Birla Institute of Technology and Science, Pilani

INTRODUCTION TO DEVOPS

Assignment – Part A

Group No - 3

Topic: DevOps Project

No.	Team Members	Roll No
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3		
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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:

Cart Component:

Order Confirmation:

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
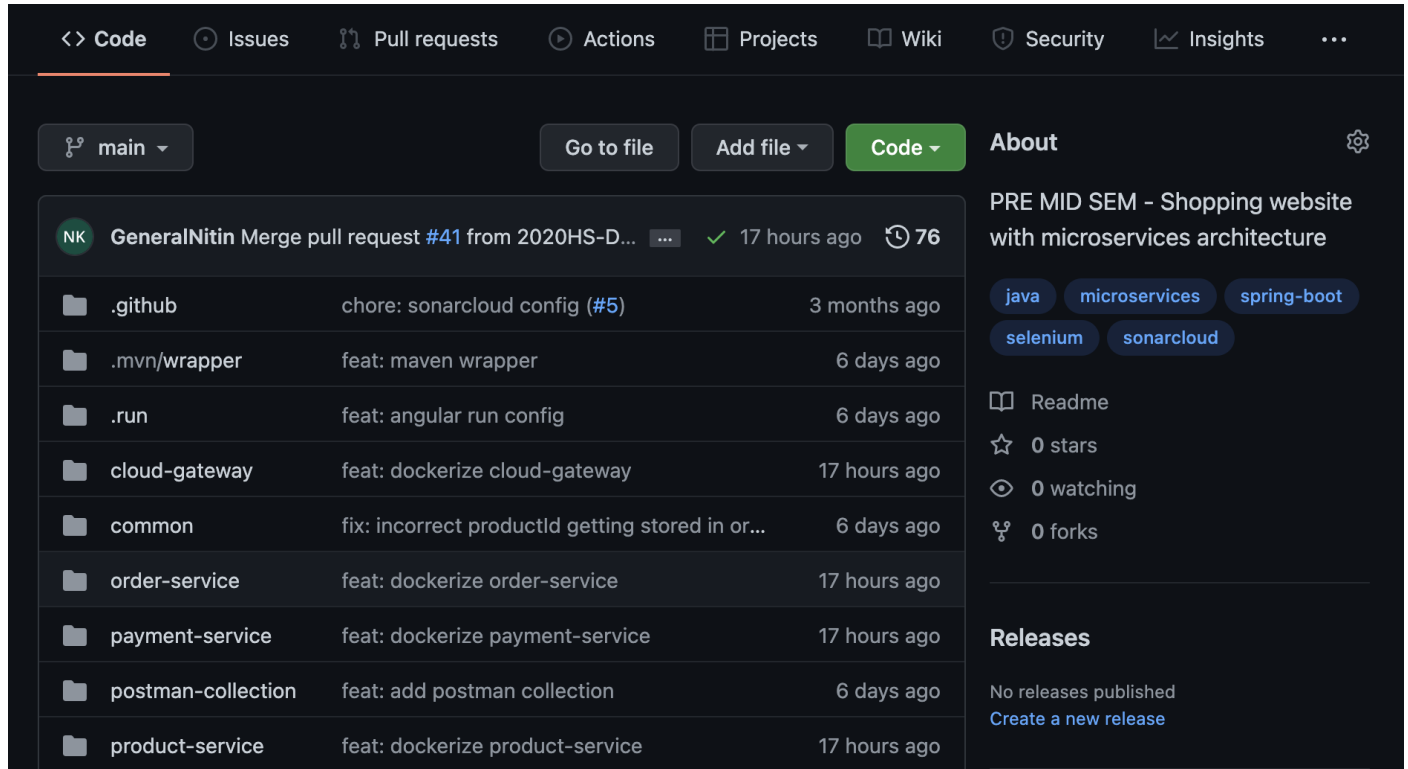
Branches:
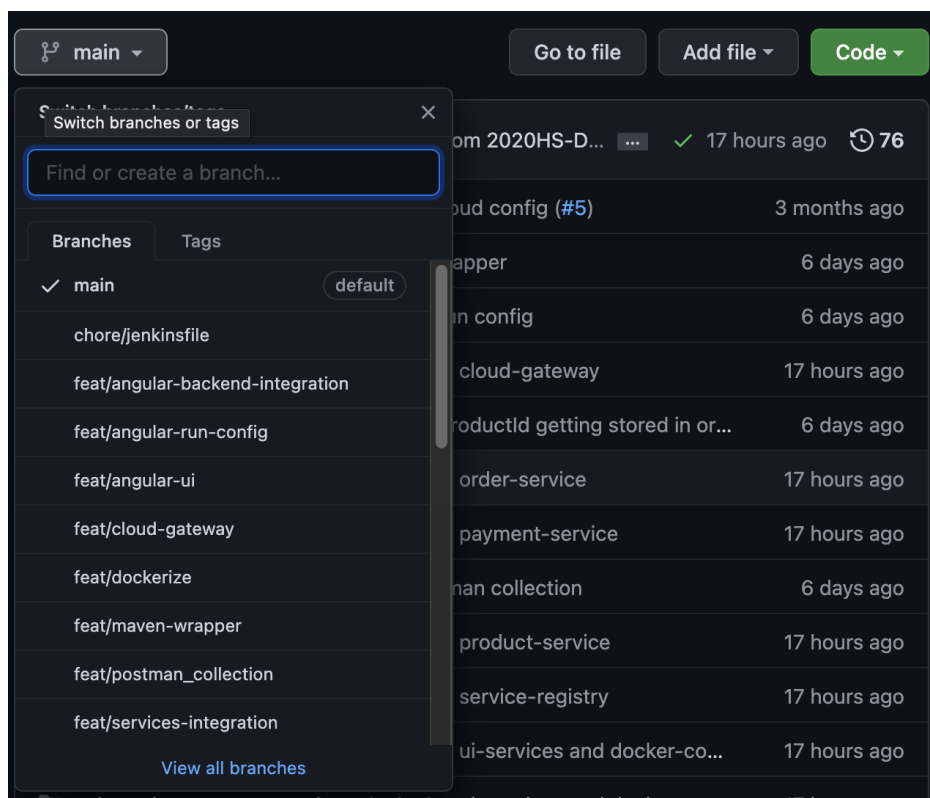
Workflow:

Network graph

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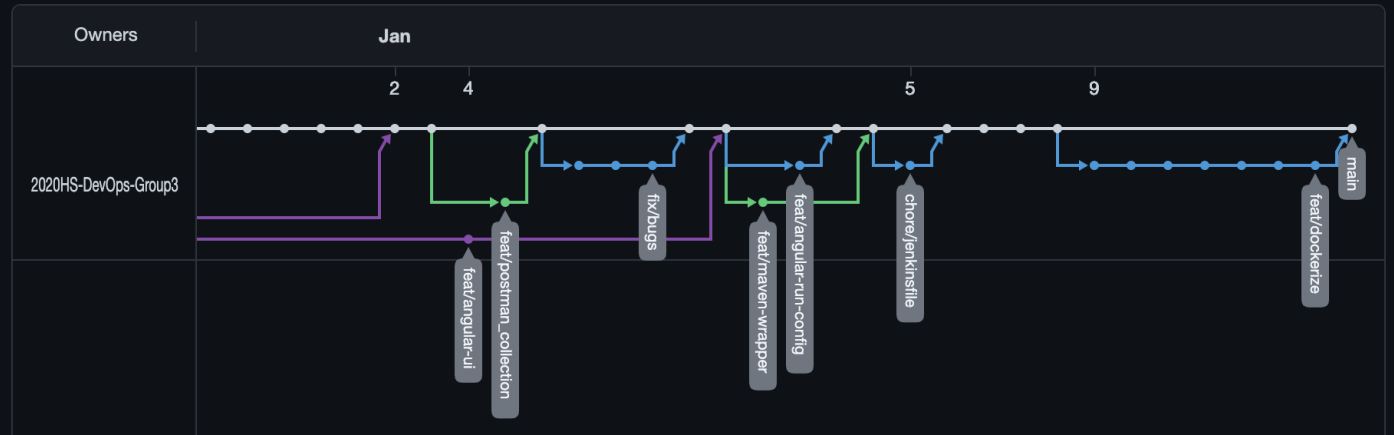
Commits:

🔀 main ▾

Commits on Jan 9, 2022

Merge pull request #41 **from 2020HS-DevOps-Group3/feat/dockerize** ⋯
NK **GeneralNitin** committed 17 hours ago ✓   Verified   67fe244 <>

feat: dockerize ui-services and docker-compose
NK **kumarniti4** committed 17 hours ago ✓   addc7fb <>

feat: dockerize service-registry
NK **kumarniti4** committed 17 hours ago   f134ea3 <>

feat: dockerize product-service
NK **kumarniti4** committed 17 hours ago   f807e49 <>

feat: dockerize payment-service
NK **kumarniti4** committed 17 hours ago   61521b9 <>

feat: dockerize order-service
NK **kumarniti4** committed 17 hours ago   5d1deb6 <>

feat: dockerize cloud-gateway
NK **kumarniti4** committed 17 hours ago   1078991 <>

fix: could gateway build failure
NK **kumarniti4** committed 18 hours ago ✓   e1119a0 <>

Commits on Jan 5, 2022

chore: update jenkinsfile
NK **GeneralNitin** committed 5 days ago ✓   Verified   c99dd8c <>

chore: update jenkinsfile
NK **GeneralNitin** committed 5 days ago ✓   Verified   bb6c36f <>

Update Jenkinsfile
NK **GeneralNitin** committed 5 days ago ✗   Verified   c6309b6 <>

Merge pull request #40 **from 2020HS-DevOps-Group3/chore/jenkinsfile** ⋯
NK **GeneralNitin** committed 5 days ago ✗   Verified   9cf70ed <>

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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
<?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>
```

```xml
            <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 complie):

```
[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/c
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
eway-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 %
```
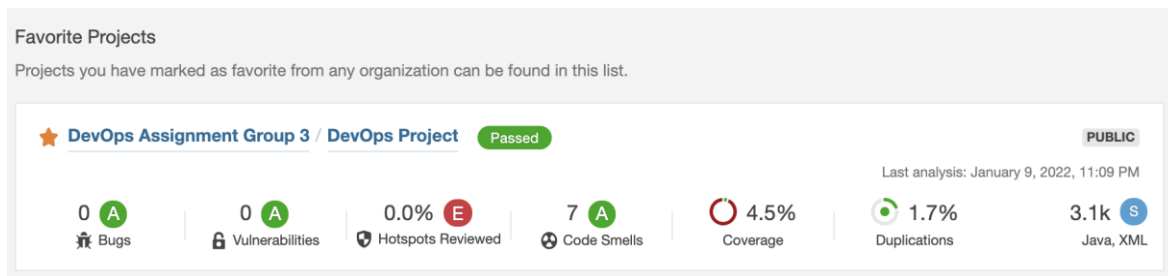
Code Quality Management using SonarQube

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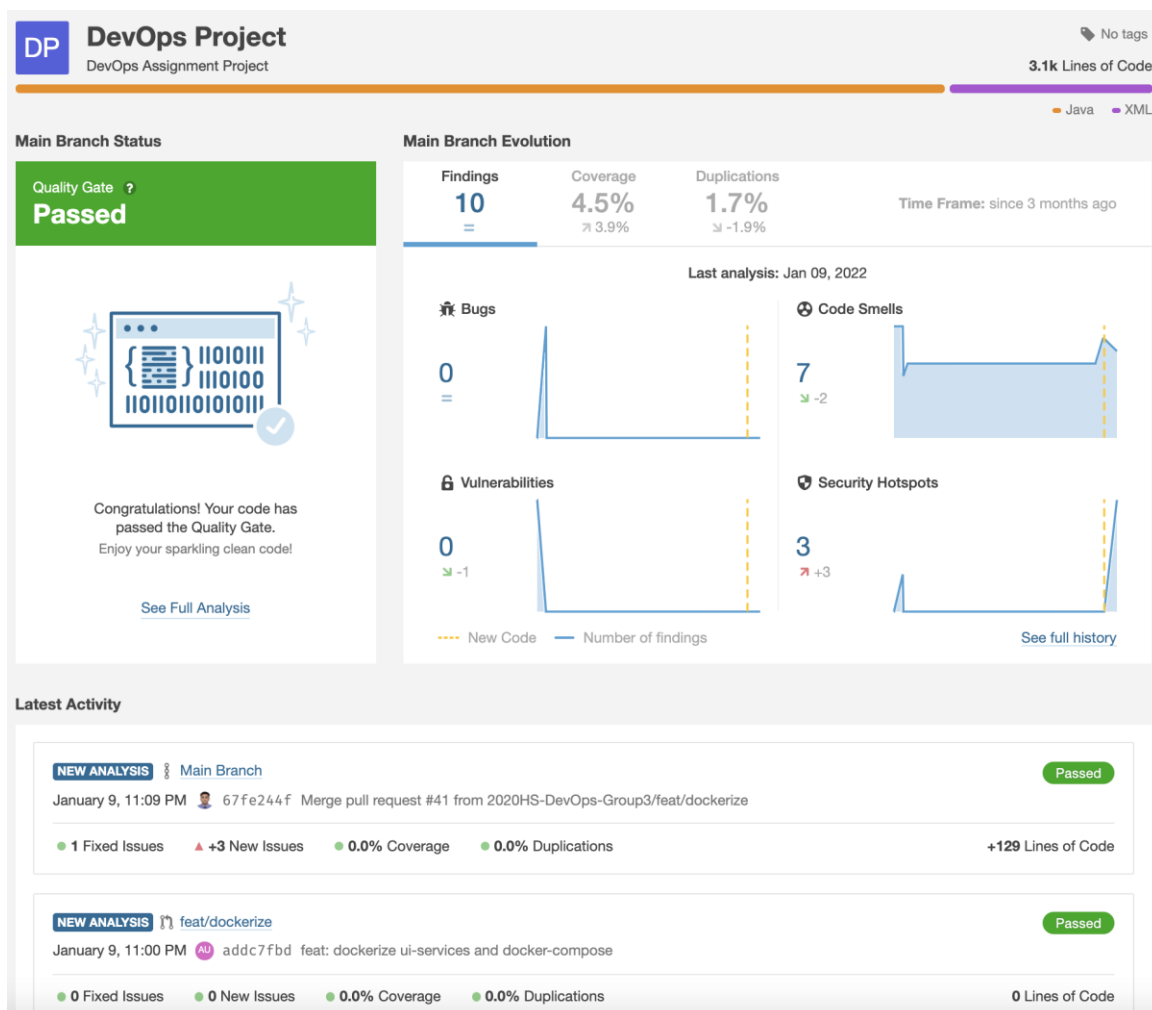
We configured and integrated SonarQube with our project, using the free cloud offering of SonarQube called SonarCloud.

Link: https://sonarcloud.io/project/overview?id=2020HS-DevOps-Group3_DevOps-Project

Project Status:

SonarCloud Home Page:

Code Smells:

Coverage:

Automation Testing with Selenium

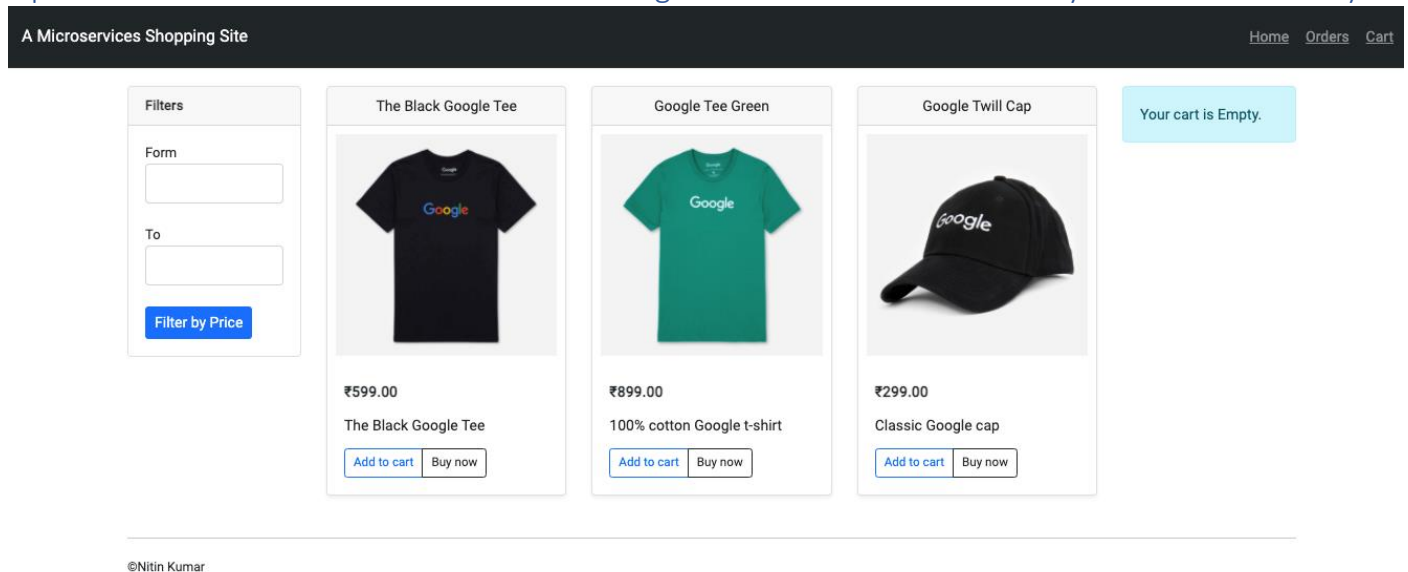Selenium is an open-source project with wide range of tools and libraries with a aim to support web browser automation. Selenium provides a tool for writing functional tests without the need to learn a test scripting language.
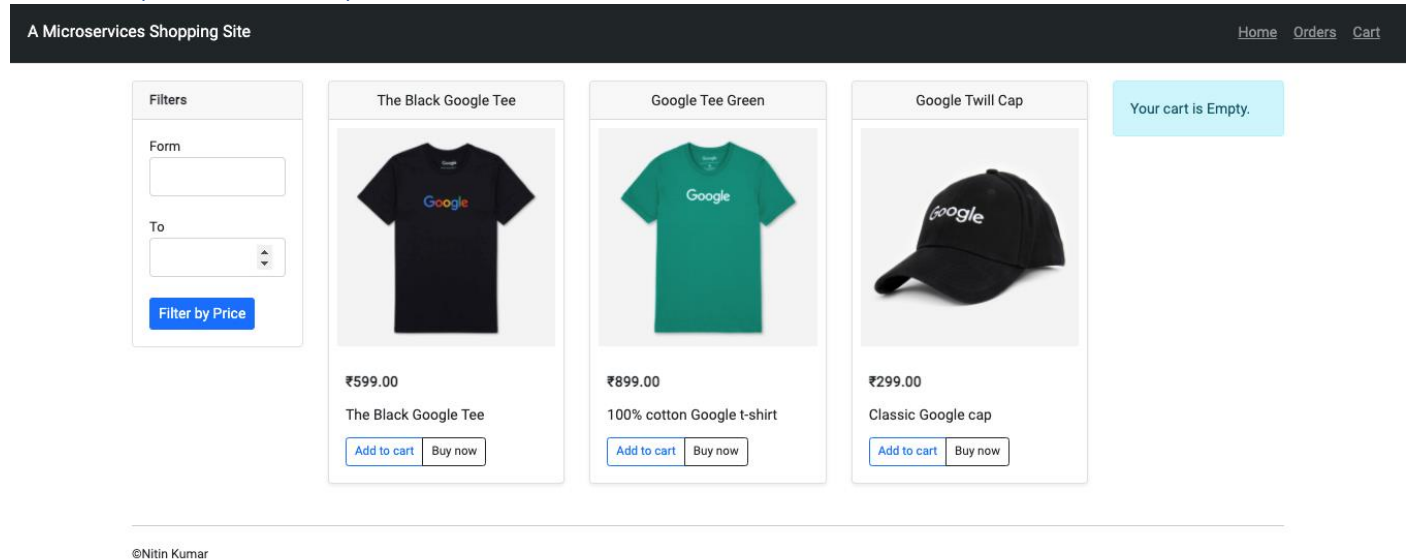
Repository Link: https://github.com/2020HS-DevOps-Group3/SeleniumTests
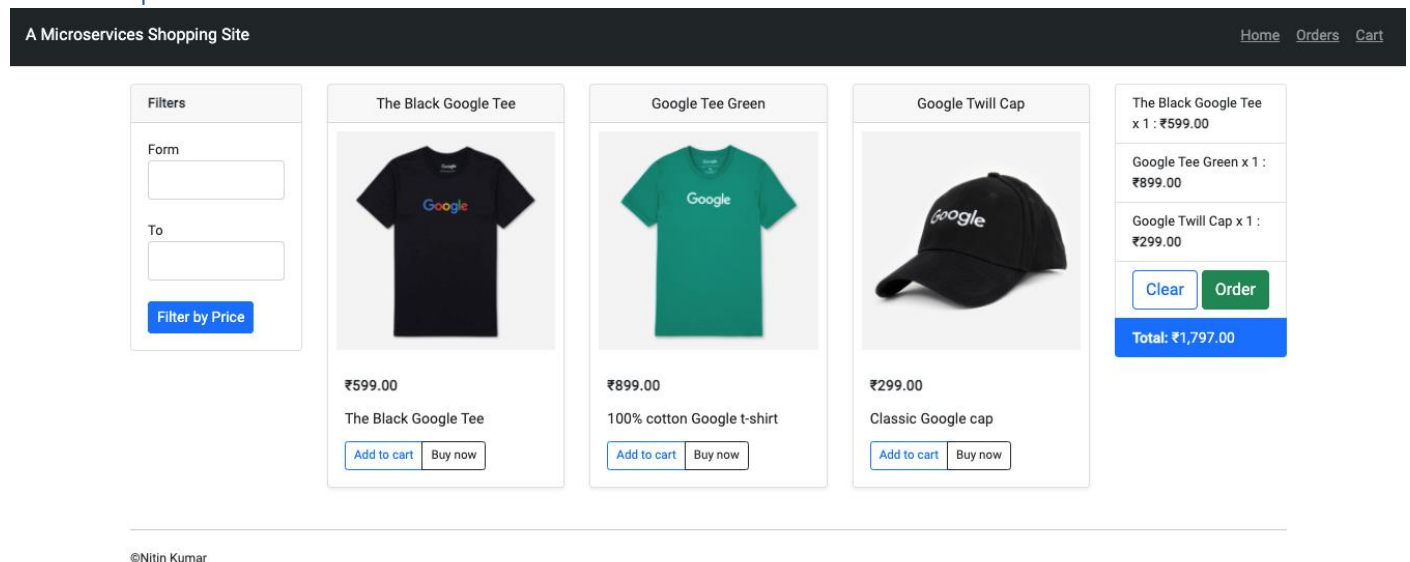
Open Website Test: Initially
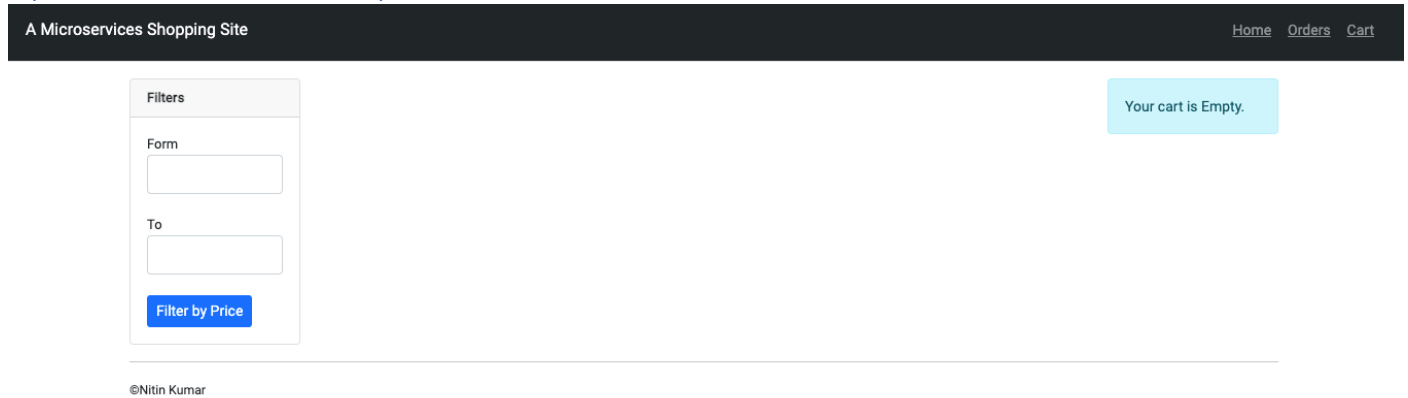
Open Website Test: When backend services registered with Eureka Discovery and Cloud Gateway

Cart Component: Initially

A Microservices Shopping Site   Home   Orders   Cart

| Filters | | | |
Form
[   ]
To
[⇕]
Filter by Price

The Black Google Tee

₹599.00

The Black Google Tee

Add to cart   Buy now

Google Tee Green

₹899.00

100% cotton Google t-shirt

Add to cart   Buy now

Google Twill Cap

₹299.00

Classic Google cap

Add to cart   Buy now

Your cart is Empty.

©Nitin Kumar

Cart Component: Add to Cart

A Microservices Shopping Site   Home   Orders   Cart

| Filters | | | |
Form
[   ]
To
[   ]
Filter by Price

The Black Google Tee

₹599.00

The Black Google Tee

Add to cart   Buy now

Google Tee Green

₹899.00

100% cotton Google t-shirt

Add to cart   Buy now

Google Twill Cap

₹299.00

Classic Google cap

Add to cart   Buy now

The Black Google Tee
x 1 : ₹599.00

Google Tee Green x 1 :
₹899.00

Google Twill Cap x 1 :
₹299.00

Clear   **Order**

Total: ₹1,797.00

©Nitin Kumar

Order Confirmation: Order Products

A Microservices Shopping Site   Home   Orders   Cart

| Filters | | | |
Form
[   ]
To
[   ]
Filter by Price

The Black Google Tee

Google Tee Green

Google Twill Cap

₹599.00

The Black Goog...

Add to cart

✓

Success!

You order has been placed successfully

Okay

The Black Google Tee
x 1 : ₹599.00

Google Tee Green x 1 :
₹899.00

Google Twill Cap x 1 :
₹299.00

Clear   **Order**

Total: ₹1,797.00

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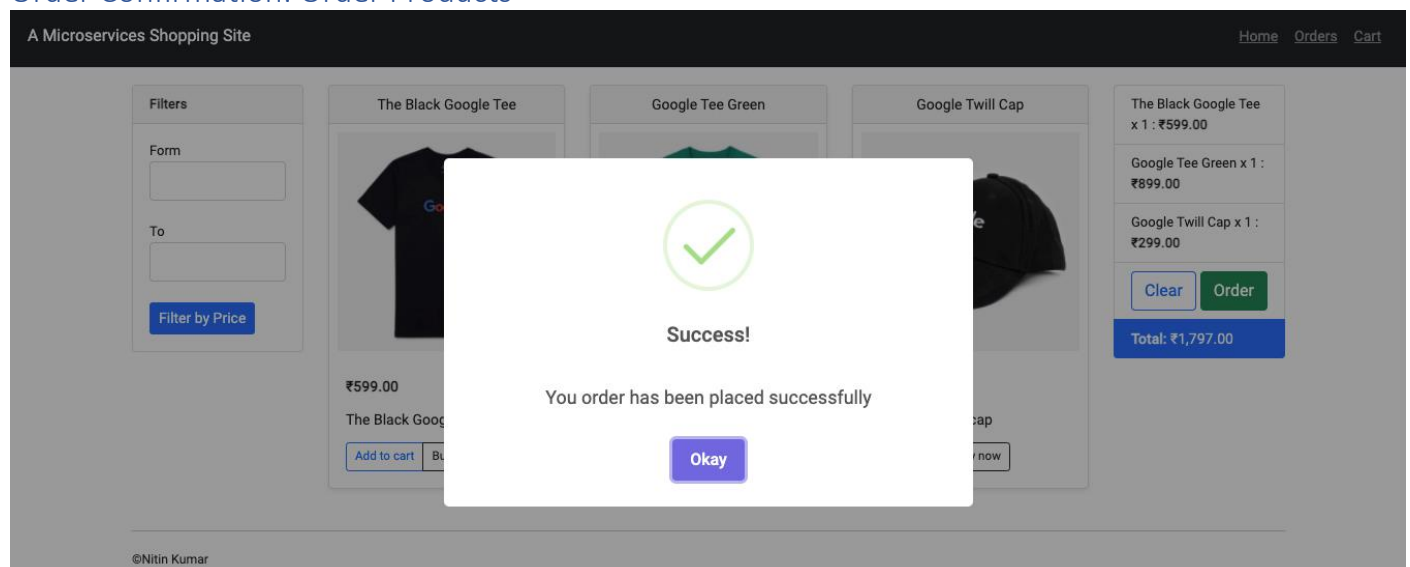
Test Results:

```
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
===============================================
```