Using Testcontainers and dependency breaking techniques to deal with legacy code

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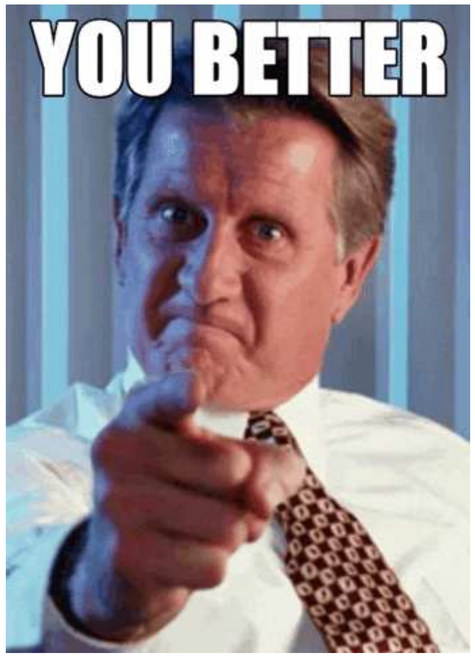
A BUG IN PRODUCTION!!!

- PortfolioService#printStatement is broken
-

```
company | shares | current price | current value | last operation
GameStop | 1 | $89.98 | $89.98 | SOLD 1 on 03/02/2021
```



https://gph.is/g/4A73z9q

What’s the situation?

- https://github.com/Alcor-Academy/StockPortfolio-BigBallOfMud-CSS-01
- My findings:
  - It has 0 (ZERO!!!) automated tests!
  - Many (MANY!!!) legacy code smells (http://legacycodesmells.com/)
  - At least 1 serious bug in production

http://gph.is/2neJxsZ

Let’s relax.

Remember the ALCOR.academy training? Code Renovation Modul?

http://gph.is/1PRG4Xg

One guy mentioned „Testcontainers“

… during the ALCOR.academy training

- https://www.testcontainers.org/

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Permissions

- ✓ Commercial use
- ✓ Modification
- ✓ Distribution
- ✓ Private use

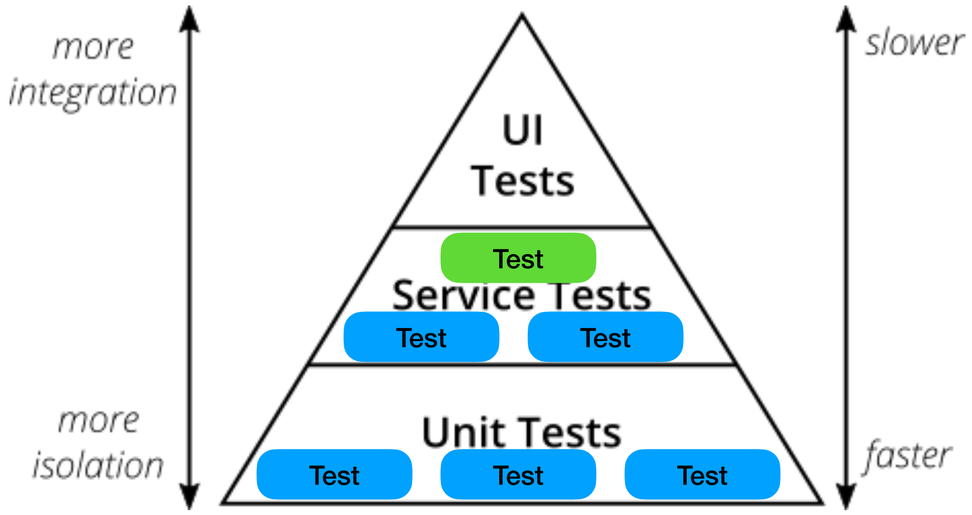
Limitations

- ✗ Liability
- ✗ Warranty

Our next experiment!

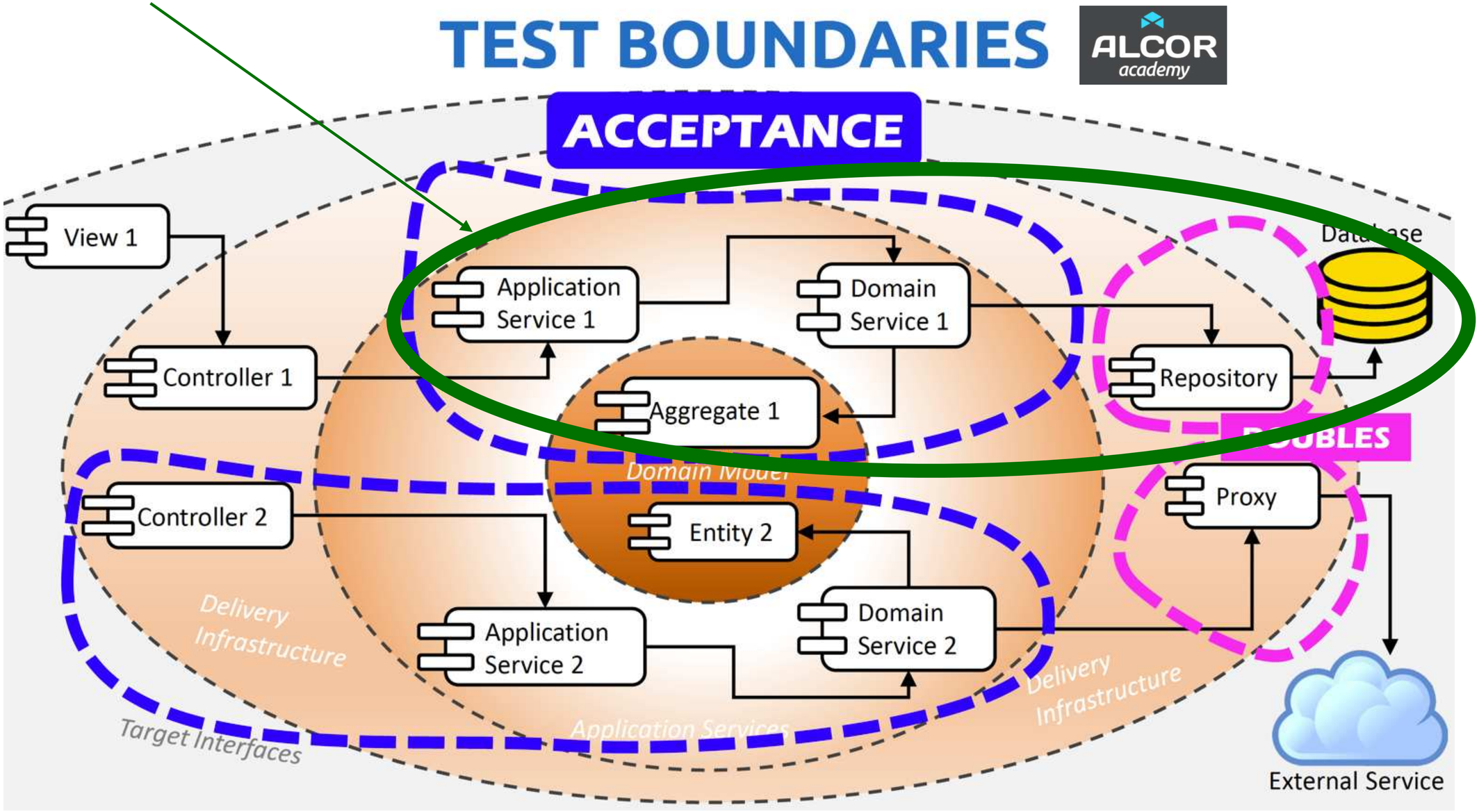
We'll give Testcontainers a try today.

- Step 1 (today)
  - Get characterization tests in place by using Testcontainers and do only the **absolute minimum of refactoring**
  - We'll have a first safety net, then!
- Step 2 (tomorrow or so?)
  - Do more refactoring as needed (break dependencies…)
  - Add unit tests and acceptance tests without MongoDB integration



https://martinfowler.com/articles/practical-test-pyramid.html

Test Scope


TEST BOUNDARIES
ALCOR academy
ACCEPTANCE
View 1
Controller 1
Controller 2
Application Service 1
Application Service 2
Domain Service 1
Domain Service 2
Aggregate 1
Entity 2
Repository
Proxy
Database
DOUBLES
Domain Model
Delivery Infrastructure
Delivery Infrastructure
Target Interfaces
Application Services
External Service

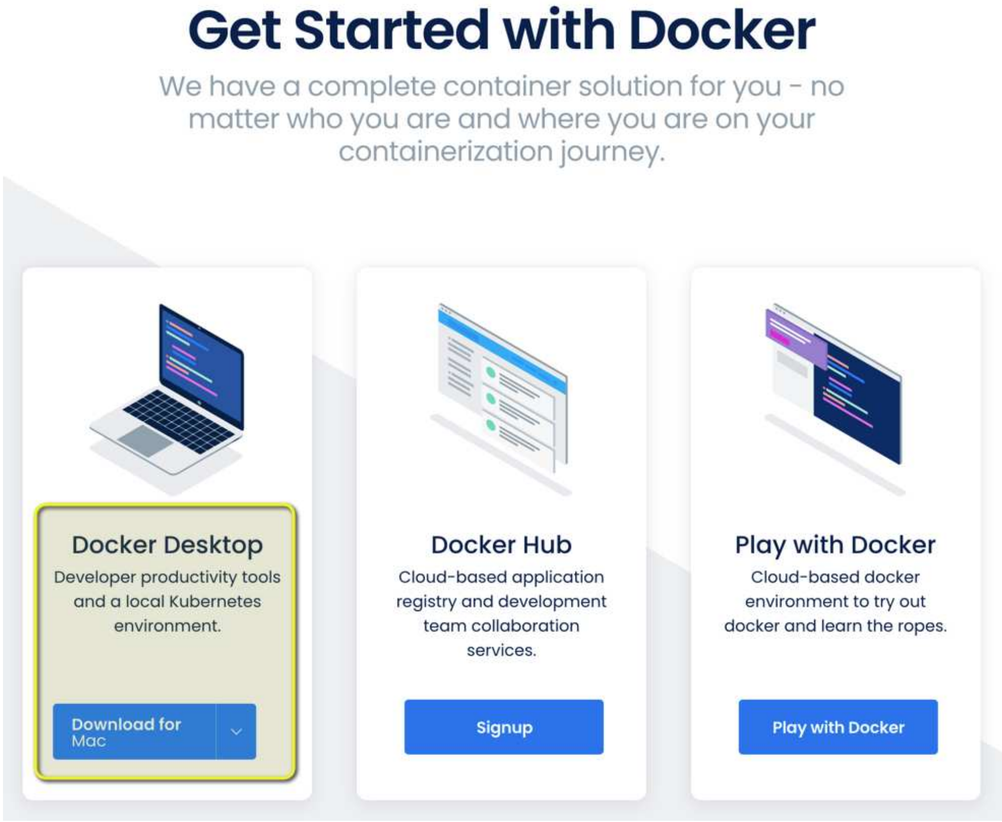
Goals for step 1

- ☑ Test on API level with good coverage
- ☑ with full MongoDB integration
- ☑ decent fast tests (<= 5 seconds per test)
- ☑ minimal changes to the existing code
- ☑ **finish in less than 10 minutes**

We need a Docker daemon instance

… on our local dev machine

- See https://www.testcontainers.org/#prerequisites
- For our local dev machine, easy!
- https://www.docker.com/get-started
- All major OS supported
  - Mac
  - Windows
  - Linux



We need a Docker daemon instance

… also on the CI/CD-Servers

- Install Docker on the CI/CD hosts itself
- Or provide a remote Docker daemon instance for them
  (for e.g. cloud native builds on Kubernetes)

So, let’s start!

https://gph.is/g/ZWdK71X

Let’s add Testcontainers to the Maven build

- pom.xml

```
        <dependency>
            <groupId>org.junit.jupiter</groupId>
            <artifactId>junit-jupiter</artifactId>
            <version>5.7.0</version>
        </dependency>
        <dependency>
            <groupId>org.testcontainers</groupId>
            <artifactId>junit-jupiter</artifactId>
            <version>1.15.1</version>
        </dependency>
        <dependency>
            <groupId>org.testcontainers</groupId>
            <artifactId>mongodb</artifactId>
            <version>1.15.1</version>
        </dependency>
        <dependency>
            <groupId>org.mockito</groupId>
            <artifactId>mockito-core</artifactId>
            <version>3.7.0</version>
            <scope>test</scope>
        </dependency>
    </dependencies>
</project>
```

Let’s try Testcontainers with MongoDB

```java
import org.junit.jupiter.api.Test;
import org.testcontainers.containers.MongoDBContainer;
import org.testcontainers.junit.jupiter.Container;
import org.testcontainers.junit.jupiter.Testcontainers;
import org.testcontainers.utility.DockerImageName;

import static org.junit.jupiter.api.Assertions.*;

@Testcontainers
class PortfolioServiceShould {

    @Container
    private final MongoDBContainer mongoDBContainer = new MongoDBContainer("mongo:4.4.3");

    @Test
    void demo_testcontainers() {
        assertTrue(mongoDBContainer.isRunning());
        int mongoDbPort = mongoDBContainer.getFirstMappedPort();
        assertTrue(mongoDbPort >= 1 && mongoDbPort <= 65535);
    }

}
```

What we learned: Break the dependency!

… to the hardcoded MongoDB URL

Before

```
public class PortfolioService {
    private static final MongoClient mclSingle = MongoClients.create(Globals.DBConf[1]);
    private final int userId;
    private final MongoDatabase db;
    private static final String loggerDbName = Globals.DBConf[0];
    private static final Logger mongoLogger = Logger.getLogger(loggerDbName);

    public PortfolioService(int userId) {
        this.userId = userId;
        mongoLogger.setLevel(Level.SEVERE);
        db = mclSingle.getDatabase(Globals.DBConf[2]);
    }
```

After

```
public class PortfolioService {
    private final int userId;
    private final MongoDatabase db;
    private static final String loggerDbName = Globals.DBConf[0];
    private static final Logger mongoLogger = Logger.getLogger(loggerDbName);

    public PortfolioService(int userId) {
        this(userId, Globals.DBConf[1]);
    }

    PortfolioService(int userId, String mongoDbUrl) {
        this.userId = userId;
        mongoLogger.setLevel(Level.SEVERE);
        MongoClient mclSingle = MongoClients.create(mongoDbUrl);
        db = mclSingle.getDatabase(Globals.DBConf[2]);
    }
```

Result

```
@Testcontainers
class PortfolioServiceShould {

    @Container
    private final MongoDBContainer mongoDBContainer = new MongoDBContainer("mongo:4.4.3");

    @Test
    void printStatement_prints_BUY_for_1_buy_transaction() {
        PortfolioService portfolioService =
                new PortfolioService(1, "mongodb://localhost:" + mongoDBContainer.getFirstMappedPort());
        portfolioService.buyShares(1, "GameStop");

        String statement = portfolioService.printStatement();

        String scrubbedStatement = statement
                .replaceAll("\\d+\\.\\d+", "__.__")
                .replaceAll("\\d{2}/\\d{2}/\\d{4}", "__/__/____");
        assertEquals(
                "company | shares | current price | current value | last operation\n" +
                "GameStop | 1 | $__.__ | $__.__ | SOLD 1 on __/__/____\n",
                scrubbedStatement
        );
    }

}
```

Conclusion

- [x] It’s easy and quick to setup characterization tests with that scope using Testcontainers
- [x] Wo got some initial coverage —> safety net from the beginning
- [x] Good first step
- [ ] Step 2 likely to follow
  - [ ] Fast acceptance tests without MongoDB integration
  - [ ] Unit tests
  - [ ] Break more dependencies (Time, Price, …)
    to get more coverage

http://gph.is/1FA0WT1

Questions?

- References
  - https://www.testcontainers.org/
  - https://alcor.academy/code-renovation
  - https://giphy.com

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http://gph.is/2gWzAAh