Unit Testing

Testing, Unit Testing

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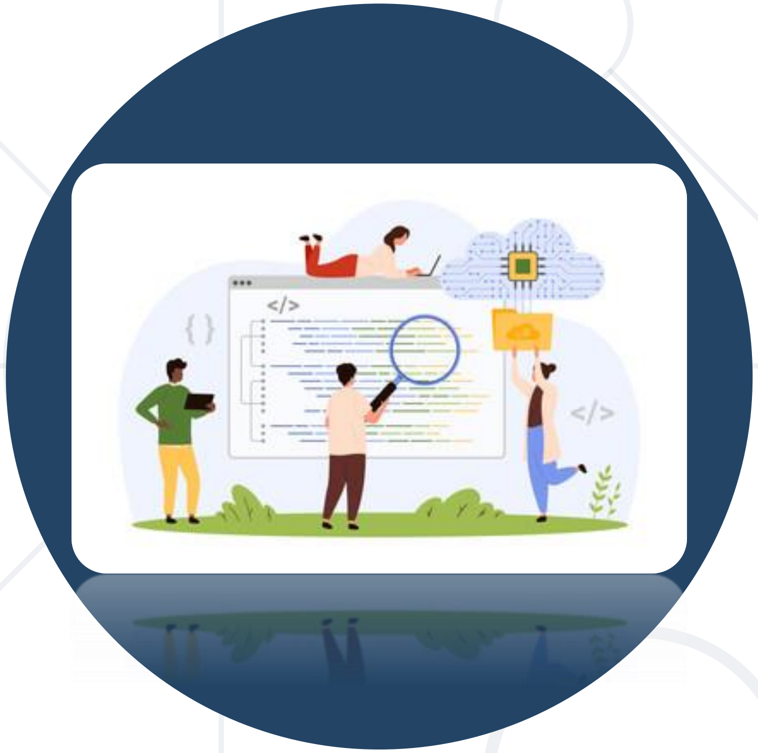


Testing

Testing

- **Testing** is an important part of the application lifecycle
  - In our ever-changing environment, testing is a necessity
  - New features need to be verified, before delivered to the clients

Testing

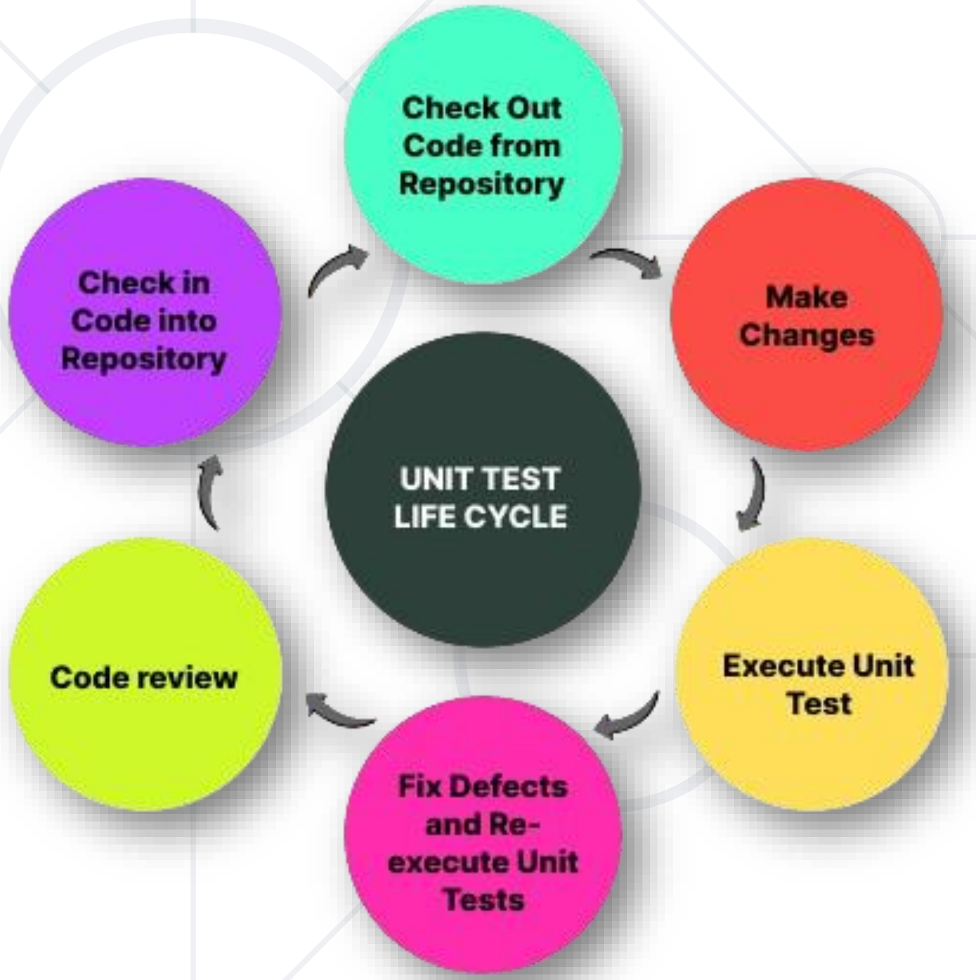
- Testing is a wide area of application development
  - There are several **levels** of testing
  - It does not affect only programmers
  - It has many **concepts** of development
  - There are **different types** of testing

Unit Testing

Unit Testing

- **Unit Testing**
  - A level of software testing where **individual components are tested**
  - The purpose is to validate that **each unit performs as designed**
  - The **lowest level of software testing**
  - Often isolated in order to ensure individual testing

Unit Testing Life Cycle


UNIT TEST LIFE CYCLE
Check Out Code from Repository
Make Changes
Execute Unit Test
Fix Defects and Re-execute Unit Tests
Code review
Check in Code into Repository

Mocking

- Software practice, primarily used in **Unit Testing**
  - An object under test may have **dependencies** on other objects
  - To **isolate** the behavior, the other objects are replaced
    - The replacements are **mocked objects**
    - The mocked objects **simulate** the behavior of the **real objects**

Benefits

- Unit testing **increases confidence** in **changing**/**maintaining code**
- Development is faster:
  - Verifying the correctness of new functionality is not manual
  - Localizing bugs, introduced in development is much faster
- The code is modular and reusable (necessary for Unit testing)

Unit Testing

- **Unit Testing** for web apps is similar to the unit tests we've done
  - Writing test methods to test classes and methods (functionalities)
    - Testing individual code components (**units**)
    - Independently from the **infrastructure**
  - You still use the same testing frameworks as in casual unit testing

Unit Testing

- When using a web frameworks such as **Spring MVC**
  - Built-in logic does not need to be **tested**
    - It is already tested during the development of the **framework** itself
  - You still need to test your **custom** functionality

Unit Testing

- Testing a simple service with mocking in an **Spring MVC** app

```
@Entity
@Table(name = "users")
public class User {
    private String id;
    private String username;
    private String password;

    ...
}
```

```
@Repository
public interface UserRepository
extends JpaRepository<User, String> {
    User findByUsername(String username);
}
```

```
public interface UserService {
    User getUserByUsername(String username);
}
```

```
@Service
public class UserServiceImpl implements UserService {
    ...
    public User getUserByUsername(String username) {
        return this.userRepository.findByUsername(username);
    }
}
```

Unit Testing

- Testing a simple service with **mocking** in an **Spring MVC** app

```
public class UserServiceTests {
    private User testUser;
    private UserRepository mockedUserRepository;

    @Before
    public void init() {
        this.testUser = new User() {{
            setId("SOME_UUID");
            setUsername("Pesho");
            setPassword("123");
        }};

        this.mockedUserRepository = Mockito.mock(UserRepository.class);
    }}
```

Unit Testing (Arrange)

- Testing a simple service with **mocking** in an **Spring MVC** app

```
public class UserServiceTests {
    @Test
    public void
userService_GetUserWithCorrectUsername_ShouldReturnCorrect() {
        // Arrange
        Mockito.when(this.mockedUserRepository
                .findByUsername("Pesho"))
                .thenReturn(this.testUser);

        UserService userService = new
                    UserServiceImpl(this.mockedUserRepository);
        User expected = this.testUser;
    }}
```

Unit Testing (Act)

- Testing a simple service with **mocking** in an **Spring MVC** app

```
public class UserServiceTests {
    @Test
    public void
         userService_GetUserWithCorrectUsername_ShouldReturnCorrect() {
        ...

        // Act
        User actual = userService.getUserByUsername("Pesho");

        ...
    }
}
```

Unit Testing (Assert)

- Testing a simple service with **mocking** in an **Spring MVC** app

```
public class UserServiceTests {
    @Test
    public void
        userService_GetUserWithCorrectUsername_ShouldReturnCorrect() {
        ...
        // Assert
        Assertions.assertEquals("Broken...", expected.getId(),
                                               actual.getId());
        Assertions.assertEquals("Broken...", expected.getUsername(),
                                               actual.getUsername());
        Assertions.assertEquals("Broken...", expected.getPassword(),
                                               actual.getPassword());
    }}
```

Testing

- There are also different concepts and practices of test development
  - **Code-first** approach (The usual Development)
  - **Test-first** approach (Test-Driven Development)

Testing

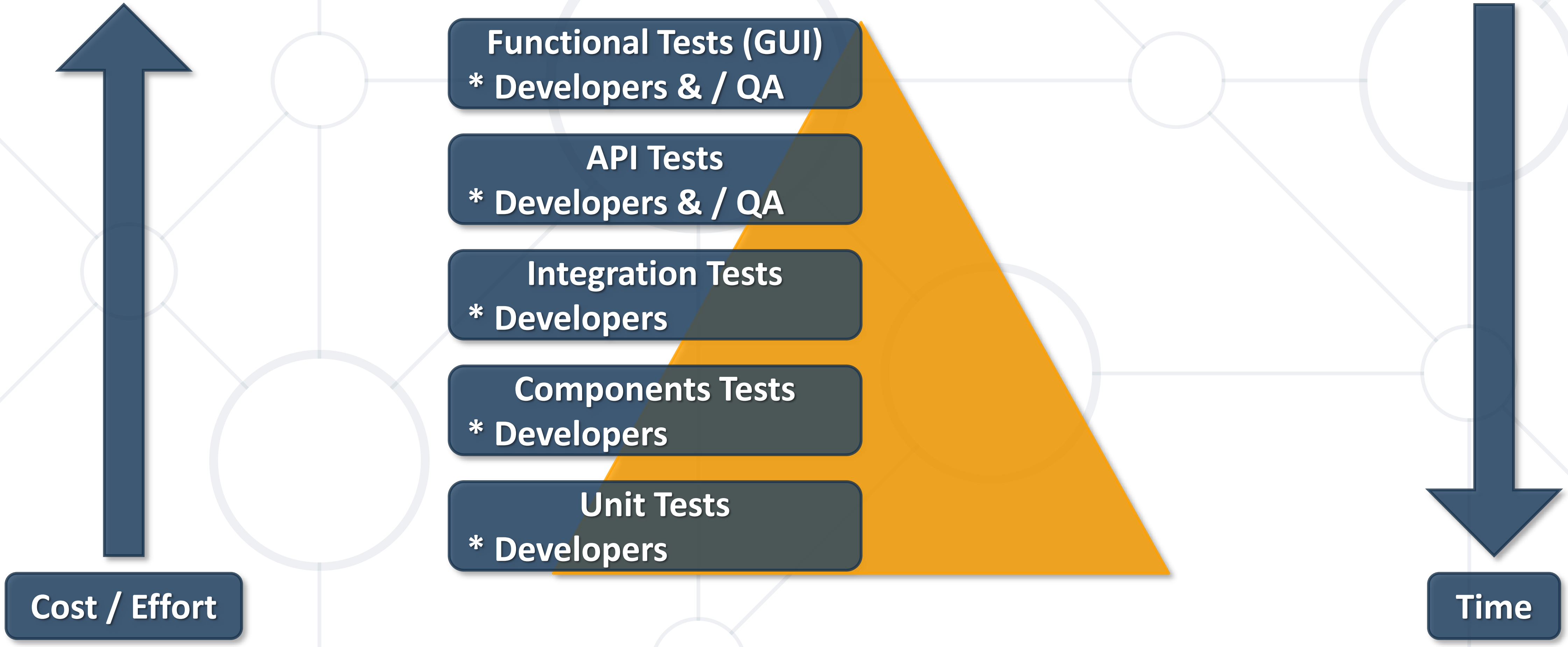
- Each has its own **advantages** and **disadvantages**
  - The **Code-first** approach ensures **flexibility** & **fast** development
  - The **Code-first** approach requires **additional refactoring**
  - The **Test-first** approach ensures **quality** and **edge case coverage**
  - The **Test-first** approach is **complicated** and is an "**initial delay**"

Testing

- Unit testing **ensures** the correctness of a particular unit
  - Not testing **all components** may lead to **false** results
    - A **single unit** may function correctly, independent of the infrastructure
  - Combining components and testing them **collectively** is necessary
  - **Every** level of testing is **essential** to an application's lifecycle

Different Testing levels

- Different Testing levels **require different** time and resources



Summary

- **Testing** is an important part of the application lifecycle
  - New features need to be verified, before delivered to the clients
- **Unit Testing**
  - A level of software testing where individual components are tested
  - The purpose is to validate that each unit performs as designed

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