Testing con Microservicios

JoeDayz | 2026

Quarkus-junit5

Notas

- Soporte a CDI
- Testing HTTP simplificado
- Mocking simplificado
- Servicios contenerizados
- Requisito: implementar el Surefire maven plugin, el log manager.

```java
import javax.inject.Inject;
import org.junit.jupiter.api.Assertions;
import org.junit.jupiter.api.Test;
import io.quarkus.test.junit.QuarkusTest;

@QuarkusTest (1)
public class MyEngineTest {

    @Inject
    Engine engine; (2)

    @Test (3)
    public void testEngine() {
        // Given
        engine.stop();

        // When
        engine.start();

        // Then
        Assertions.assertTrue(engine.isRunning()); (4)
    }
}
```

Nota: tambien puede usar Hamcrest, AssertJ

DEV SERVICES

```
quarkus.datasource.db-kind=postgresql (1)
%test.quarkus.datasource.db-kind=h2 (2)
```

Testing de HTTP endpoints

```
@QuarkusTest
public class MyTestClass {

    @TestHTTPResource("index.html")
    URL resource;

    @Test
    public void testResource() {
        try (InputStream in = resource.openStream()) {
            String contents = new BufferedReader(new InputStreamReader(in))
                .lines().collect(Collectors.joining("\n"));
            Assertions.assertTrue(contents.equals("Static resource"));
        }
    }
}
```

http://localhost:8080/index.html.

Testing de HTTP endpoints

```
@QuarkusTest
public class MyTestClass {

    @TestHTTPEndpoint(MyService.class)
    @TestHTTPResource
    URL endpoint;

    @Test
    public void testMyServiceEndPoint() {
        try (InputStream in = endpoint.openStream()) {
            String contents = new BufferedReader(new InputStreamReader(in))
                .lines().collect(Collectors.joining("\n"));
            Assertions.assertTrue(contents.equals("hello"));
```

REST Assured

```
<dependency>
    <groupId>io.rest-assured</groupId>
    <artifactId>rest-assured</artifactId>
    <scope>test</scope>
</dependency>
```

```
import static io.restassured.RestAssured.given;
import static org.hamcrest.CoreMatchers.is;

@QuarkusTest
public class MyTestClass {

    @TestHTTPEndpoint(MyService.class)
    @TestHTTPResource
    URL endpoint;

    @Test
    public void testMyServiceEndPoint() {
        given().when().get(endpoint).then().body(is("hello"));
    }
}
```

REST Assured

```
@QuarkusTest
@TestHTTPEndpoint(MyService.class)
public class MyTestClass {

  @Test
  public void testMyServiceEndPoint() {
    given()
        .when()
            .get("/me")
        .then()
            .body(is("hello"));
  }
}
```

1

2

http://localhost:8081/my-service/me

Test de Integration

```
import io.quarkus.test.junit.QuarkusIntegrationTest;

@QuarkusIntegrationTest
public class MyServiceIT {
    ...code omitted...
}
```

mvn verify

Recursos

https://junit.org/junit5/

https://github.com/rest-assured/rest-assured

Demo Test Unit

Testing de microservicios con Mock Frameworks

5 formas de generar dobles

Dummies

Dummies are dependencies required by the test only when it creates or invokes the unit under test. Common examples include objects passed to constructor methods that are mandatory but never used during the test.

Fakes

Fakes replace dependencies with a different implementation. The implementation is simpler and easier to manage during the test phase, but not suitable for production usage. Examples of fakes are in-memory databases, or allow-all authenticators.

Stubs

Stubs provide the code unit under test with canned responses. Use stubs when testing for expected behavior and responses of the unit against well-known dependency responses. Common examples include methods that always return the same known result.

Mocks

Mocks are dependencies pre-programed to respond to a limited set of requests. Use mocks when the original dependencies are too complex to use a stub. Examples of mocks include objects that mimic REST clients, or services.

Spies

Spies are stubs or mocks that record interactions with the unit under test. Unit tests can then make assertions over the interactions.

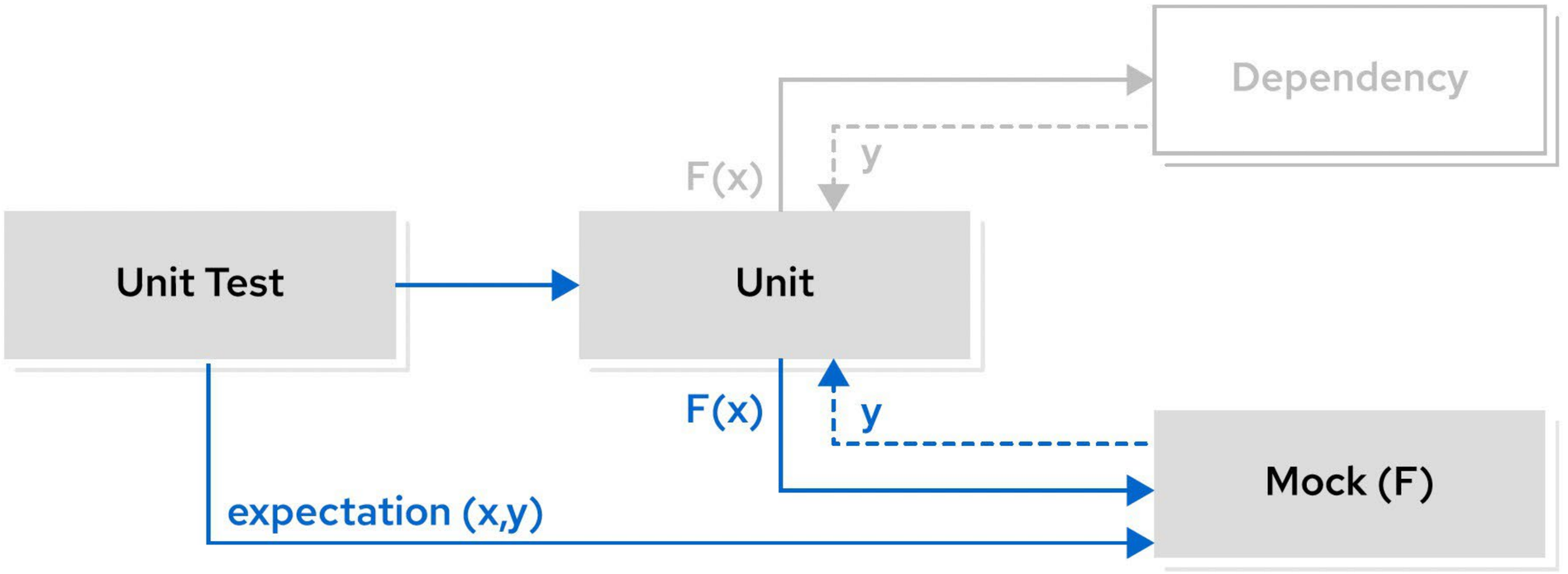


Figure 3.1: Mock type example

```java
import io.quarkus.test.Mock;

import javax.enterprise.context.ApplicationScoped;

@Mock 1    = @Alternative , @Priority(1) y un @Dependent
@ApplicationScoped 2
public class OrderServiceMock extends OrderService {
    @Override
    public Order getOrder(UUID uuid) {
        return new Order(uuid, "Customer Name", 123);
    }
}
```

```
@QuarkusTest
public class OrderServiceTest {

    @Inject (1)
    OrderService orderService;

    @Test
    public void testExample() {
        UUID uuid = ...code omitted...

        Order order = orderService.getOrder(uuid); (2)

        boolean isFraud = orderService.isFraud(order); (3)

        ...code omitted...
    }
}
```

NOTA: Esta técnica solo funciona con @QuarkusTest no con @QuarkusIntegrationTest

MOCKITO

```java
@QuarkusTest
public class OrderServiceTest {
    @Test
    public void testExample() {
        UUID uuid = ...code omitted...

        OrderService orderService = Mockito.mock(OrderService.class); (1)

        Mockito
            .when(orderService.getOrder(uuid)) (2)
            .thenReturn(new Order(uuid, "Customer Name", 123)); (3)

        Mockito
            .when(orderService.getOrder(null)) (4)
            .thenThrow(new NullPointerException()); (5)

        Order order = orderService.getOrder(uuid); (6)

        ...code omitted...

        Order order = orderService.getOrder(null); (7)

        ...code omitted...
    }
}
```

```xml
<dependency>
    <groupId>io.quarkus</groupId>
    <artifactId>quarkus-junit5-mockito</artifactId>
    <scope>test</scope>
</dependency>
```

ARGUMENT MATCHERS

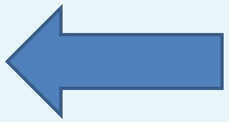
```
@QuarkusTest
public class OrderServiceTest {
    @Test
    public void testExample() {
        UUID uuid = ...code omitted...

        OrderService orderService = Mockito.mock(OrderService.class);

        Mockito
            .when(orderService.getOrder(Mockito.any())) (1)
            .thenReturn(new Order(uuid, "Customer Name", 123));

        Order order = orderService.getOrder(uuid); (2)
        Order order = orderService.getOrder(null); (3)

        ...code omitted...
    }
}
```



```
@QuarkusTest
public class SomeServiceTest {

    @InjectMock (1)
    OrderService orderService;

    @BeforeEach
    public void setup() {
        Mockito
            .when(orderService.getOrder(null))
            .thenThrow(new NullPointerException()); (2)
    }

    @Test
    public void testExample() {
        UUID uuid = ...code omitted...

        Mockito
            .when(orderService.getOrder(Mockito.any()))
            .thenReturn(new Order(uuid, "Customer Name", 123)); (3)

        Data data = orderService.getOrder(uuid);

        ...output omitted...
  }
}
```

@InjectMock

Testing Indirect Interactions

```
@QuarkusTest
public class SpyTest {
    @InjectMock
    OrderService orderService;

    @Test
    public void testExample() {
        given()
        .when()
            .get("/orders")
        .then()
            .statusCode(200)
            .body("$.size()", is(0));

        Mockito.verify(orderService, Mockito.times(1)).list(); (1)
        Mockito.verify(expenseService).list(); (2)
        Mockito.verifyNoMoreInteractions(orderService, expenseService); (3)
    }
}
```

- `Mockito.times(int wantedNumberOfInvocations)`: verifies that the code calls the method a specified number of times.
- `Mockito.atMost(int maxNumberOfInvocations)`: verifies that the code does not call the method more than a specified number of times.
- `Mockito.never()`: verifies that the code never calls the method.
- `Mockito.atLeastOnce()`: verifies that the code calls the method one or more times.

Mocking de Panache Entities

```java
@QuarkusTest
public class SomeResourceTest {

    @BeforeAll
    public static void setup() {
        PanacheMock.mock(Order.class); (1)
    }

    @Test
    public void testExample() {
        Mockito
            .when(Order.listAll()) (2)
            .thenReturn(Collections.emptyList()); (3)

        given() (4)
        .when()
            .get("/orders")
        .then()
            .statusCode(200)
            .body("$.size()", is(0));
    }
}
```

```xml
<dependency>
  <groupId>io.quarkus</groupId>
  <artifactId>quarkus-panache-mock</artifactId>
  <scope>test</scope>
</dependency>
```

Mocking de REST Clients

```
@QuarkusTest
public class SomeResourceTest {

    @InjectMock
    @RestClient
    FraudScoreService scoringService; (1)

    @Test
    public void testExample() {
        UUID uuid = ...code omitted...

        Mockito
            .when(scoringService.getById(Mockito.anyString())) (2)
            .thenReturn(new FraudScore(uuid, 9999)); (3)

        given() (4)
        .when()
            .get("/orders/score/an-order-uuid")
        .then()
            .statusCode(200)
            .body("$.size()", is(1));
    }
}
```

Spies

```
@QuarkusTest
public class SomeResourceTest {

    @InjectSpy
    OrderService orderService; (1)

    @Test
    public void testExample() {
        given() (2)
        .when()
            .get("/orders")
        .then()
            .statusCode(200)
            .body("$.size()", is(0));

        Mockito.verify(orderService, Mockito.times(1)).list(); (3)
    }
}
```

Recursos

https://jakarta.ee/specifications/cdi/2.0/cdi-spec-2.0.html

https://site.mockito.org/

Testing con Dev Services

```
[user@host my-app]$ mvn quarkus:dev
[INFO] Scanning for projects...
...output omitted...
Listening for transport dt_socket at address: 5005
... (docker-java-stream-1159839045) Starting to pull image
...output omitted...
... Dev Services for the default datasource (postgresql) started.
...output omitted...
```

Otros: Kafka, Redis, ActiveMQ, RabbitMQ, Keycloak, etc.

Testing con Dev Services

```
quarkus.devservices.enabled = false
```

NOTA: Dev Services está habilitado por defecto.

```
quarkus.keycloak.devservices.enabled = false
```

quarkus.[dev_service].devservices.image-name

quarkus.datasource.devservices.image-name = mysql:8

Quarkus test resources instead of Dev Services

```
@QuarkusTest
@QuarkusTestResource(CustomBrokerResource.class)
public class MyTest {

    @Test
    public someTest() {
        // Perform the test that uses your external service
    }
}
```

Quarkus test resources instead of Dev Services

```
public class CustomBrokerResource (1)
    implements QuarkusTestResourceLifecycleManager {

    DockerImageName IMAGE = DockerImageName.parse(
        "quay.io/myorg/custom-broker:v1.0"); (2)

    GenericContainer<?> SERVICE = new GenericContainer<>( IMAGE )
       .withExposedPorts(9092)
       .withEnv("API_URL", "localhost:9092"); (3)

    @Override
    public Map<String, String> start() { (4)
        SERVICE.start(); (5)

        return Map.of("broker.internal.port", SERVICE.getPort()); (6)
    }

    @Override
    public void stop() { (7)
        SERVICE.stop(); (8)
    }
}
```

Quarkus test resources instead of Dev Services

```
@QuarkusTestResource( 1
    CustomBrokerResource.class 2
)
@Retention(RetentionPolicy.RUNTIME) 3
@Target(ElementType.TYPE) 4
public @interface WithCustomBroker { 5
    String myPort() default ""; 6 7
}
```

Quarkus test resources instead of Dev Services

```
public class CustomBrokerResource implements
QuarkusTestResourceConfigurableLifecycleManager<WithCustomBroker> { (1)(2)

    DockerImageName IMAGE = DockerImageName.parse(
        "quay.io/myorg/custom-broker:v1.0");
    GenericContainer<?> SERVICE = new GenericContainer<>( IMAGE );
    private String port;

    @Override
    public void init( WithCustomBroker params ) { (3)
        port = params.myPort(); (4)
    }

    @Override
    public Map<String, String> start() {
        SERVICE
            .withExposedPorts( port )
            .start();
         return Map.of("some.custom.broker.port", port );
     }

     @Override
     public void stop() {
         SERVICE.stop();
     }
}
```

```
@QuarkusTest
@WithMyCustomBroker( myPort = "9090" )
public class MyTest {

    @Test
    public someTest() {
        // Perform the test that uses your external service
    }
}
```

Recursos

https://www.testcontainers.org/

https://www.testcontainers.org/supported_docker_environment/

https://quarkus.io/version/2.13/guides/dev-services