

Spring Boot Microservices API Test using Junit-Mockito-DataJpaTest

Spring Boot provides several utilities and annotations to test Spring boot applications. The Spring Boot starter: **spring-boot-starter-test** provides the following libraries in the test scope.

- [JUnit](#) — The de-facto standard for unit testing Java applications.
- [Spring Test](#) & Spring Boot Test — Utilities and integration test support for Spring Boot applications.
- [AssertJ](#) — A fluent assertion library.
- [Hamcrest](#) — A library of matcher objects (also known as constraints or predicates).
- [Mockito](#) — A Java mocking framework.
- [JSONassert](#) — An assertion library for JSON.
- [JsonPath](#) — XPath for JSON.

In this lab, We will review the following code examples from the author MyKong, the founder of mykong.com, and test them using maven.

Example Projects and their Sources

1. Spring Boot + Junit 5 + Mockito

C:\apitestlabs\testing-junit5-mockito

Source: <https://mkyong.com/spring-boot/spring-boot-junit-5-mockito/>

2. Testing Spring Data with @DataJpaTest

C:\apitestlabs\spring-data-jpa-test

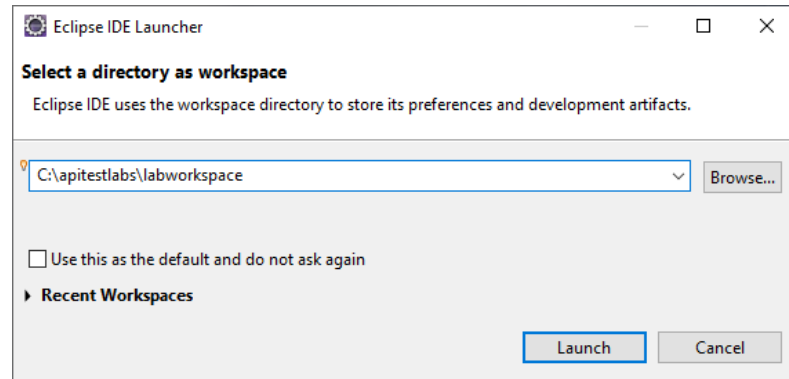
Source: <https://mkyong.com/spring-boot/testing-spring-data-jpa-with-datajpatest/>

Windows (C:) > apitestlabs > testing-junit5-mockito	
Name	Type
src	File folder
pom	Microsoft Edge H...
README.md	MD File

Windows (C:) > apitestlabs > spring-data-jpa-test >	
Name	Type
src	File folder
mvnw	File
mvnw	Windows Command ...
pom	Microsoft Edge HTML...
README.md	MD File

Part 1- Spring Boot + Junit 5 + Mockito Test

1. Start your eclipse and go to your lab workspace: **C:\apitestlabs\labworkspace**



2. Let us import the customer service project. In Eclipse,

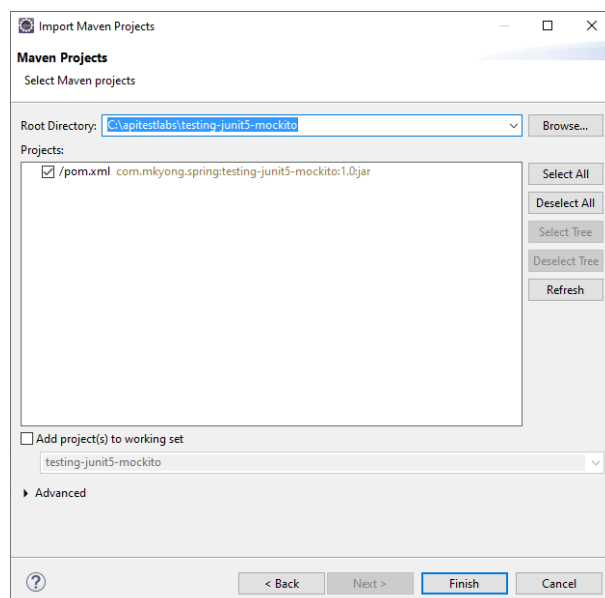
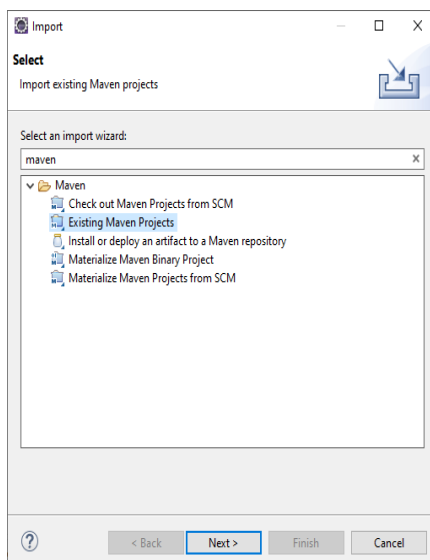
Click on **File → Import → Maven → Existing maven projects**

Click on **Next**.

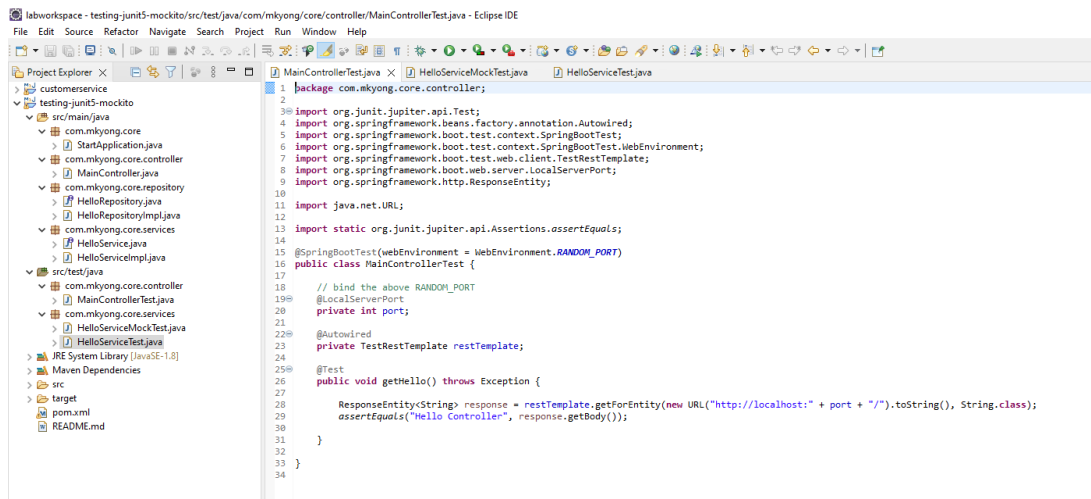
Navigate to **C:\apitestlabs\testing-junit5-mockit**

Select this project.

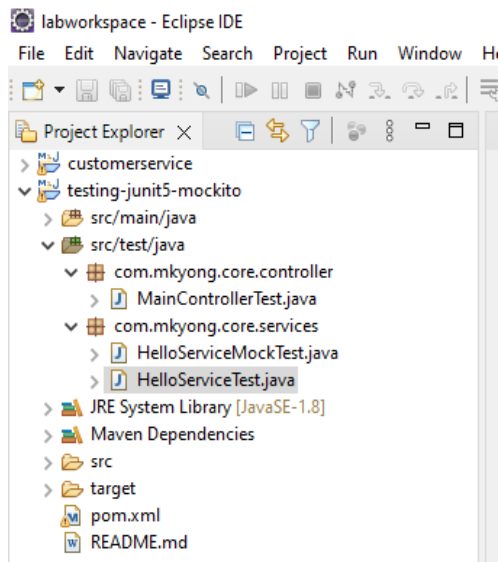
Click on **Finish**.



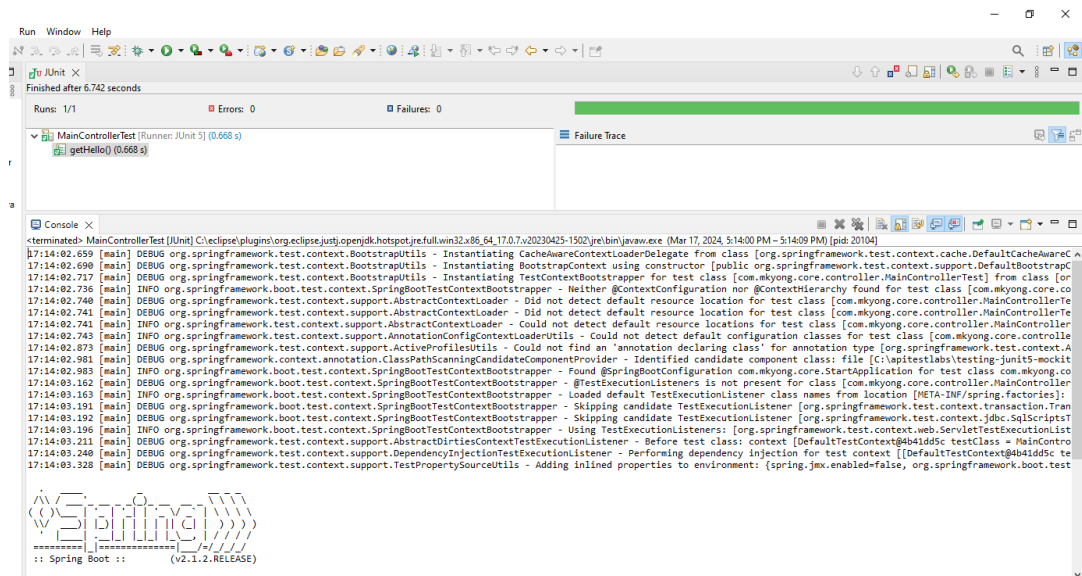
3. In Eclipse Project Explorer view, Select the project → right click on **testing-junit5-mockito** project → Maven → Update Project
4. In Project Explorer view, Expand the project **src/main/java** to review the application components code and review the test code files in **src/test/java**.



5. Review the Test code all test files:
 - a. MainControllerTest.java
 - b. HelloServiceMockTest.java
 - c. HelloServiceTest.java



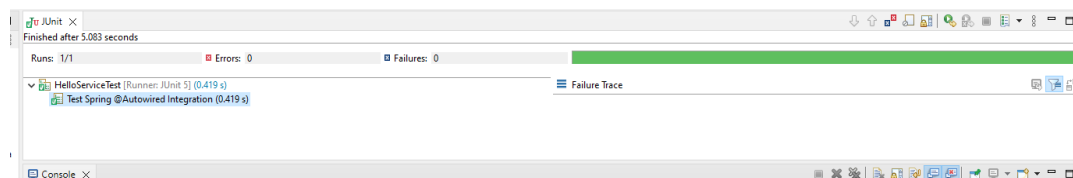
6. We can run each test one by one OR Select the project run Junit tests.
Select the test **MainControllerTest.java** → right click → **Run As** → **JUnit Test**.



Review the JUnit view and Console view messages.

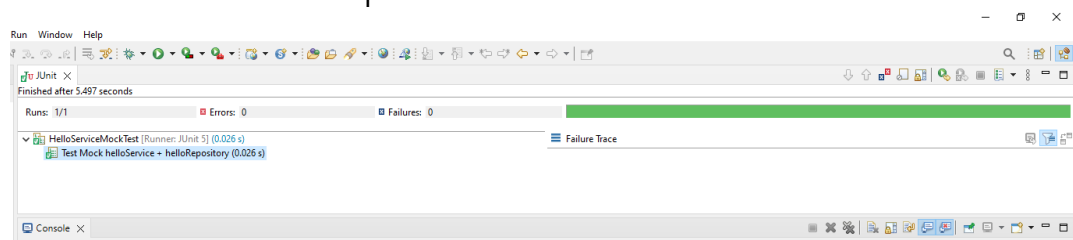
7. Select the file **HelloServiceTest.java** → right click → **Run As** → **Junit Test**
and run the Junit Test.

What is the result? Pass | Fail ?



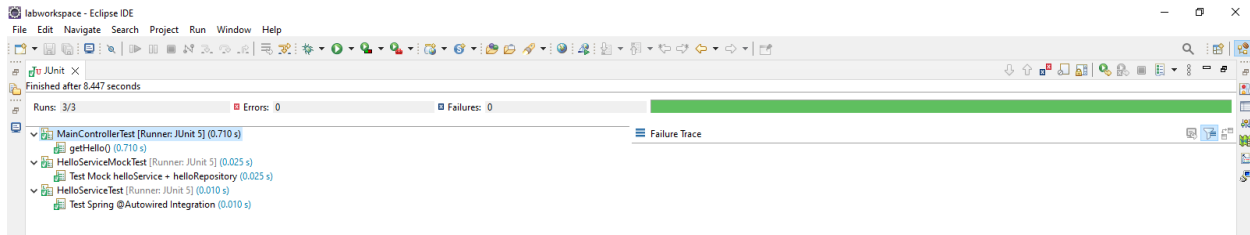
8. Select the file **HelloServiceMockTest.java** → right click → **Run As** → **Junit Test**
and run the Junit Test.

What is the result? Pass | Fail ?



9. In the Project Explorer, select the project **testing-junit5-mockito** → right click → **Run As** → **JUnit Test**

This will all JUnit tests in the project.



10. Let us run all the tests from the command terminal. Minimize Eclipse, we will return to eclipse later. Open a Windows Command Window, change directory to **C:\apitestlabs\testing-junit5-mockito**

```

testing-junit5-mockito
Microsoft Windows [Version 10.0.19045.4170]
(c) Microsoft Corporation. All rights reserved.

C:\Users\saravanan>title testing-junit5-mockito
testing-junit5-mockito

C:\Users\saravanan>cd C:\apitestlabs\testing-junit5-mockito
C:\apitestlabs\testing-junit5-mockito>

```

11. Let us use maven to run the tests. Type the following maven test command.

mvn test

```

testing-junit5-mockito - mvn test

C:\apitestlabs\testing-junit5-mockito>mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.mkyong.spring:testing-junit5-mockito >-----
[INFO] Building testing-junit5-mockito 1.0
[INFO]
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- maven-resources-plugin:3.1.0:resources (default-resources) @ testing-junit5-mockito ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory C:\apitestlabs\testing-junit5-mockito\src\main\resources
[INFO] skip non existing resourceDirectory C:\apitestlabs\testing-junit5-mockito\src\main\resources
[INFO]
[INFO] --- maven-compiler-plugin:3.8.0:compile (default-compile) @ testing-junit5-mockito ---
[INFO] Changes detected - recompiling the module!
[INFO] Compiling 6 source files to C:\apitestlabs\testing-junit5-mockito\target\classes

```

12. Can you see all 3 tests run?

```

[+] testing-junit-mockito
[[[
=====
:: Spring Boot ::      (v2.1.2.RELEASE)

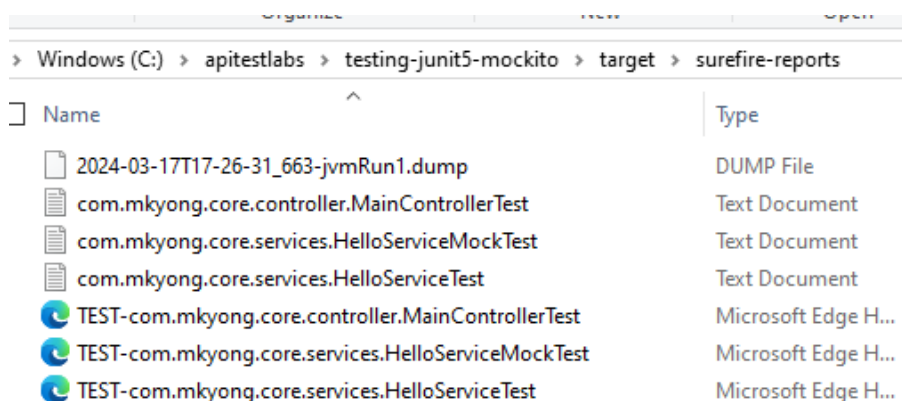
-----
2024-03-17 17:26:42.050 INFO 11904 --- [establs-testing-junits-mockito]    main] c.m.core.services.HelloServiceMockTest : Starting HelloServiceMockTest on DESKTOP-9938A2R with PID 11904 (started by saravanan in C:\apitools\labs\testing-junits-mockito)
2024-03-17 17:26:42.056 INFO 11904 --- [main] c.m.core.services.HelloServiceMockTest : No active profile set, falling back to default profiles: default
2024-03-17 17:26:43.126 INFO 11904 --- [main] o.s.s.concurrent.ThreadPoolTaskExecutor : Initializing ExecutorService 'applicationTaskExecutor'
2024-03-17 17:26:43.419 INFO 11904 --- [main] c.m.core.services.HelloServiceMockTest : Started HelloServiceMockTest in 1.615 seconds (JVM running for 11.8002)
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 2.108 s - in com.mykiong.core.services.HelloServiceMockTest
[INFO] Running com.mykiong.core.services.HelloServiceMockTest
2024-03-17 17:26:44.073 INFO 11904 --- [main] .b.t.c.SpringBootTestContextBootstrapper : Neither @ContextConfiguration nor @ContextHierarchy found for test class [com.mykiong.core.service.HelloService], using SpringBootTestContextLoader
2024-03-17 17:26:44.074 INFO 11904 --- [main] o.s.t.c.support.AbstractContextLoader : Could not detect default resource locations for test class [com.mykiong.core.services.HelloService]: no resource found for suffixes (-context.xml, Context.groovy).
2024-03-17 17:26:44.074 INFO 11904 --- [main] t.c.s.AnnotationConfigContextLoaderUtils : Could not detect default configuration classes for test class [com.mykiong.core.services.HelloService]: using SpringBootTest does not declare any static, non-private, non-final, nested classes annotated with @Configuration.
2024-03-17 17:26:44.077 INFO 11904 --- [main] .b.t.c.SpringBootTestContextBootstrapper : Found @SpringBootTestConfiguration for test class com.mykiong.core.services.HelloServiceTest
2024-03-17 17:26:44.079 INFO 11904 --- [main] .b.t.c.SpringBootTestContextBootstrapper : Loaded default TestExecutionListener class names from location [META-INF/spring.factories]: [org.springframework.test.context.mock.mockito.TestExecutionListeners, org.springframework.boot.test.autoconfigure.restdocs.RestDocsTestExecutionListener, org.springframework.boot.test.autoconfigure.web.client.MockMvcRestServiceResetTestExecutionListener, org.springframework.boot.test.autoconfigure.web.servlet.MockMvcPrintOnlyOnFailureTestExecutionListener, org.springframework.boot.test.autoconfigure.web.servlet.MockMvcPrinterTestExecutionListener, org.springframework.test.context.support.DirtiesContextBeforeModesTestExecutionListener, org.springframework.test.context.support.DependencyInjectionTestExecutionListener, org.springframework.test.context.support.DirtiesContextTestExecutionListener, org.springframework.test.context.transaction.TransactionalTestExecutionListener, org.springframework.test.context.jdbc.SqlScriptsTestExecutionListener]
2024-03-17 17:26:44.081 INFO 11904 --- [main] .b.t.c.SpringBootTestContextBootstrapper : Using TestExecutionListeners: [org.springframework.test.context.web.ServletTestExecutionListener@12d350eb, org.springframework.test.context.support.DirtiesContextBeforeModesTestExecutionListener@c2cc9e81, org.springframework.boot.test.autoconfigure.restdocs.RestDocsTestExecutionListener@d7d401cdc, org.springframework.boot.test.autoconfigure.web.client.MockMvcRestServiceResetTestExecutionListener@a49b3956, org.springframework.test.context.support.DirtiesContextTestExecutionListener@b27fcbec, org.springframework.boot.test.autoconfigure.web.servlet.MockMvcPrintOnlyOnFailureTestExecutionListener@b31af02, org.springframework.boot.test.autoconfigure.web.servlet.MockMvcPrinterTestExecutionListener@bb3455]
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.017 s - in com.mykiong.core.services.HelloServiceMockTest
2024-03-17 17:26:44.144 INFO 11904 --- [Thread=3] o.s.s.concurrent.ThreadPoolTaskExecutor : Shutting down ExecutorService 'applicationTaskExecutor'
2024-03-17 17:26:44.146 INFO 11904 --- [Thread=5] o.s.s.concurrent.ThreadPoolTaskExecutor : Shutting down ExecutorService 'applicationTaskExecutor'
[INFO] Results:
[INFO] 
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0
[INFO] 
[INFO] BUILD SUCCESS
[INFO] Total time: 26.193 s
[INFO] Finished at: 2024-03-17T17:26:44-04:00
[INFO] 

C:\apitools\labs\testing-junit5-mockito>

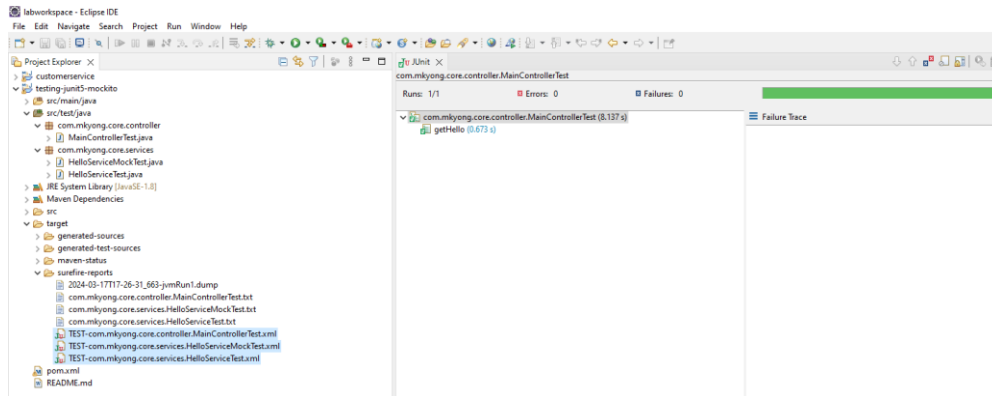
```

13. Let us review the test results. Open a File Explorer, navigate to **C:\apitestlabs\testing-junit5-mockito\target\surefire-reports**

Can you see the test results? Open the results and review them.



14. Can you view the test results in Eclipse? Open eclipse OR maximize eclipse and see the project directory in the Project Explorer view.



Part 2- Testing Spring Data with @DataJpaTest

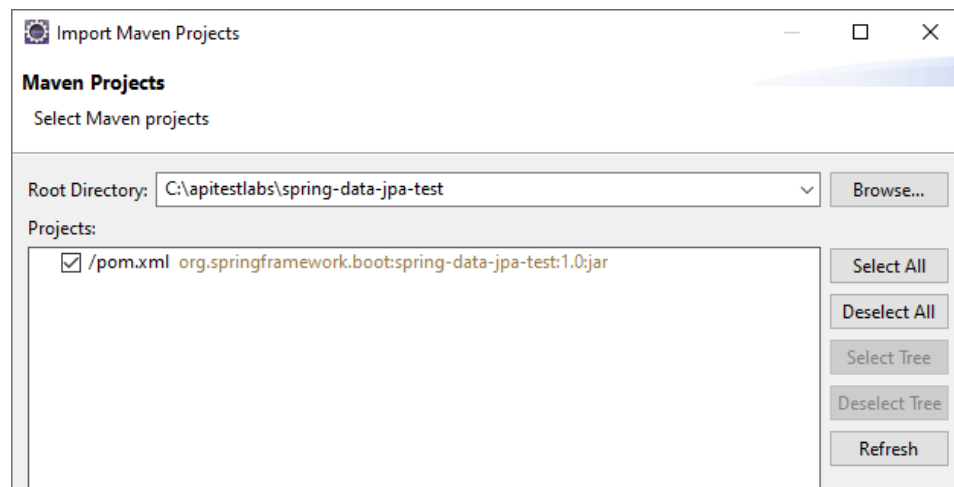
15. Let us continue to work in the same eclipse workspace. Import the maven project **spring-data-jpa-test** into workspace. In Eclipse Click on **File → Import → Maven → Existing maven projects**

Click on **Next**.

Navigate to **C:\apitestlabs\spring-data-jpa-test**

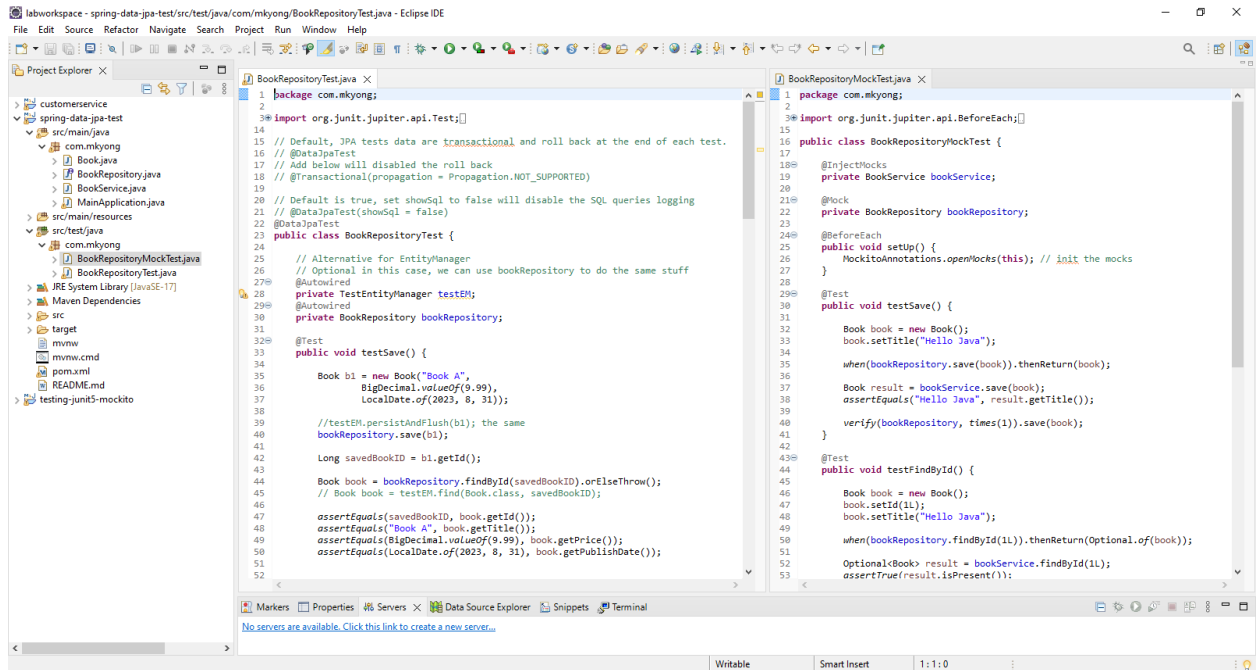
Select this project.

Click on **Finish**.



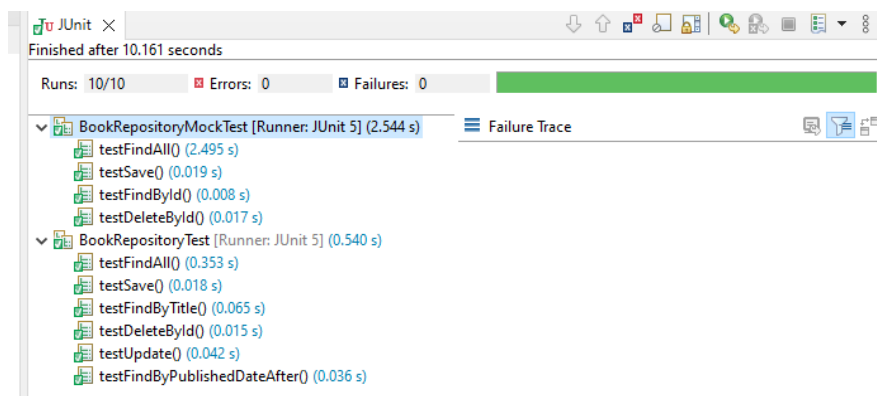
16. In the Project Explorer view, select the **project** → **right click** → **Maven** → **Update Maven Project**.

17. Expand the project and review the spring boot application code in **src/main/java** folder and review the test code in **src/test/java** folder.

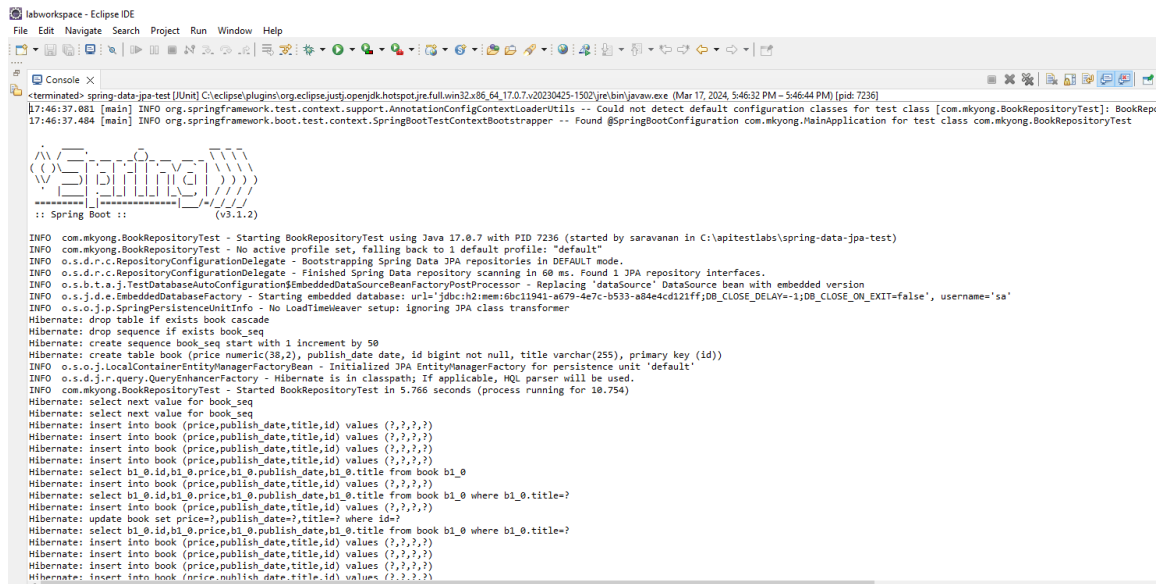


18. Select the **spring-data-jpa-test** project in project explorer view, **right click** → **Run As** → **JUnit Test**

How Many tests passed?
How Many tests failed?



19. Click on the Console view and review test log messages.



```

labworkspace - Eclipse IDE
File Edit Navigate Search Project Run Window Help
Console X
[terminated] spring-data-jpa-test [Unit] C:\eclipse\plugins\org.eclipse.justi.openjdk.hotspot.jre.full.win32.x86_64.17.0.7.v20230425-1502\jre\bin\javaw.exe (Mar 17, 2024, 5:46:32 PM) [pid: 7236]
17:46:37.081 [main] INFO org.springframework.test.context.support.AnnotationConfigContextLoaderUtils -- Could not detect default configuration classes for test class [com.mkyong.BookRepositoryTest]: BookRep
17:46:37.484 [main] INFO org.springframework.boot.test.context.SpringBootTestContextBootstrapper -- Found @SpringBootConfiguration com.mkyong.MainApplication for test class com.mkyong.BookRepositoryTest

Spring Boot
:: Spring Boot ::
(v3.1.2)

INFO com.mkyong.BookRepositoryTest - Starting BookRepositoryTest using Java 17.0.7 with PID 7236 (started by saravanan in C:\apitestlabs\spring-data-jpa-test)
INFO com.mkyong.BookRepositoryTest - No active profile set, falling back to 1 default profile: "default"
INFO o.s.d.r.c.RepositoryConfigurationDelegate - Bootstrapping Spring Data JPA repositories in DEFAULT mode.
INFO o.s.d.r.c.RepositoryConfigurationDelegate - Finished Spring Data repository scanning in 60 ms. Found 1 JPA repository interfaces.
INFO o.s.b.t.a.j.TestDatabaseAutoConfiguration$EmbeddedDataSourceBeanFactoryPostProcessor - Replacing 'dataSource' DataSource bean with embedded version
INFO o.s.j.d.e.EmbeddedDatabaseFactory - Starting embedded database: url=jdbc:h2:mem:60c11941-a679-4e7c-b533-a84e4cd121ff;DB_CLOSE_DELAY=-1;DB_CLOSE_ON_EXIT=false, username='sa'
INFO o.s.o.j.p.SpringPersistenceUnitInfo - No LoadTimeWeaver setup: ignoring JPA class transformer
Hibernate: drop table if exists book cascade
Hibernate: drop sequence if exists book_seq
Hibernate: create sequence book_seq start with 1 increment by 50
Hibernate: create table book (price numeric(38,2), publish_date date, id bigint not null, title varchar(255), primary key (id))
INFO o.s.d.j.LocalContainerEntityManagerFactoryBean - Initialized JPA EntityManagerFactory for persistence unit 'default'
INFO o.s.d.j.r.query.QueryEnhancerFactory - Hibernate is in classpath; if applicable, HQL parser will be used.
INFO com.mkyong.BookRepositoryTest - Started BookRepositoryTest in 5.766 seconds (process running for 10.754)
Hibernate: select next value for book_seq
Hibernate: select next value for book_seq
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0 where b1_0.title=?
Hibernate: update book set price=?,publish_date=?,title=? where id=?
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0 where b1_0.title=?
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,?)

```

20. Let us run all the tests from the command terminal. Minimize Eclipse, we will return to eclipse later. Open a Windows Command Window, change directory to C:\apitestlabs\spring-data-jpa-test

```

C:\Users\saravanan>title spring-data=jpa-test
Microsoft Windows [Version 10.0.19045.4170]
(c) Microsoft Corporation. All rights reserved.

C:\Users\saravanan>title spring-data=jpa-test
C:\Users\saravanan>cd C:\apitestlabs\spring-data-jpa-test
C:\apitestlabs\spring-data-jpa-test>

```

21. Let us use maven to run the tests. Type the following maven test command.

mvn test

```

C:\apitestlabs\spring-data-jpa-test>mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.springframework.boot:spring-data-jpa-test >-----
[INFO] Building Spring Boot Spring Data JPA 1.0
[INFO] -----[ jar ]-----
[INFO]
[INFO] --- maven-resources-plugin:3.3.1:resources (default-resources) @ spring-data-jpa-test ---
[INFO] Copying 1 resource from src\main\resources to target\classes
[INFO] Copying 0 resource from src\main\resources to target\classes
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:compile (default-compile) @ spring-data-jpa-test ---

```

22. Can you see all 10 tests run?

```
INFO spring-data-jpa-test
:: Spring Boot :: (v3.1.2)

INFO com.mkyong.BookRepositoryTest - Starting BookRepositoryTest using Java 17.0.1 with PID 15080 (started by saravanan in C:\apitestlabs\spring-data-jpa-test)
INFO com.mkyong.BookRepositoryTest - No active profile set, falling back to 1 default profile: "default"
INFO o.s.d.r.c.RepositoryConfigurationDelegate - Bootstrapping Spring Data JPA repositories in DEFAULT mode.
INFO o.s.d.r.c.RepositoryConfigurationDelegate - Finished Spring Data repository scanning in 66 ms. Found 1 JPA repository interfaces.
INFO o.s.b.a.j.t.TestDatabaseAutoConfigurationEmbeddedDataSourceBeanFactoryPostProcessor - Replacing 'dataSource' DataSource bean with embedded version
INFO o.s.j.d.e.EmbeddedDatabaseConnectionFactory - Starting embedded database: url=jdbc:h2:mem:9da49fbc-e942-4488-8088-9a5a49876ff0;DB_CLOSE_DELAY=1;DB_CLOSE_ON_EXIT=false, username='sa'
INFO o.s.o.j.p.SpringPersistenceUnitInfo - No LoadTimeWeaver setup: ignoring JPA class transformer
Hibernate: drop table if exists book cascade
Hibernate: drop sequence if exists book_seq
Hibernate: create sequence book_seq start with 1 increment by 50
Hibernate: create table book (price numeric(38,2), publish_date date, id bigint not null, title varchar(255), primary key (id))
INFO o.s.o.j.localContainerEntityManagerFactoryBean - Initialized JPA EntityManagerFactory for persistence unit 'default'
INFO o.s.d.j.r.query.QueryEnhancerFactory - Hibernate is in Classpath; If applicable, HQL parser will be used.
INFO com.mkyong.BookRepositoryTest - Started BookRepositoryTest in 6.647 seconds (process running for 12.002)
Hibernate: select next value for book_seq
Hibernate: select next value for book_seq
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0 where b1_0.title=?
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: update book set price=?,publish_date=?,title=? where id=?
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0 where b1_0.title=?
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: insert into book (price,publish_date,title,id) values (?,?,?,:)
Hibernate: select b1_0.id,b1_0.price,b1_0.publish_date,b1_0.title from book b1_0 where b1_0.publish_date=?
INFO Tests run: 6, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 8.345 s - in com.mkyong.BookRepositoryTest
INFO o.s.o.j.localContainerEntityManagerFactoryBean - Closing JPA EntityManagerFactory for persistence unit 'default'
Hibernate: drop table if exists book cascade
Hibernate: drop sequence if exists book_seq
[INFO]
[INFO] Results:
[INFO]
[INFO]
[INFO] Tests run: 10, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 19.519 s
[INFO] Finished at: 2024-03-17T17:52:48+04:00
[INFO]
```