-SNAPSHOT ..... SUCCESS [ 0.160 s]
[INFO] payment-service 0.0.1-SNAPSHOT ..... SUCCESS [ 0.096 s]
[INFO] service-registry 0.0.1-SNAPSHOT ..... SUCCESS [ 0.056 s]
[INFO] product-service 0.0.1-SNAPSHOT ..... SUCCESS [ 0.093 s]
[INFO] cloud-gateway 0.0.1-SNAPSHOT ..... SUCCESS [ 0.041 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 1.190 s
[INFO] Finished at: 2022-01-10T16:38:20+05:30
[INFO] -----
I514807@C02FQ8NQMD6M DevOps-Project %
```

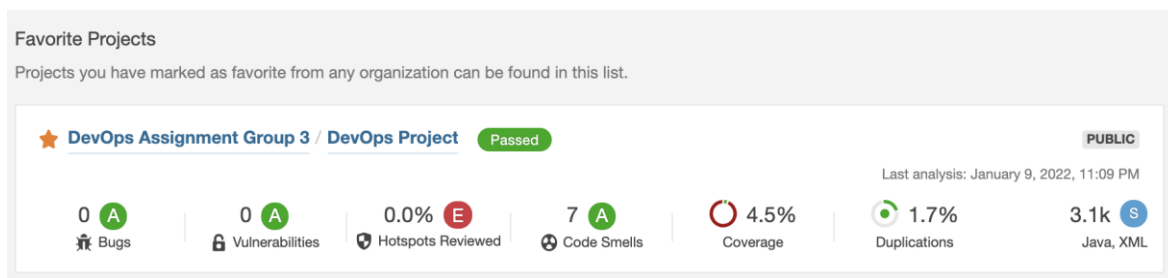
## Code Quality Management using SonarQube

SonarQube is an open-source platform for continuous inspection of code quality to perform automatic reviews with static analysis of code to detect bugs, code smells, and security vulnerabilities on many programming languages.

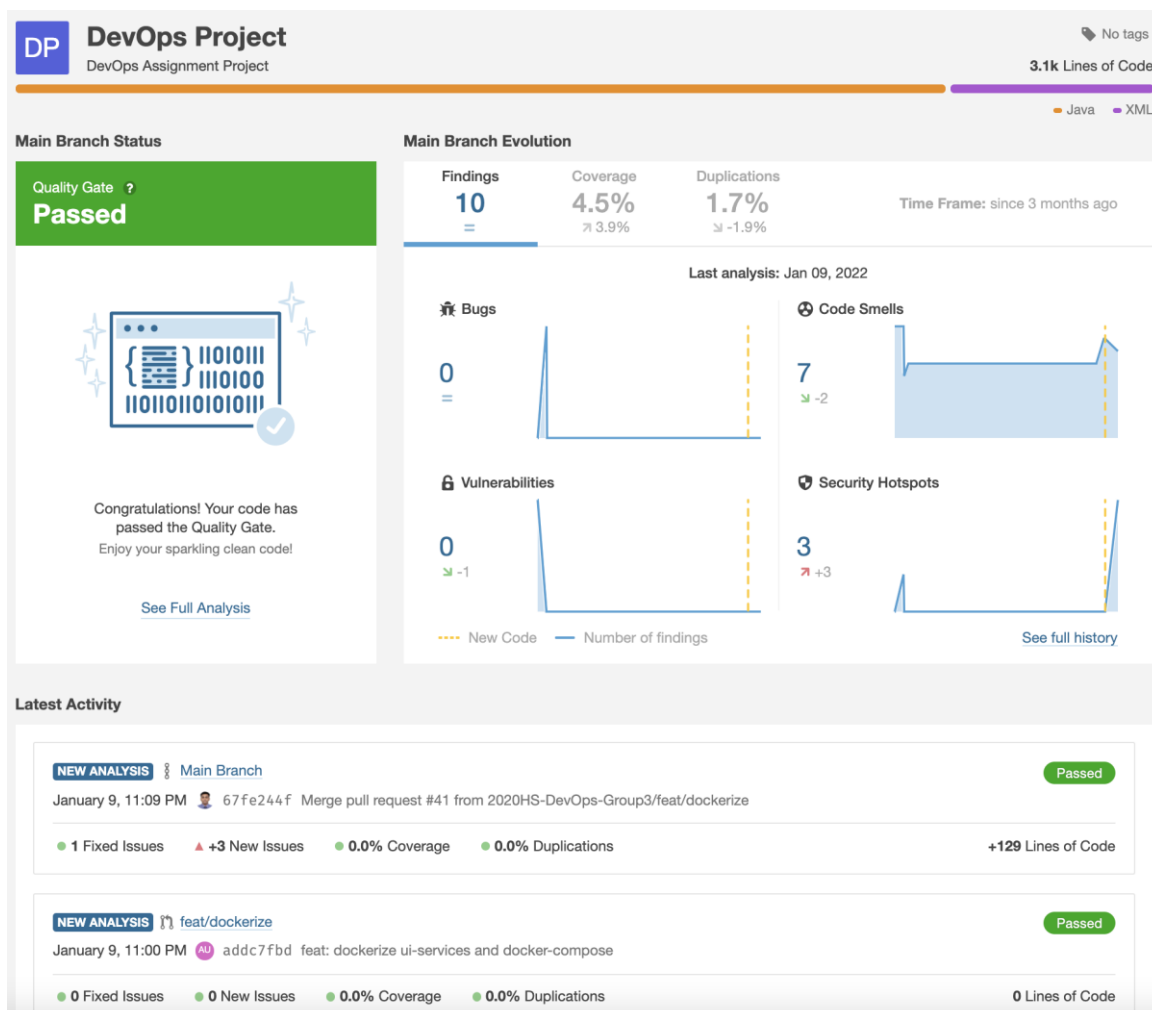
We configured and integrated SonarQube with our project, using the free cloud offering of SonarQube called SonarCloud.

Link: [https://sonarcloud.io/project/overview?id=2020HS-DevOps-Group3\\_DevOps-Project](https://sonarcloud.io/project/overview?id=2020HS-DevOps-Group3_DevOps-Project)

Project Status:



SonarCloud Home Page:



Code Smells:

Filters

Type

Bug0

Vulnerability0

Code Smell7

Severity

Blocker0

Minor4

Critical0

Info1

Major2

Resolution

Status

Security Category

Creation Date

Language

Rule

Tag

Directory

File

Assignee

Author

Bulk Change

↑ ↓ to select issues ← → to navigate ↺ 1 / 7 issues 1h 15min effort

order-service/.../com/devops/orderservice/config/ExceptionsHandler.java

1 duplicated blocks of code must be removed. Why is this an issue?

Code Smell Minor Open Nitin Kumar 20min effort Comment

3 months ago L32 No tags

order-service/.../com/devops/orderservice/entity/Orders.java

This block of commented-out lines of code should be removed. Why is this an issue?

Code Smell Minor Open Nitin Kumar 5min effort Comment

3 months ago L32 No tags

order-service/.../devops/orderservice/service/OrderService.java

Complete the task associated to this TODO comment. Why is this an issue?

Code Smell Info Open Nitin Kumar 0min effort Comment

3 months ago L42 No tags

This block of commented-out lines of code should be removed. Why is this an issue?

Code Smell Major Open Nitin Kumar 5min effort Comment

6 days ago L44 No tags

This block of commented-out lines of code should be removed. Why is this an issue?

Code Smell Major Open Nitin Kumar 5min effort Comment

6 days ago L47 No tags

payment-service/.../devops/paymentservice/config/ExceptionsHandler.java

1 duplicated blocks of code must be removed. Why is this an issue?

Code Smell Minor Open Nitin Kumar 20min effort Comment

3 months ago No tags

product-service/.../devops/productservice/config/ExceptionsHandler.java

1 duplicated blocks of code must be removed. Why is this an issue?

Code Smell Minor Open Nitin Kumar 20min effort Comment

3 months ago No tags

7 of 7 shown

Coverage:

DevOps Assignment Group 3 / DevOps Project / main

Summary Issues Security Hotspots Measures Code Activity

Search for files...

↑ ↓ to select files ← → to navigate

	Lines of Code	Bugs	Vulnerabilities	Code Smells	Security Hotspots	Coverage	Duplications
DevOps Project							
cloud-gateway	128	0	0	0	3	100.0%	0.0%
common	1,929	0	0	0	0	100.0%	0.0%
order-service	344	0	0	5	0	91.5%	4.7%
payment-service	235	0	0	1	0	70.4%	7.4%
product-service	272	0	0	1	0	81.4%	6.4%
service-registry	87	0	0	0	0	83.3%	0.0%
pom.xml	109	0	0	0	0	—	0.0%

7 of 7 shown

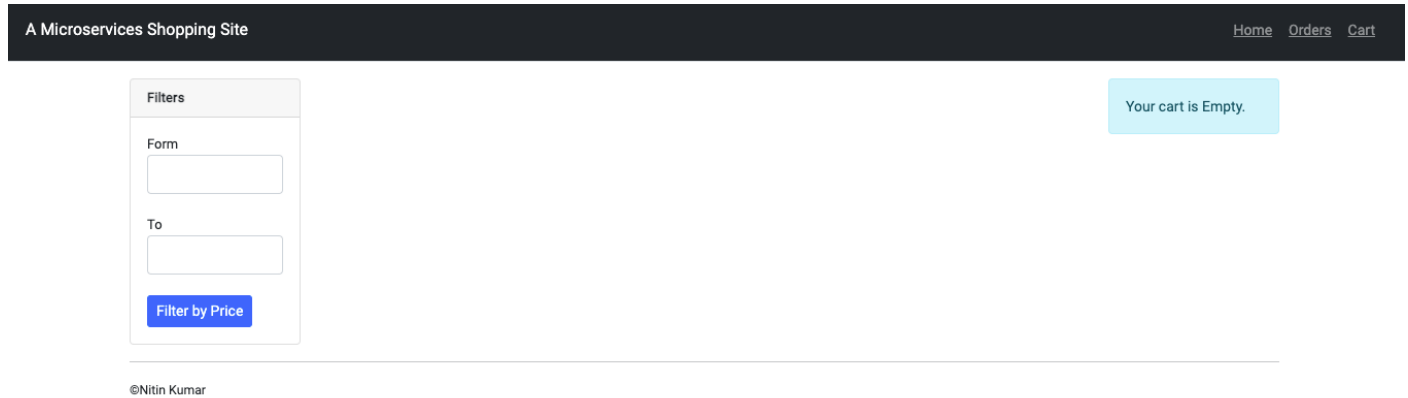
12

## Automation Testing with Selenium

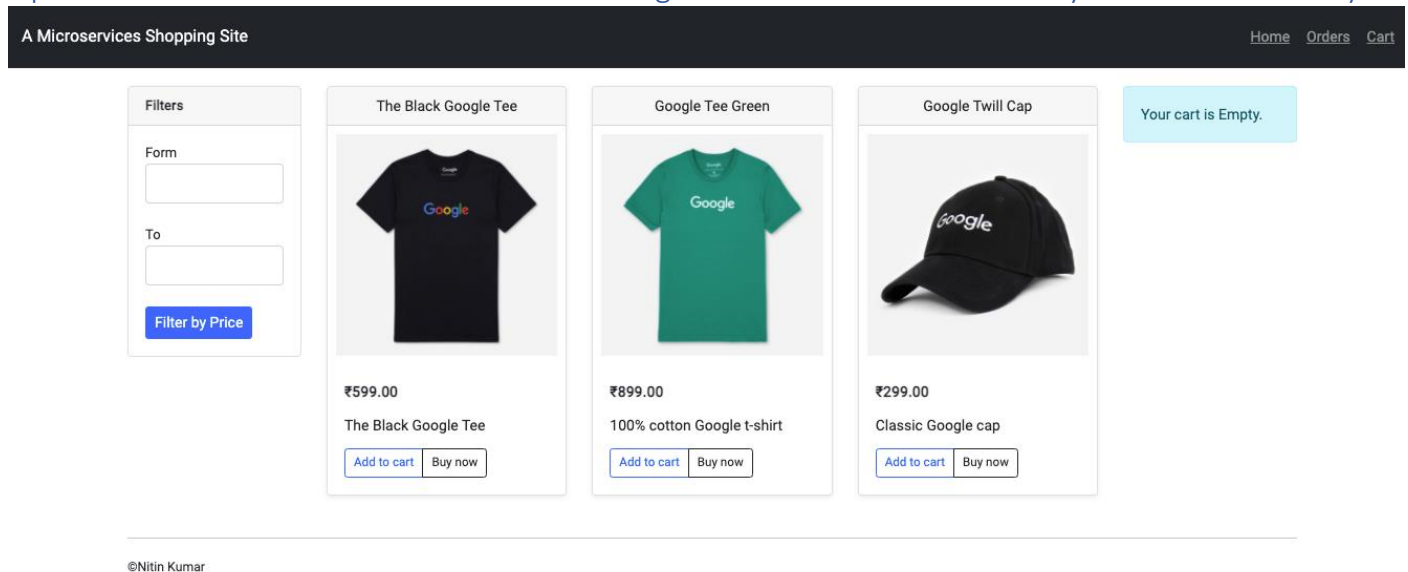
Selenium is an open-source project with wide range of tools and libraries with a aim to support web browser automation. Selenium provides a tool for writing functional tests without the need to learn a test scripting language.

Repository Link: <https://github.com/2020HS-DevOps-Group3/SeleniumTests>

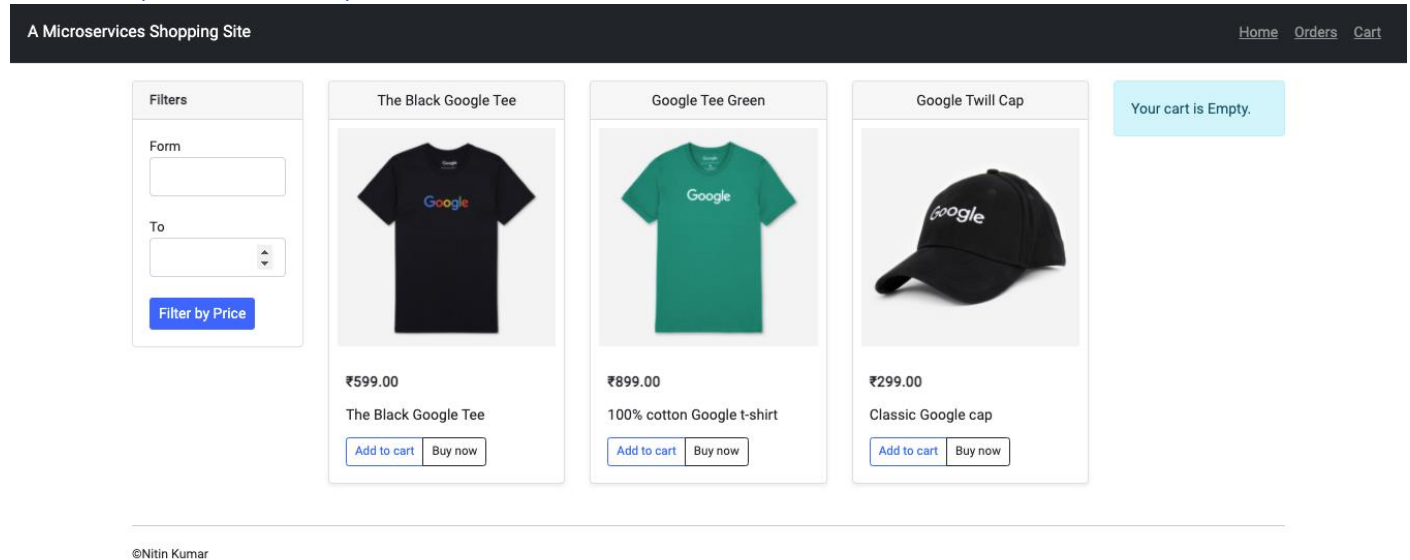
### Open Website Test: Initially



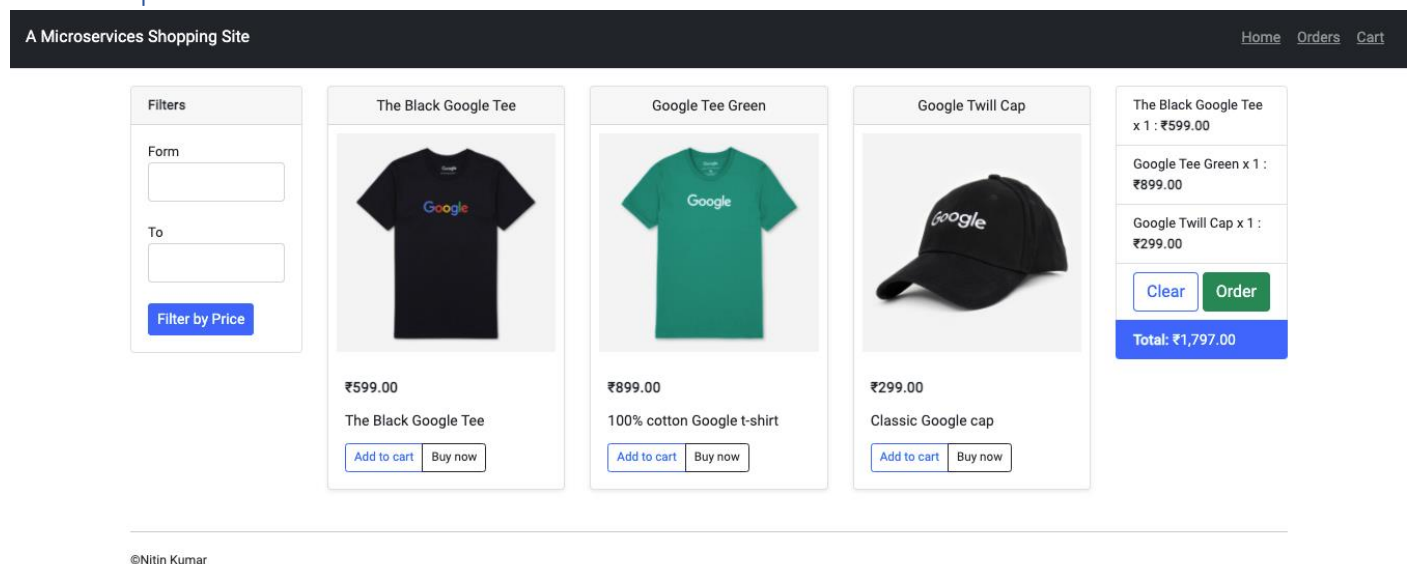
### Open Website Test: When backend services registered with Eureka Discovery and Cloud Gateway



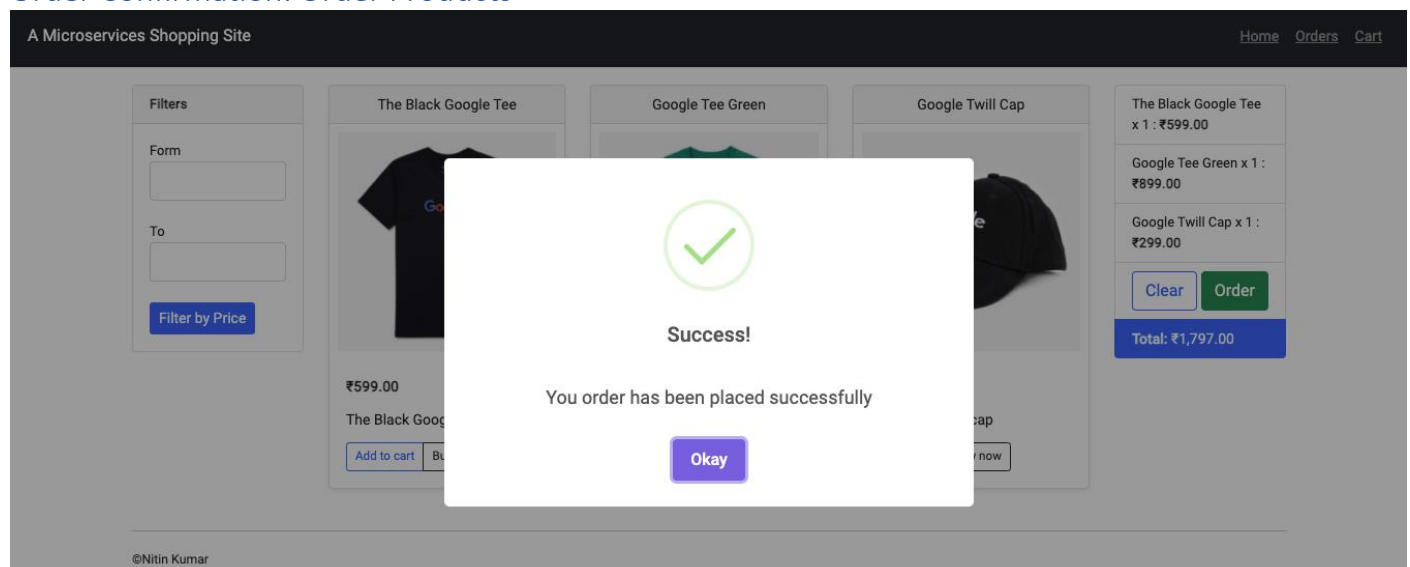
## Cart Component: Initially



## Cart Component: Add to Cart



## Order Confirmation: Order Products



## Test Results:

```
PASSED: LaunchSiteTest
        Launch The Site
PASSED: ClearCartTest
        Clear The Cart
PASSED: AddToCartTest
        Add Products To The Cart
PASSED: OrderProductsTest
        Order Products Test

=====
      Default test
      Tests run: 4, Failures: 0, Skips: 0
=====

=====
Default suite
Total tests run: 4, Passes: 4, Failure: 0, Skips: 0
=====
```