

# Integration Tests with Testcontainers



# Things we love



← → C 🔒 start.spring.io ⌂ ⌃ ⌚ S ⌚

# spring® initializr

**Project**

- Maven Project
- Gradle Project

**Spring Boot**

- 3.0.0 (SNAPSHOT)
- 3.0.0 (M3)

**Language**

- Java
- Kotlin
- Groovy

**QUARKUS** | 2.9 io.quarkus.platform ▾

CONFIGURE YOUR APPLICATION

Group org.acme

Artifact code-with-quarkus

Build Tool Maven ▾

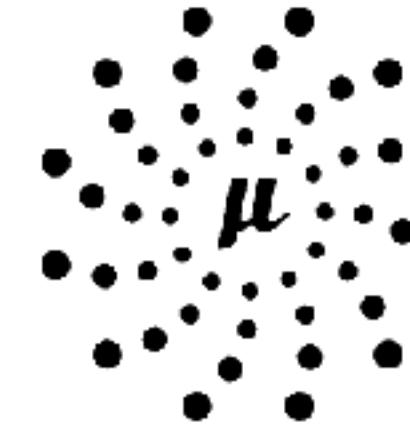
MORE OPTIONS

0 Gen

Filters:  mininitializr

GitHub Twitter

# MICRONAUT<sup>®</sup> LAUNCH



Application Type

- Micronaut Application

Java Version

- 11

Micronaut Version

- 3.5.1
- 3.5.2-SNAPSHOT
- 2.5.13

Language

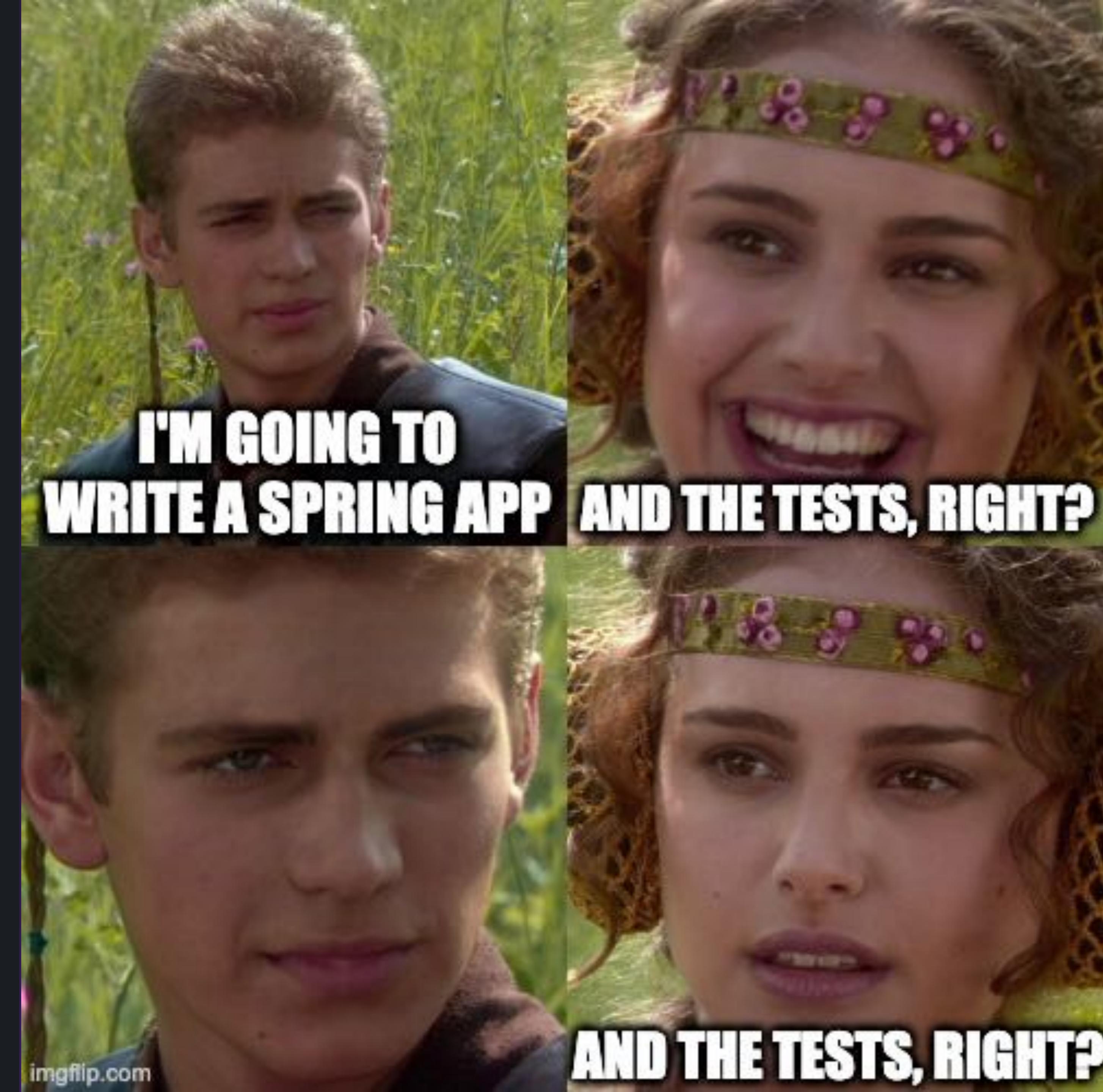
- Java
- Groovy
- Kotlin

Name demo

Build Tool

- Gradle
- Gradle Kotlin
- Maven

PREVIEW



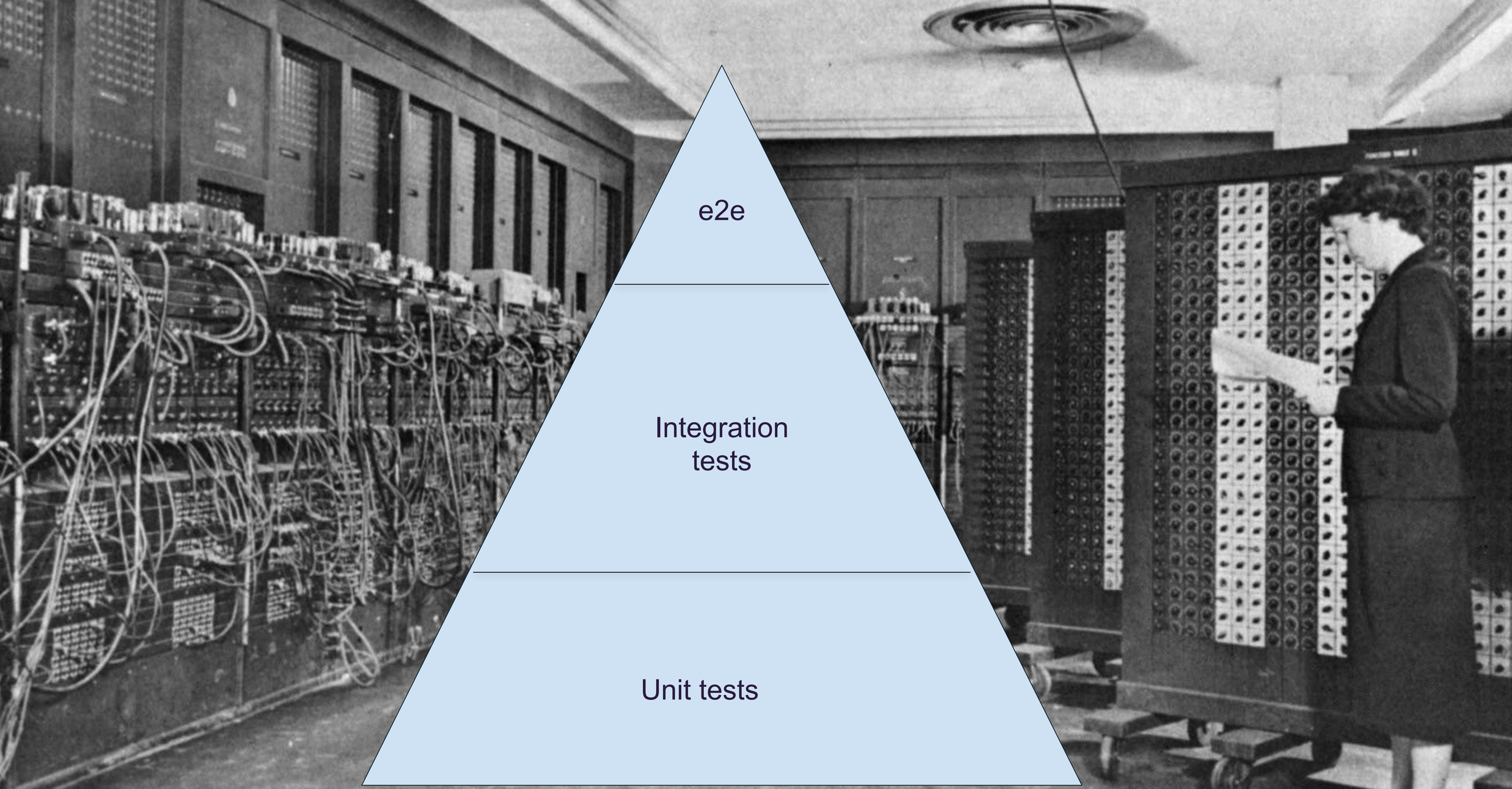
# Top things engineers wish they could spend less time on

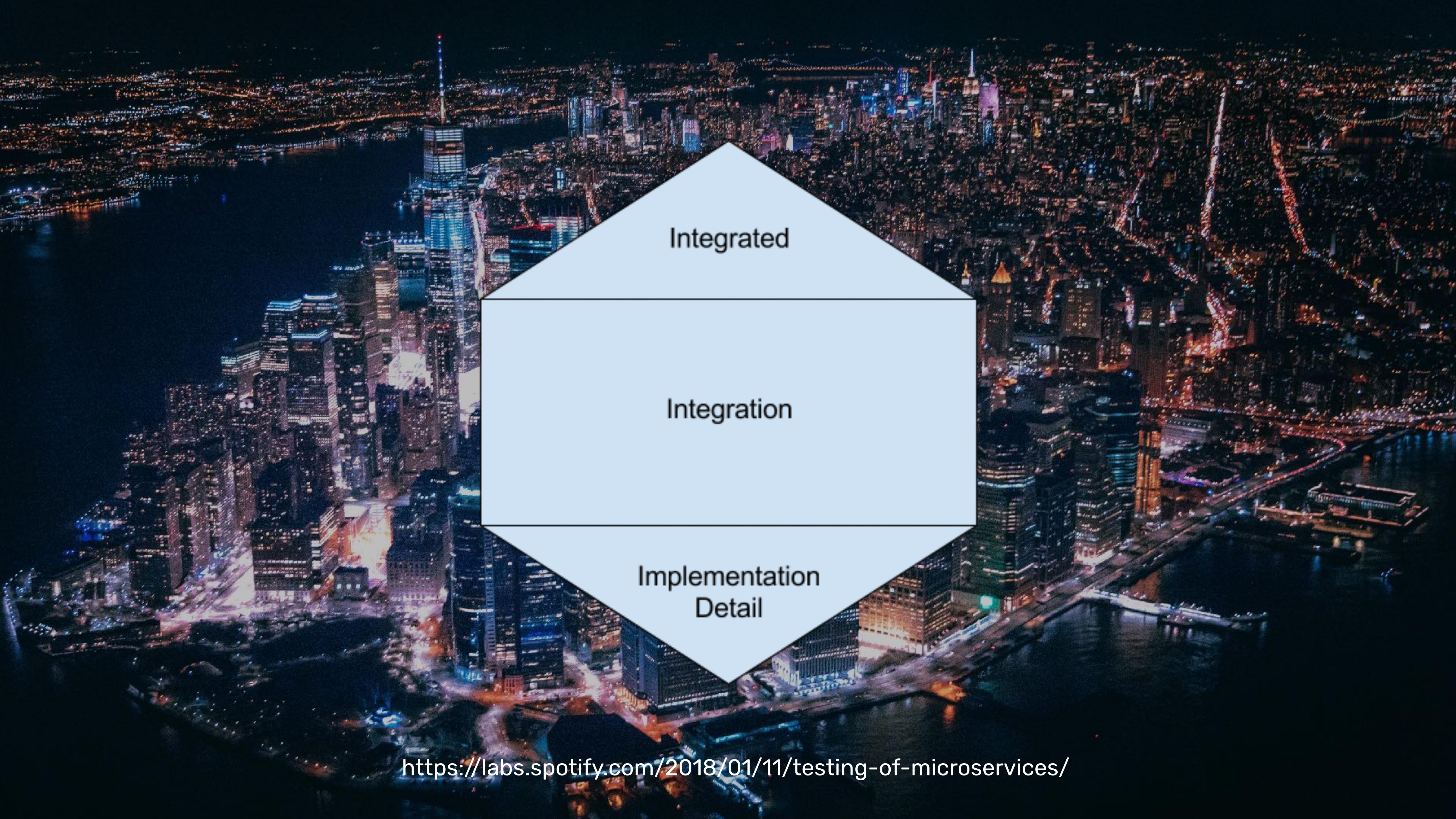
## Individual contributors

Testing changes (writing tests, manual testing, etc.)	37%
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## Senior and managing engineers

Testing changes (writing tests, manual testing, etc.)	32%
---	-----



The background of the slide is a high-angle, nighttime aerial photograph of the New York City skyline. The city is densely packed with skyscrapers, their windows glowing with lights. A river or bay is visible in the foreground, with several bridges spanning it. The overall atmosphere is dark and urban.

Integrated

Integration

Implementation  
Detail



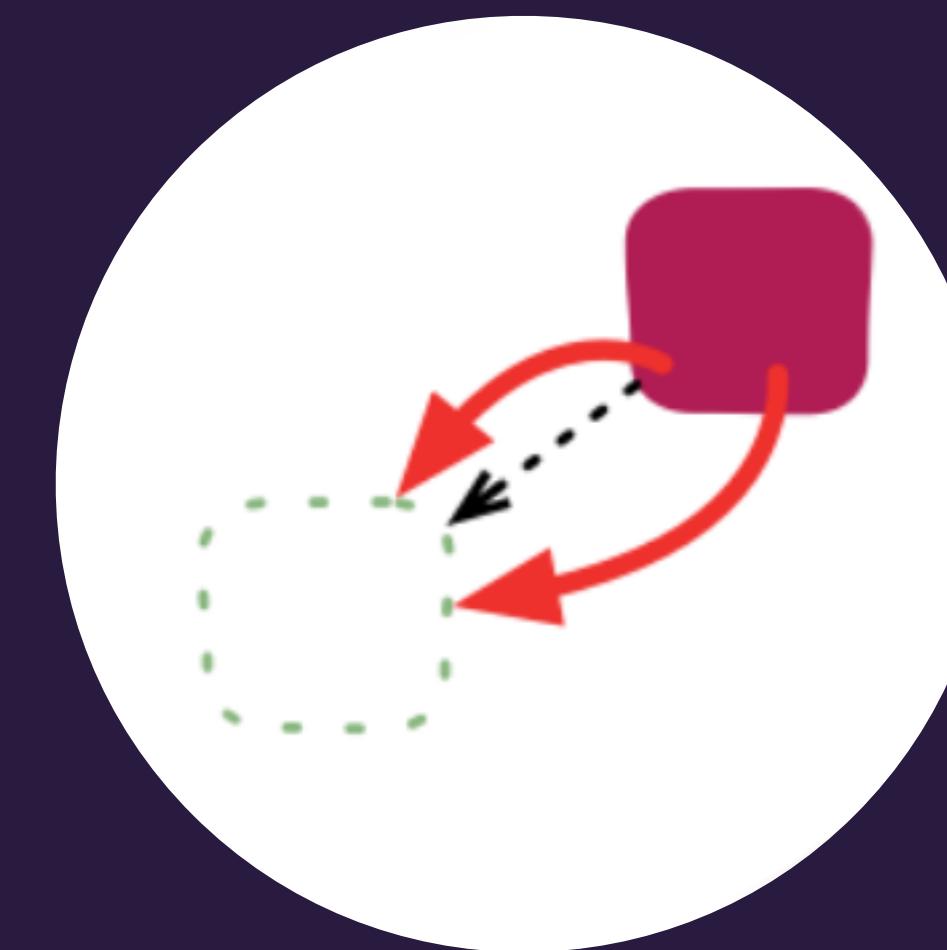
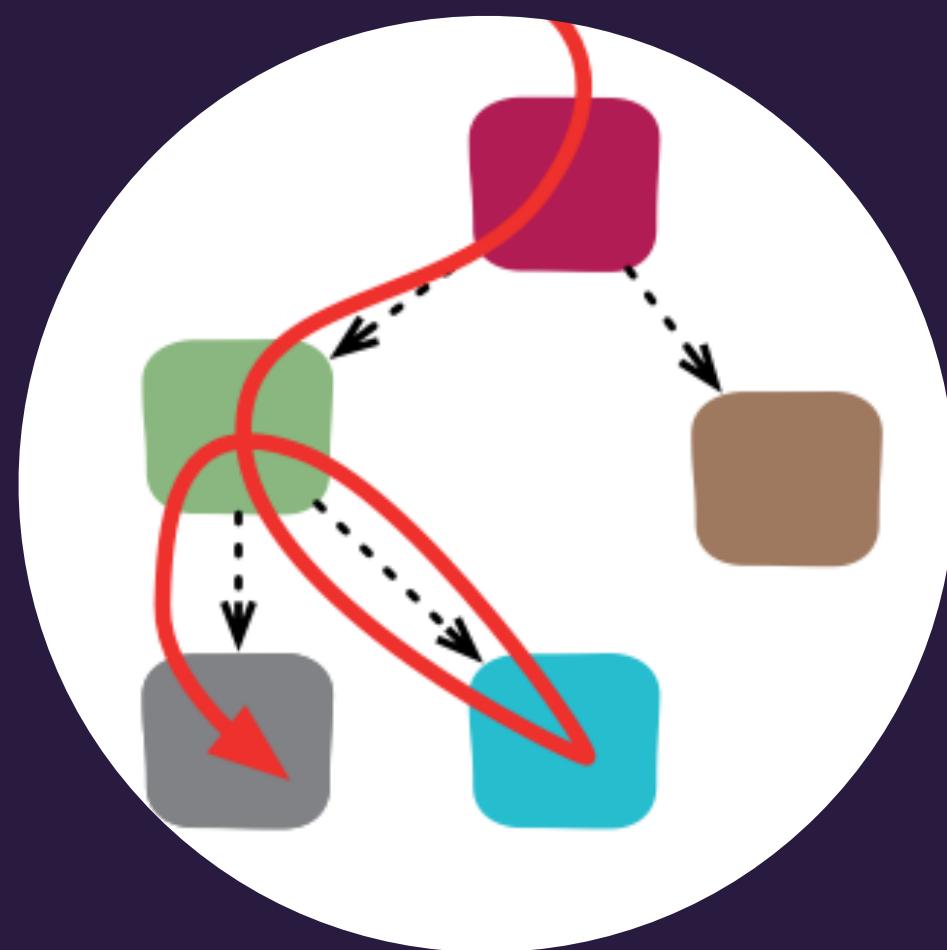
**Oleg Šelajev**  
Developer relations

 @shelajev

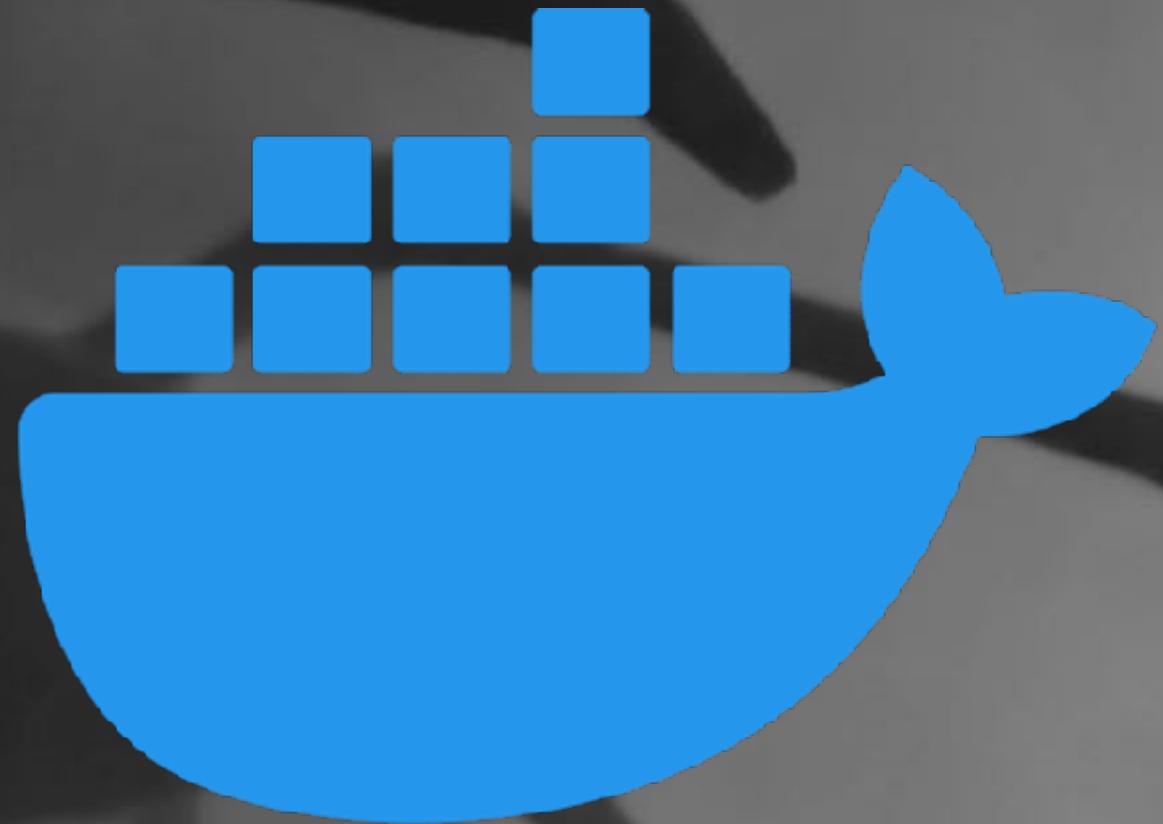
 [github.com/shelajev](https://github.com/shelajev)

 oleg@atomicjar.com





<https://martinfowler.com/bliki/IntegrationTest.html>



docker®



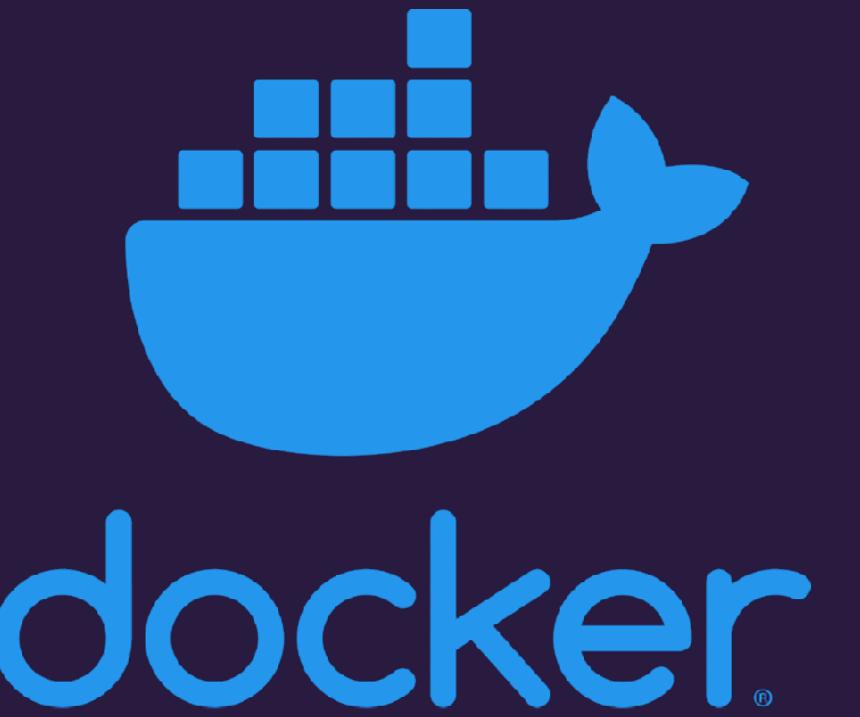
Installing  
apps

Running  
them  
in Docker

Running  
them  
in Docker

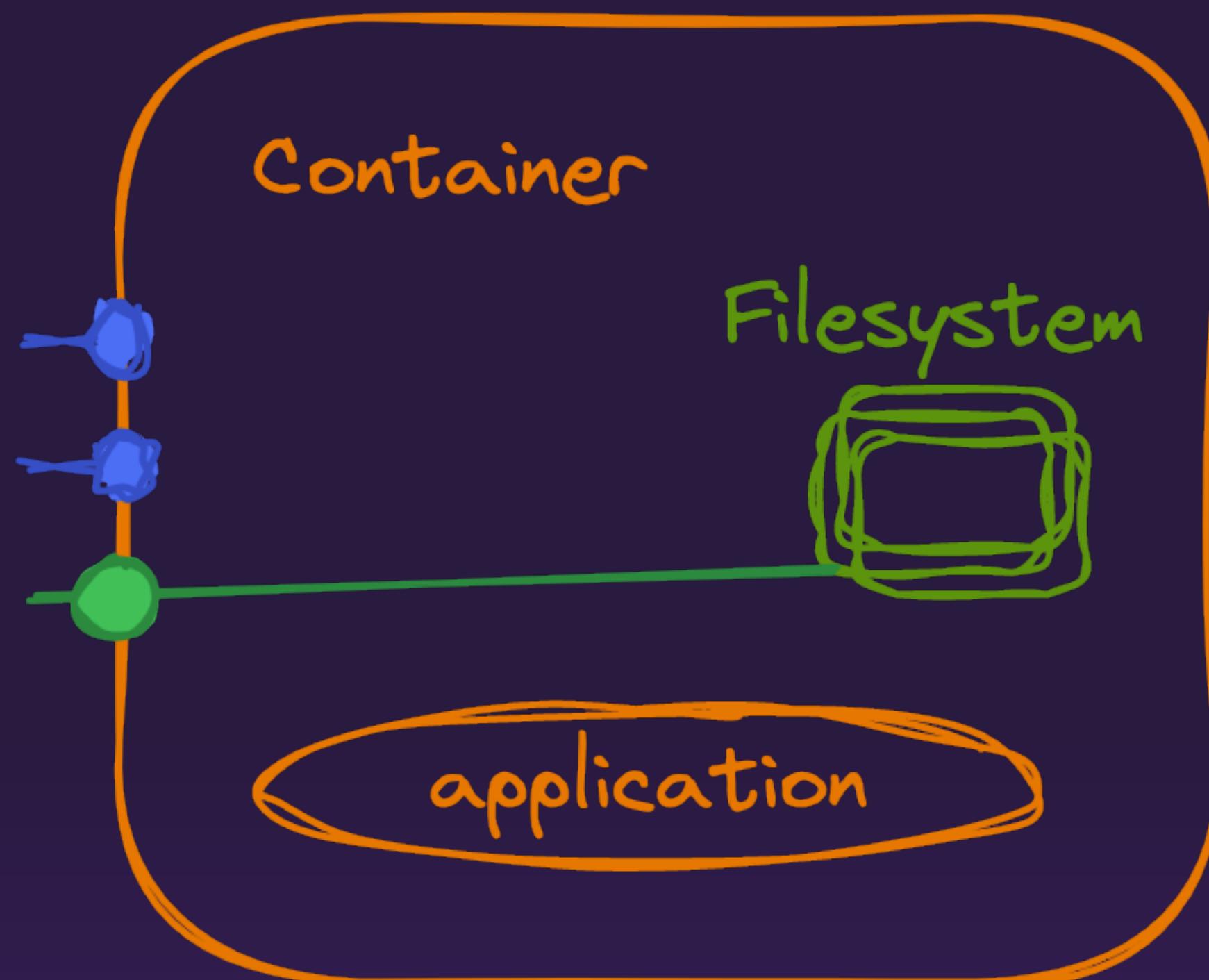


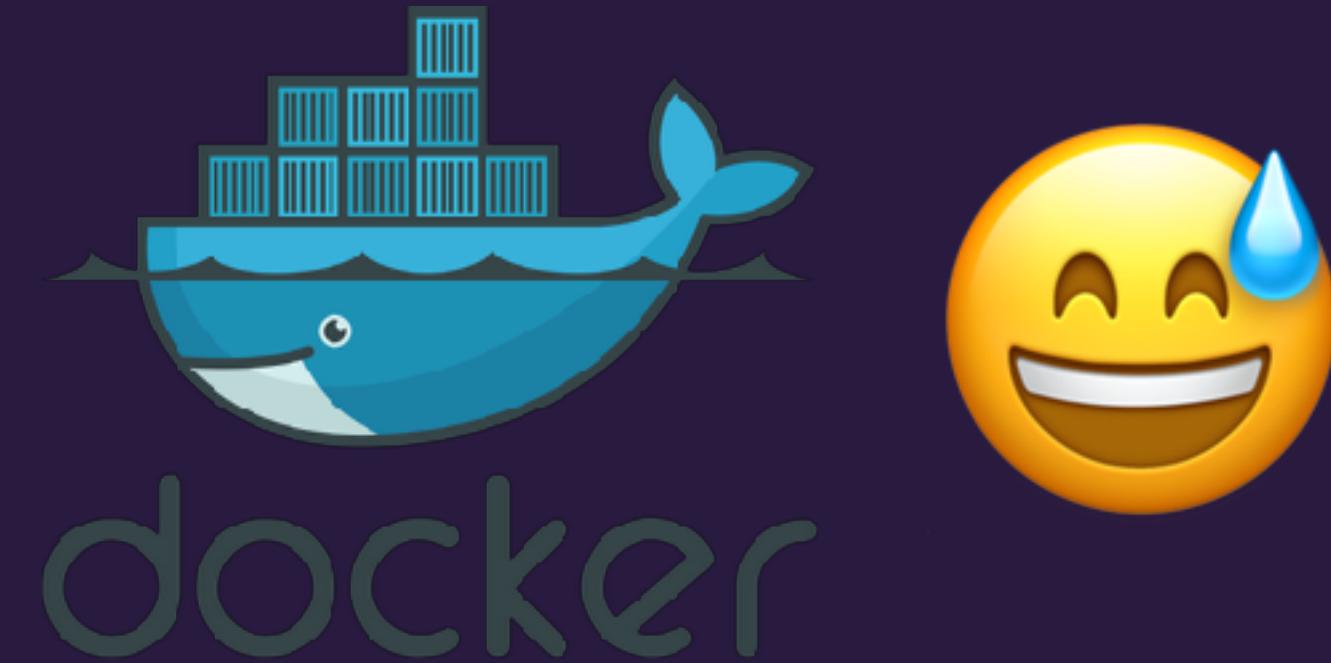
imgflip.com



```
docker pull image:tag  
docker run -p port:port name:tag
```

- Process isolation
- FileSystem, Network
- CPU/memory limits





- Configuring **multiple** services simultaneously
- **Flexibility** in creating test data or use-cases
- Separation of production & **test environments**
- **Dynamic configuration** of external mappings
- **Parallel** deployments

---

```
version: '2'  
services:  
  zookeeper:  
    image: confluentinc/cp-zookeeper:7.0.1  
    ports:  
      - "32181:32181"  
    environment:  
      ZOOKEEPER_CLIENT_PORT: 32181  
      ZOOKEEPER_TICK_TIME: 2000
```

```
kafka:  
  image: confluentinc/cp-kafka:7.0.1  
  ports:  
    - "29092:29092"  
  depends_on:  
    - zookeeper  
  environment:  
    KAFKA_BROKER_ID: 1  
    KAFKA_ZOOKEEPER_CONNECT:  
      zookeeper:32181  
    KAFKA_ADVERTISED_LISTENERS:  
      PLAINTEXT://localhost:29092  
  
    KAFKA_OFFSETS_TOPIC_REPLICATION_FACTOR:  
      : 1
```

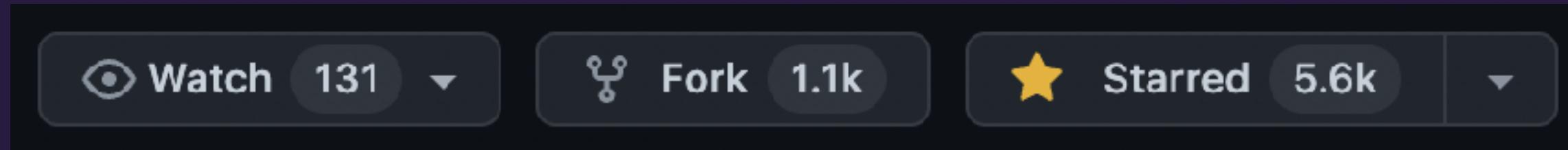


# Testcontainers

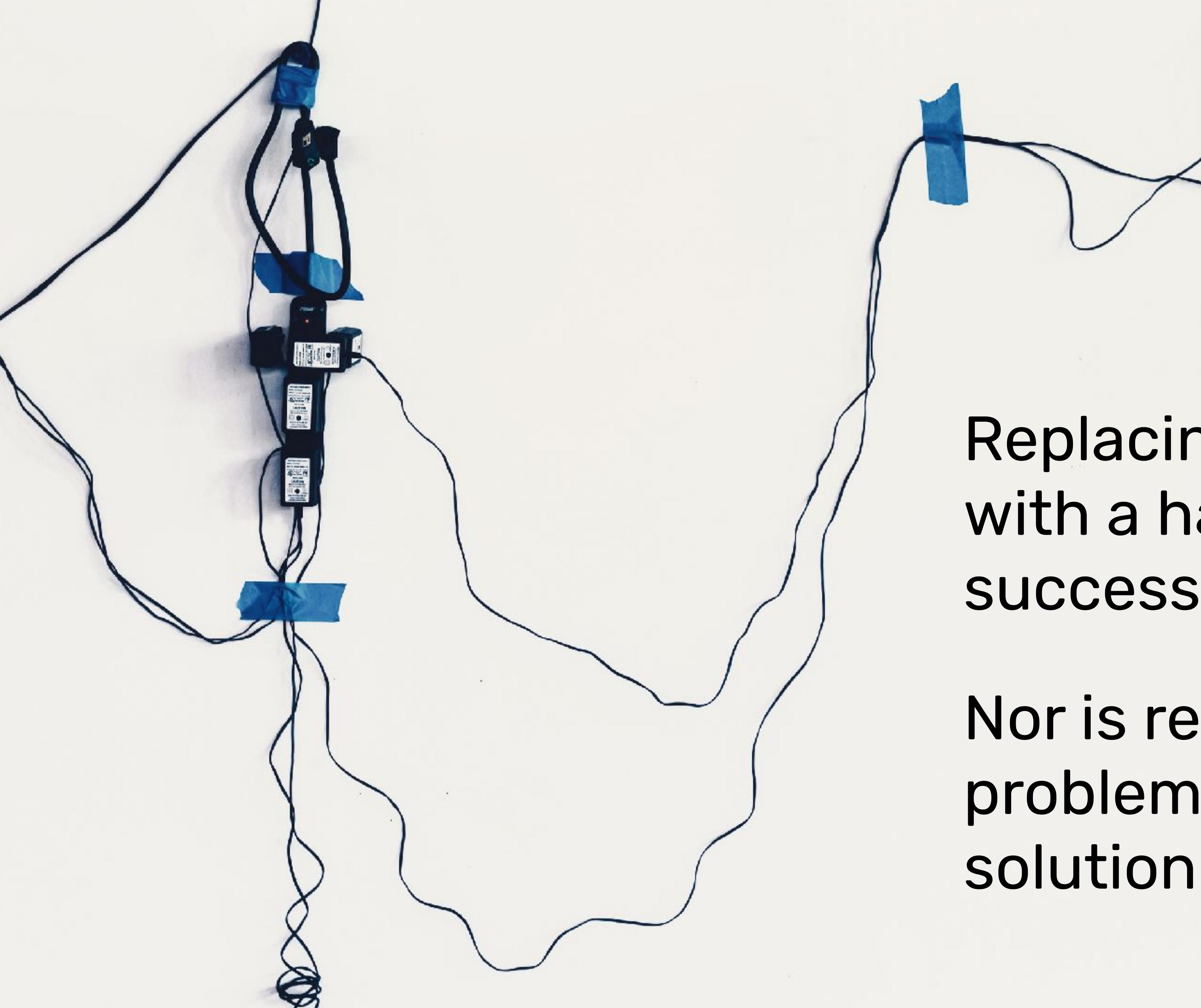
[testcontainers.org](https://testcontainers.org)

# Testcontainers-java

- Created 7 years ago
- [github.com/testcontainers/testcontainers-java](https://github.com/testcontainers/testcontainers-java)



- Uses **docker-java** API
- Integrates with frameworks, like Spring, JUnit
- Automatic Docker environment **discovery**
- Automatic **cleanup**



Replacing a hard problem  
with a hard solution is not  
success.

Nor is replacing an easy  
problem with an easy  
solution.

# System checks

i Checking the system...

- ✓ Docker version should be at least 1.6.0
- ✓ Docker environment should have more than 2GB free disk space
- ✓ File should be mountable
- ✓ A port exposed by a docker container should be accessible

# During

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
			NAMES		
1d086deb291b	postgres:14-alpine	"docker-entrypoint.s..."	6 seconds ago	Up 4 seconds	0.0.0.0:54663->5432/tcp, :::54663->5432/tcp
895dea775351	confluentinc/cp-kafka:5.4.3	"sh -c '#!/bin/bash\n...'"	23 seconds ago	Up 20 seconds	9092/tcp, 0.0.0.0:54459->2181/tcp, :::54459->2181/tcp, 0.0.0.0:54460->9093/tcp, :::54460->9093/tcp
9ba7b0670e6f	redis:6-alpine	"docker-entrypoint.s..."	35 seconds ago	Up 32 seconds	beautiful_shannon 0.0.0.0:54305->6379/tcp, :::54305->6379/tcp
6594984b1654	testcontainers/ryuk:0.3.3	"/app"	46 seconds ago	Up 44 seconds	0.0.0.0:54131->8080/tcp, :::54131->8080/tcp
d41d2					

# After

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES

## The problem

Port conflicts

Hard-coded scenarios

Slow tests

## Extra mile

Port randomization

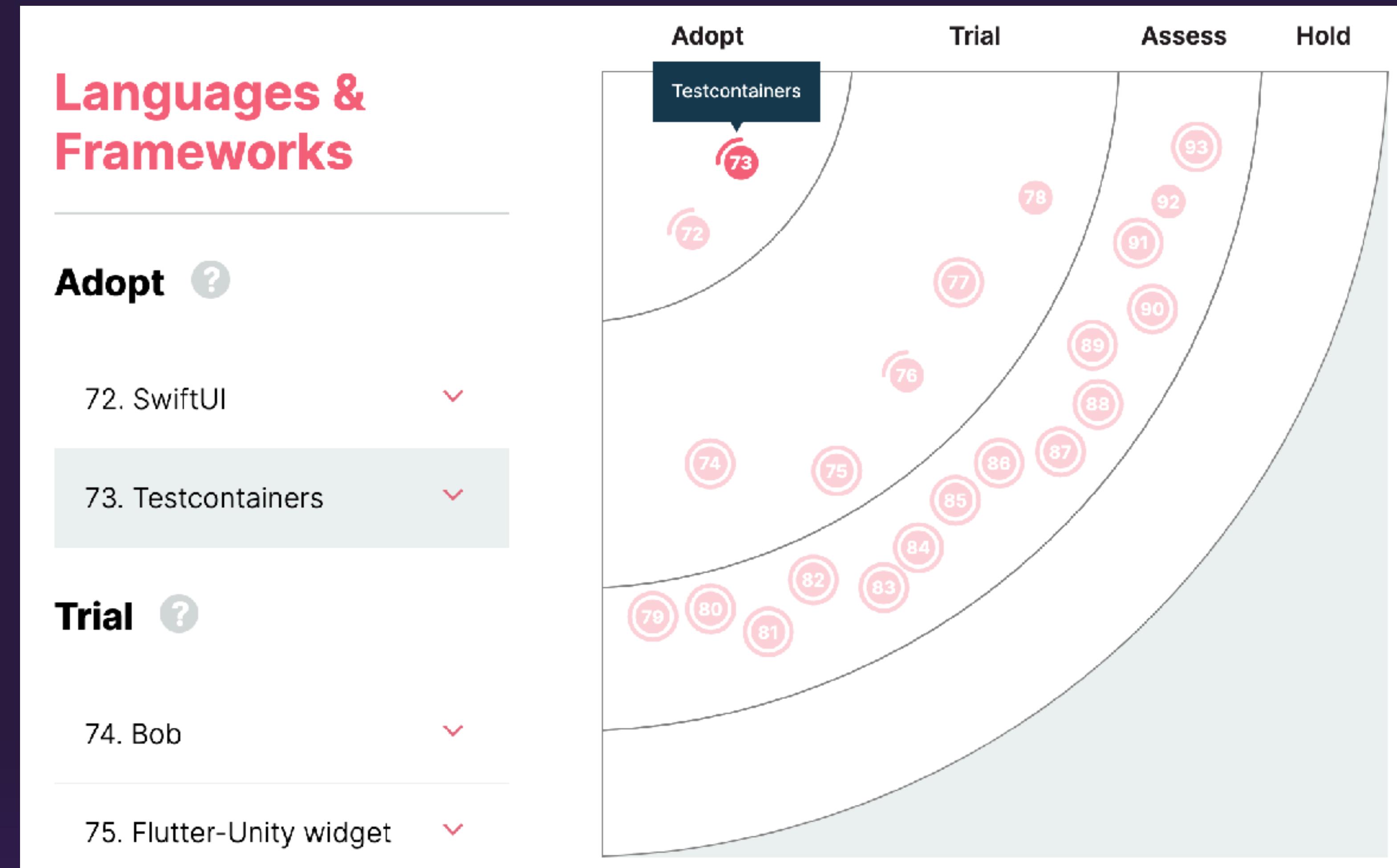
Data-driven tests

Parallelization



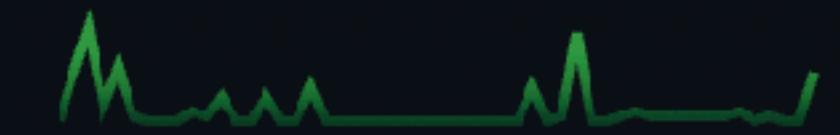
We think it's a useful **default** option for creating a **reliable environment** for running tests.

...  
Our teams have consistently found this library of **programmable**, **lightweight** and **disposable** containers to make functional tests more reliable.



## testcontainers-rs Public

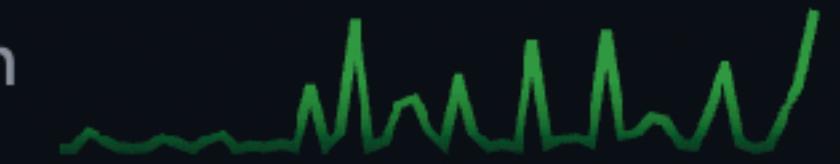
A library for integration-testing against docker containers from within Rust.



Rust ⭐ 173 📈 50 ⚡ 23 (5 issues need help) 🏁 6 Updated 2 hours ago

## testcontainers-java Public

Testcontainers is a Java library that supports JUnit tests, providing lightweight, throwaway instances of common databases, Selenium web browsers, or anything else that can run in a Docker container.



Java ⭐ 5,580 📈 MIT 📈 1,100 ⚡ 355 (26 issues need help) 🏁 106 Updated 2 hours ago

## testcontainers-scala Public

Docker containers for testing in scala



Scala ⭐ 479 📈 MIT 📈 83 ⚡ 16 🏁 2 Updated yesterday

## testcontainers-go Public

Testcontainers is a Golang library that providing a friendly API to run Docker container. It is designed to create runtime environment to use during your automatic tests.



Go ⭐ 1,190 📈 MIT 📈 172 ⚡ 51 🏁 20 Updated yesterday

## testcontainers-python Public

Python ⭐ 452 📈 Apache-2.0 📈 101 ⚡ 20 (3 issues need help) 🏁 22 Updated 3 days ago

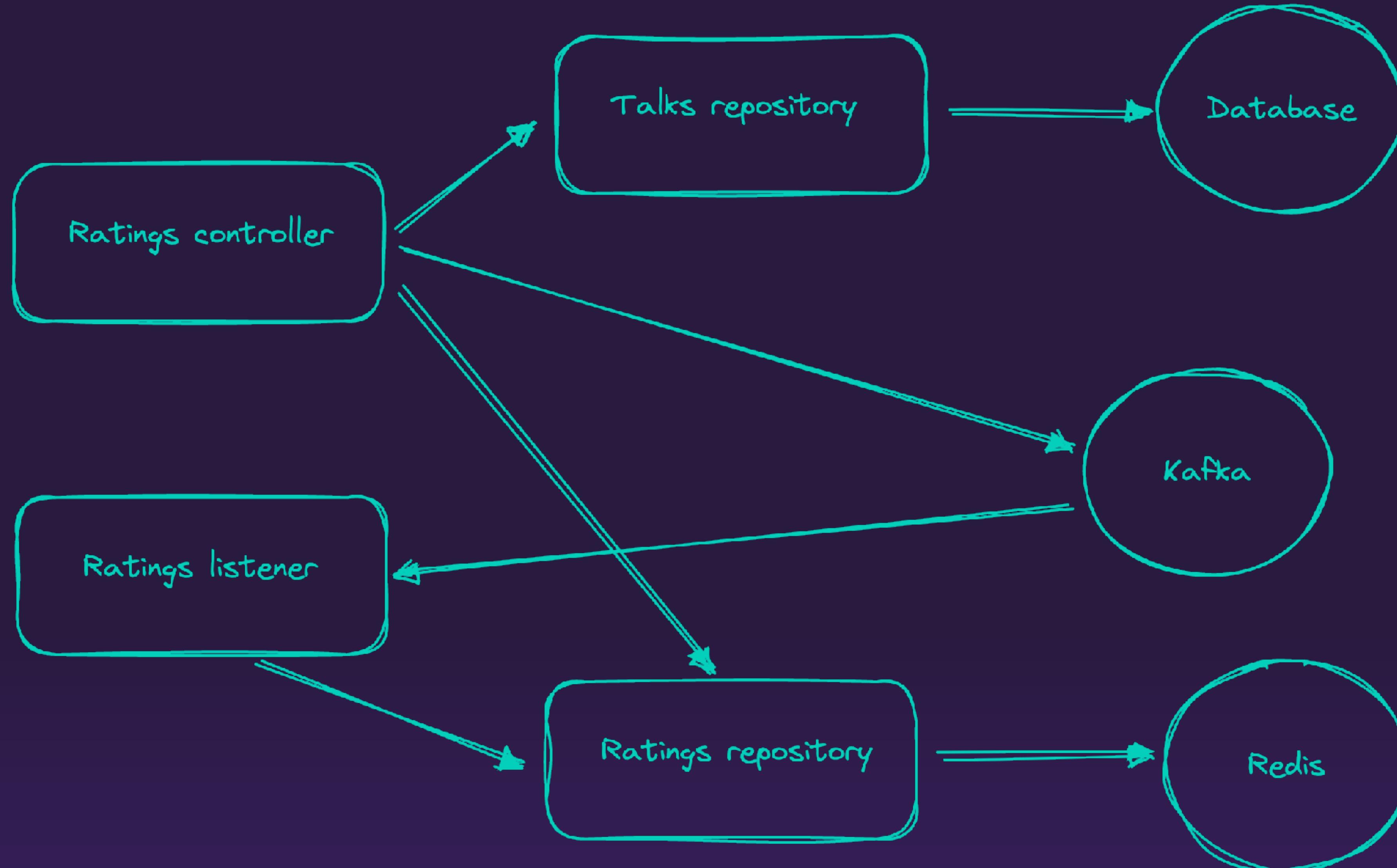




Show me the **code**

# Model:

```
record Rating (String talkId, Integer value) {}
```



**WHERE CODE**



# Investigate local development with devtools and testcontainers #29461

Open philwebb opened this issue on 19 Jan · 3 comments



philwebb commented on 19 Jan

Member

...

See  
[https://bsideup.github.io/posts/local\\_development\\_with\\_testcontainers/](https://bsideup.github.io/posts/local_development_with_testcontainers/). We might be able to automate some of this if devtools is being used.



6

## Assignees

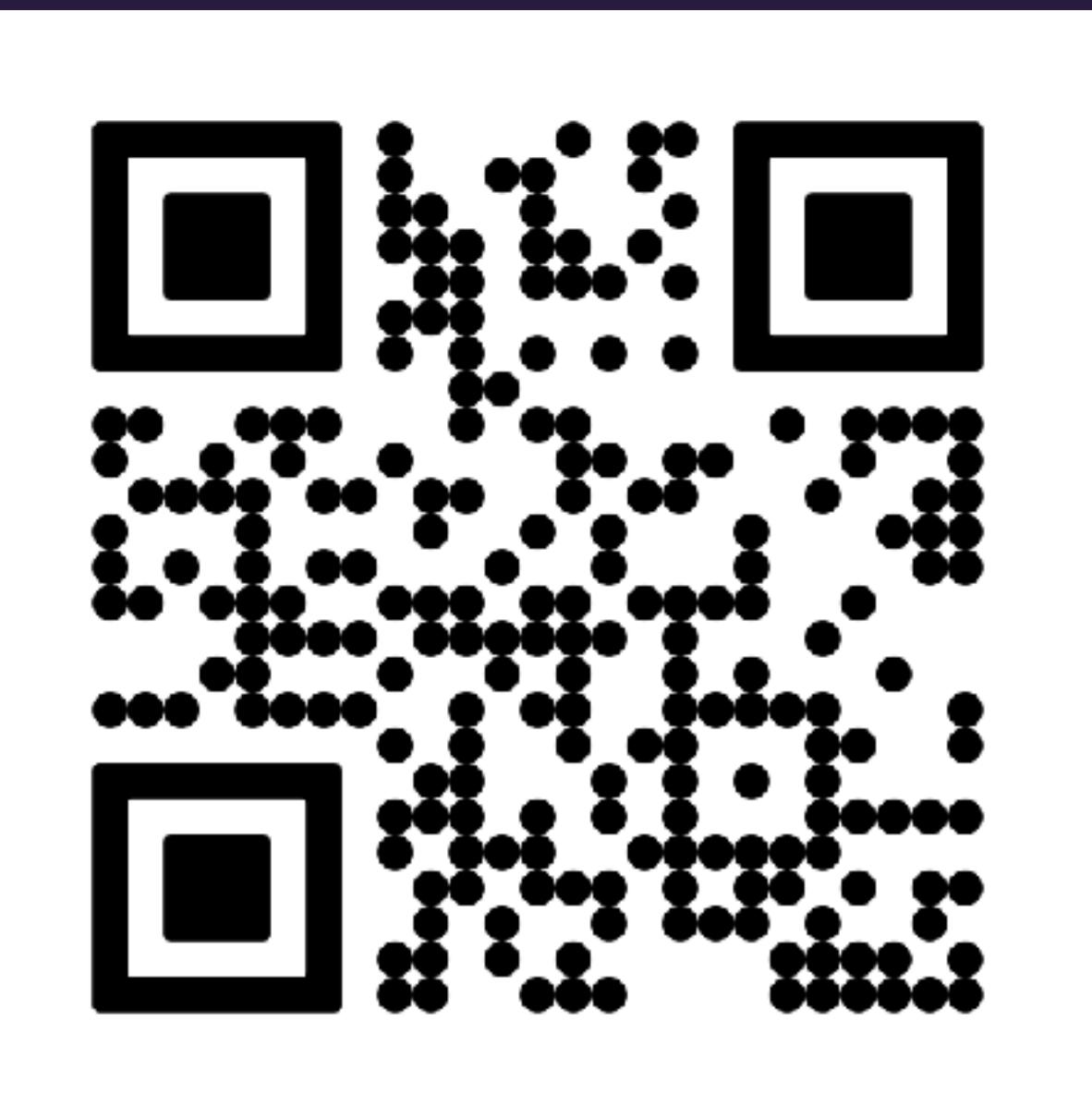
No one assigned

## Labels

type: enhancement

## Projects

None yet



# what's next?

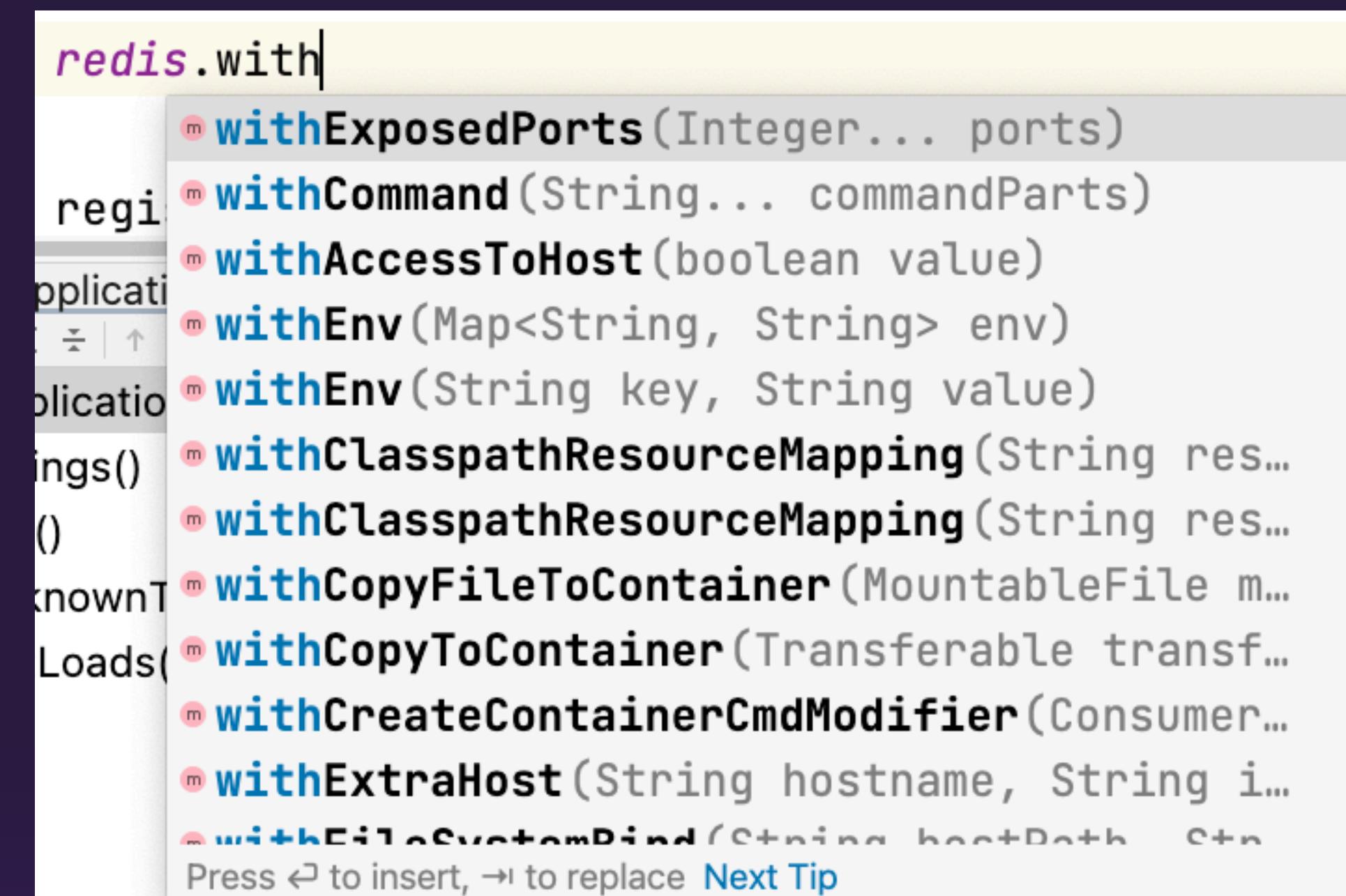
Reusable containers

Networks for more complex topologies

Custom **startup & waiting** strategies

Creating images **on-the-fly**

Logs, files, commands, limits...





**What to do if  
you have  
no Docker?**

# Docker environments

	Docker Desktop	Docker Machine	Minikube	Podman
Compatibility (more is better)	✓✓✓	✓✓	✓✓✓	?
Effort (less is better)	📦	📦	📦📦	📦📦📦
Performance (1 Kafka, in seconds)	3.81	3.69	3.91	-
Risks & comments		Deprecated		



# Testcontainers Cloud

Andy Wilkinson (@ankinson) **vmware**  
I had the good fortune of being asked to beta test Testcontainers Cloud. It's the real deal. Drop-in replacement for Docker Desktop and containers now start more quickly, both in Spring Boot's own build and tests of various Boot-based apps that I maintain. Impressive start.

Michael Simons (@rotnroll666) **neo4j**  
I have to say, @QuarkusIO dev-services combined with @testcontainers in the cloud via @AtomicJarInc is brilliant.  
No load for the containers on the local machine and config-free setup.

Sébastien Blanc (@sebi2706) **Red Hat**  
Replying to @rotnroll666 @QuarkusIO and 2 others  
Is this a real thing or just a (great) idea for now ?

Gerrit Meier (@meistermeier) **neo4j**  
Friends of Docker wormholes in CI, I have bad news for you: I just threw @AtomicJarInc @testcontainers cloud support into the build config and things(tm) are just working.

Max Rydahl Andersen (@maxandersen) **Red Hat**  
This should be interesting! Ever since @quarkusio introduced devservices that uses @testcontainers I've wondered how we could make it available for users without the machine power or even access to docker. Testcontainer cloud solves that problem.

Marouane Trabelsi (@\_tmarwen)  
One big step ahead in the Integration Testing space, one that haven't seen much innovation in a long time.  
Kudos @testcontainers and @AtomicJarInc

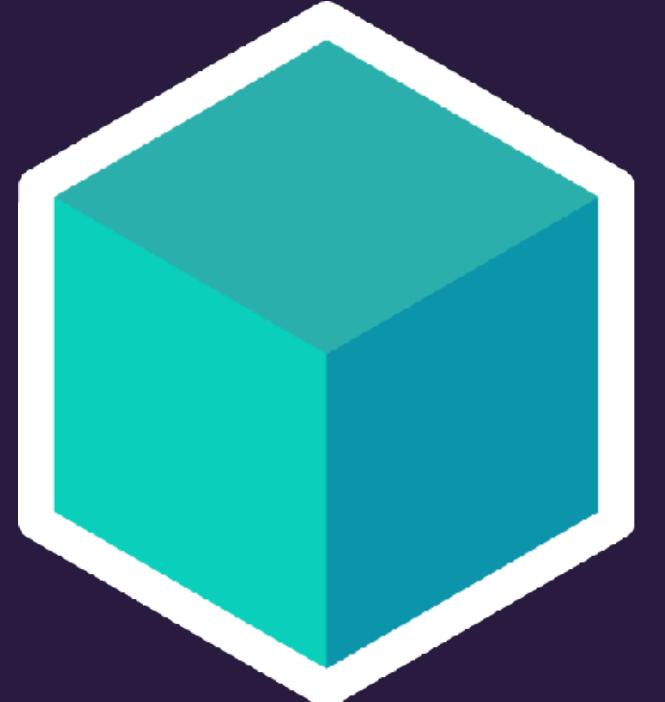
James Ward (@\_JamesWard) **Google**  
Holy amazing wowsers! The best improvement to developer productivity since docker has landed. I got hands on with Testcontainers Cloud yesterday and it blew me away. Local dev, test, and CI will never be the same. Forever better. Thank you @AtomicJarInc!

peter royal (@osi) **NETFLIX**  
Replies to @NayShins and @testcontainers  
you may be interested in what @AtomicJarInc is up to!

Julien Dubois (@juliendubois) **Microsoft**  
Congrats to the team!! That's a great idea.



# What's next?



- [www.testcontainers.org](http://www.testcontainers.org)



- [github.com/testcontainers/testcontainers-java](https://github.com/testcontainers/testcontainers-java)



- [github.com/testcontainers/workshop](https://github.com/testcontainers/workshop)

# Thanks!

[testcontainers/testcontainers-node](#) Public

[Code](#) [Issues 5](#) [Pull requests 4](#) [Discussions](#) [Actions](#) [Projects 1](#) ...

[master](#) [Code](#) [About](#)

github-actions v8.7.1 ... 5 days ago 528

.github Update bug\_report.md 13 days ago

.husky Refactor components into smaller m... 9 months ago

fixtures Migrate to official @balena/dockerig... 24 days ago

src Make Kafka containers reusable (#3...) 5 days ago

.eslintrc.js Load registry auth information (#179) 16 months ago

TestContainers is a NodeJS library that supports tests, providing lightweight, throwaway instances of common databases, Selenium web browsers, or anything else that can run in a Docker container.

docker node testcontainers

Readme MIT License

[testcontainers/testcontainers-go](#) Public

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mdelapenya Merge pull request #429 fro... 12 hours ago 637

.github Merge pull request #401 from testco... 16 days ago

docs chore: update branding 23 hours ago

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tillahoffmann and naomielst Update do... 10 days ago 439

.github/workflows General maintenance and tidying to ... 24 days ago

docs Added ClickHouse support (#173) 17 days ago

requirements Update docker version. (#203) 10 days ago

testcontainers Reduce log level to prevent log file p... 12 days ago

tests Add compose exec\_in\_container me... 17 days ago

Testcontainers is a Python library that providing a friendly API to run Docker container. It is designed to create runtime environment to use during your automatic tests.

python testing database

selenium python3

testcontainers

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meistermeier Enable Neo4j labs plugin definition. (#5035) ... yesterday 3,400

.circleci Remove ciMate (#3631) 15 months ago

.github Use collapse-after for dependencies category ... 9 days ago

Testcontainers is a Java library that supports JUnit tests, providing lightweight, throwaway instances of common databases, Selenium web browsers, or anything else that can run in a Docker container.