

An aerial photograph of a city, likely Barcelona, showing a dense urban landscape with numerous buildings of varying heights and colors. The sky is a clear, pale blue. The text is overlaid on the image in a large, white, sans-serif font.

# Testcontainers and SpringBoot: from integration tests to local development



**Things we love**





Project

- ☒ Maven Project
- ☐ Gradle Project

Language

- ☒ Java
- ☐ Kotlin
- ☐ Groovy

Spring Boot

- ☐ 3.0.0 (SNAPSHOT)
- ☐ 3.0.0 (M3)
- ☐ 2.7.1 (SNAPSHOT)
- ☒ 2.7.0
- ☐ 2.6.9 (SNAPSHOT)
- ☐ 2.6.8

Project Metadata

Group

Artifact

Dependencies

ADD ... ⌘ + B

No dependency selected



GENERATE ⌘ + ↵

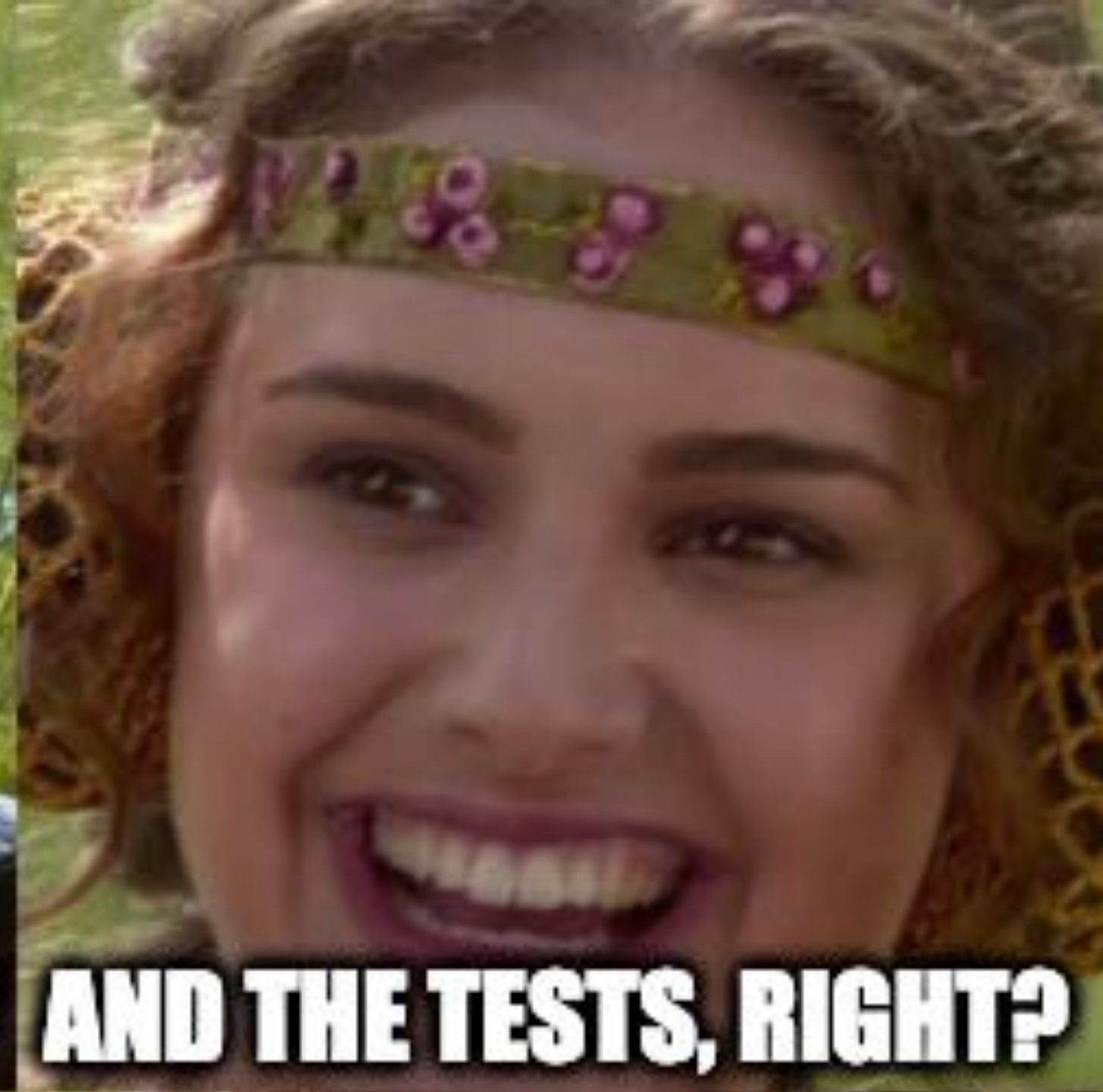
EXPLORE CTRL + SPACE

SHARE...

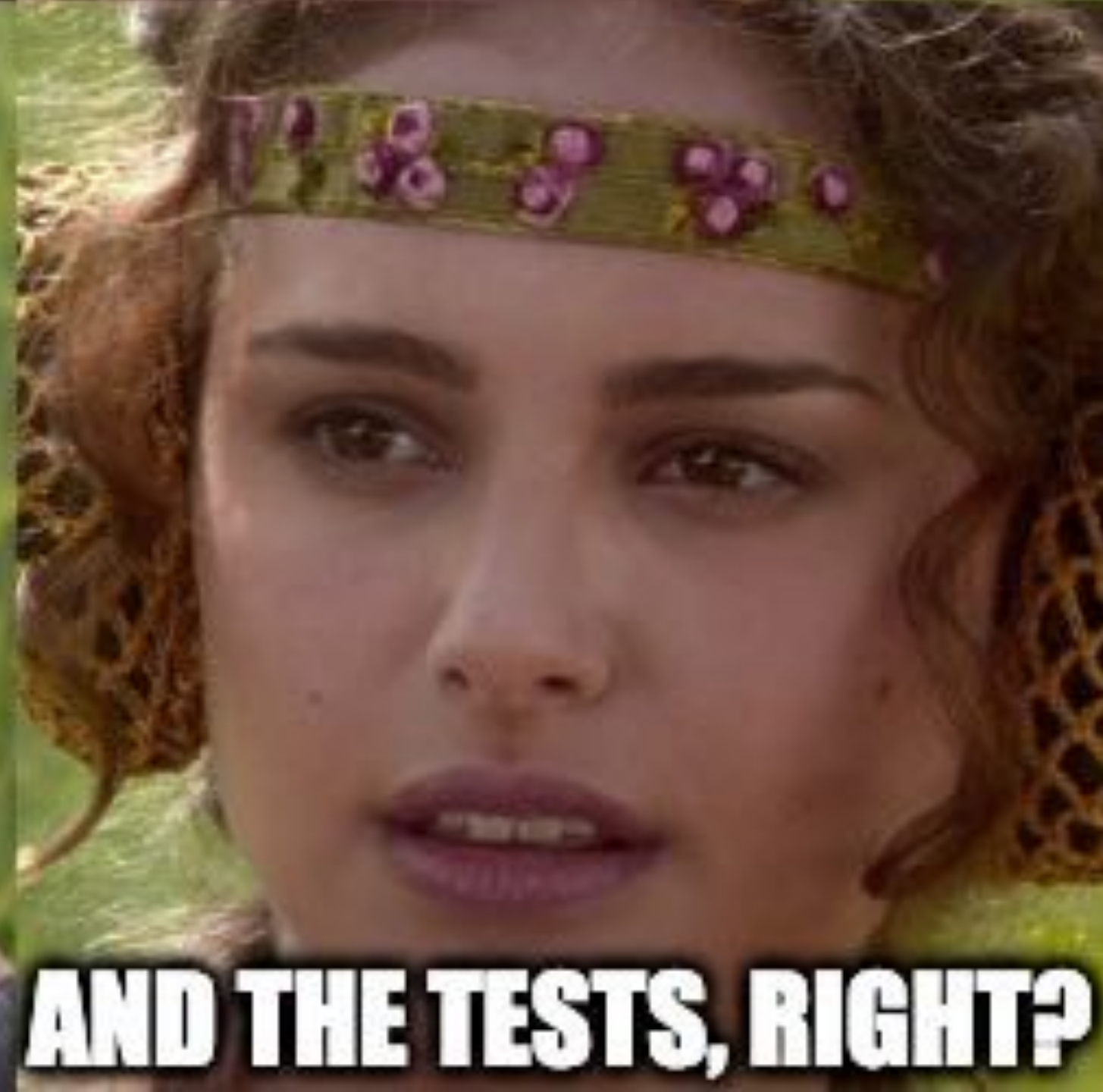




**I'M GOING TO  
WRITE A SPRING APP**



**AND THE TESTS, RIGHT?**



**AND THE TESTS, RIGHT?**



# Top things engineers wish they could spend less time on

## Individual contributors

Testing changes (writing tests, manual testing, etc.)	37%
---	-----

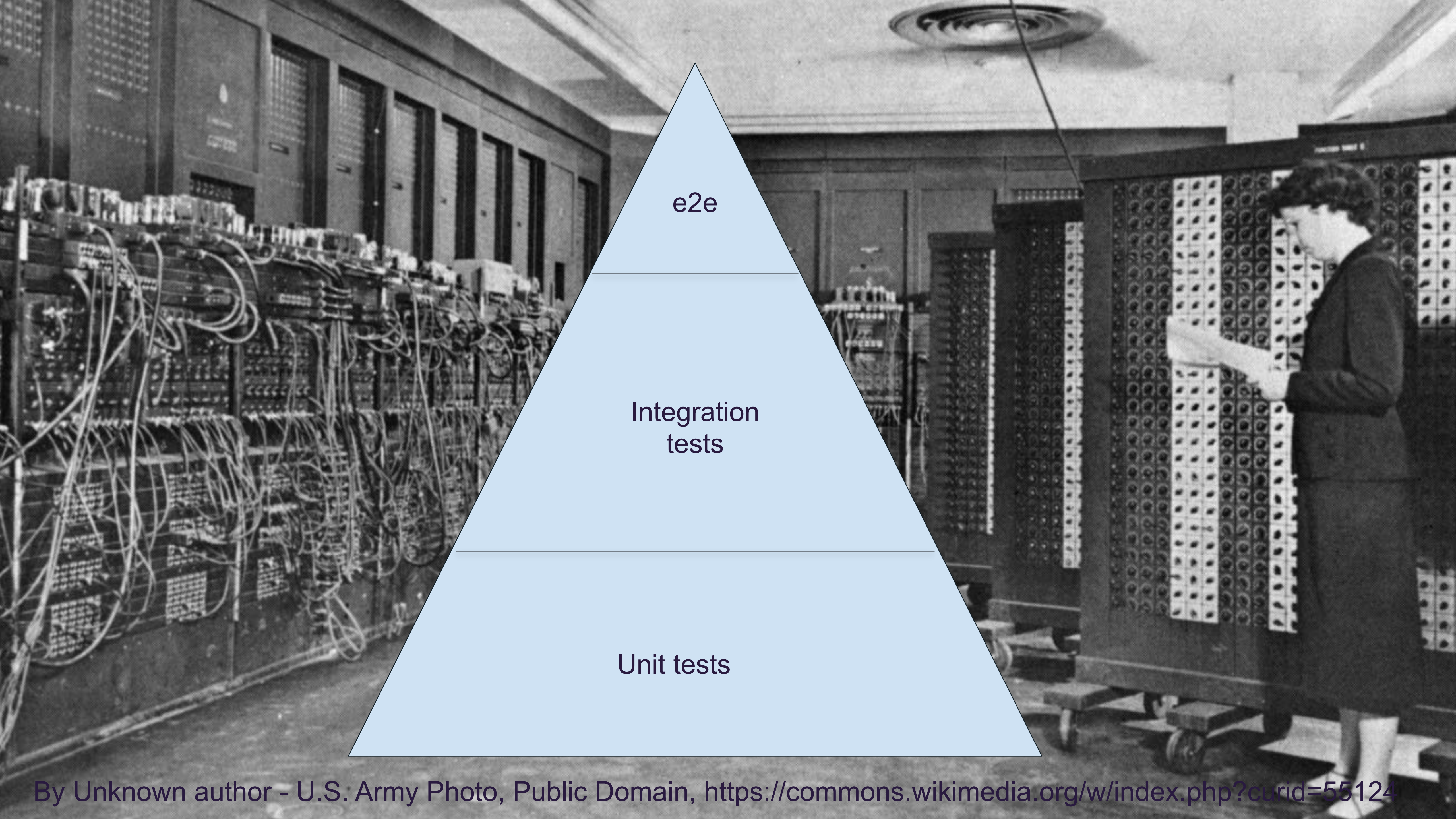
Testing changes (writing tests, manual testing, etc.)	37%
---	-----

## Senior and managing engineers

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

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



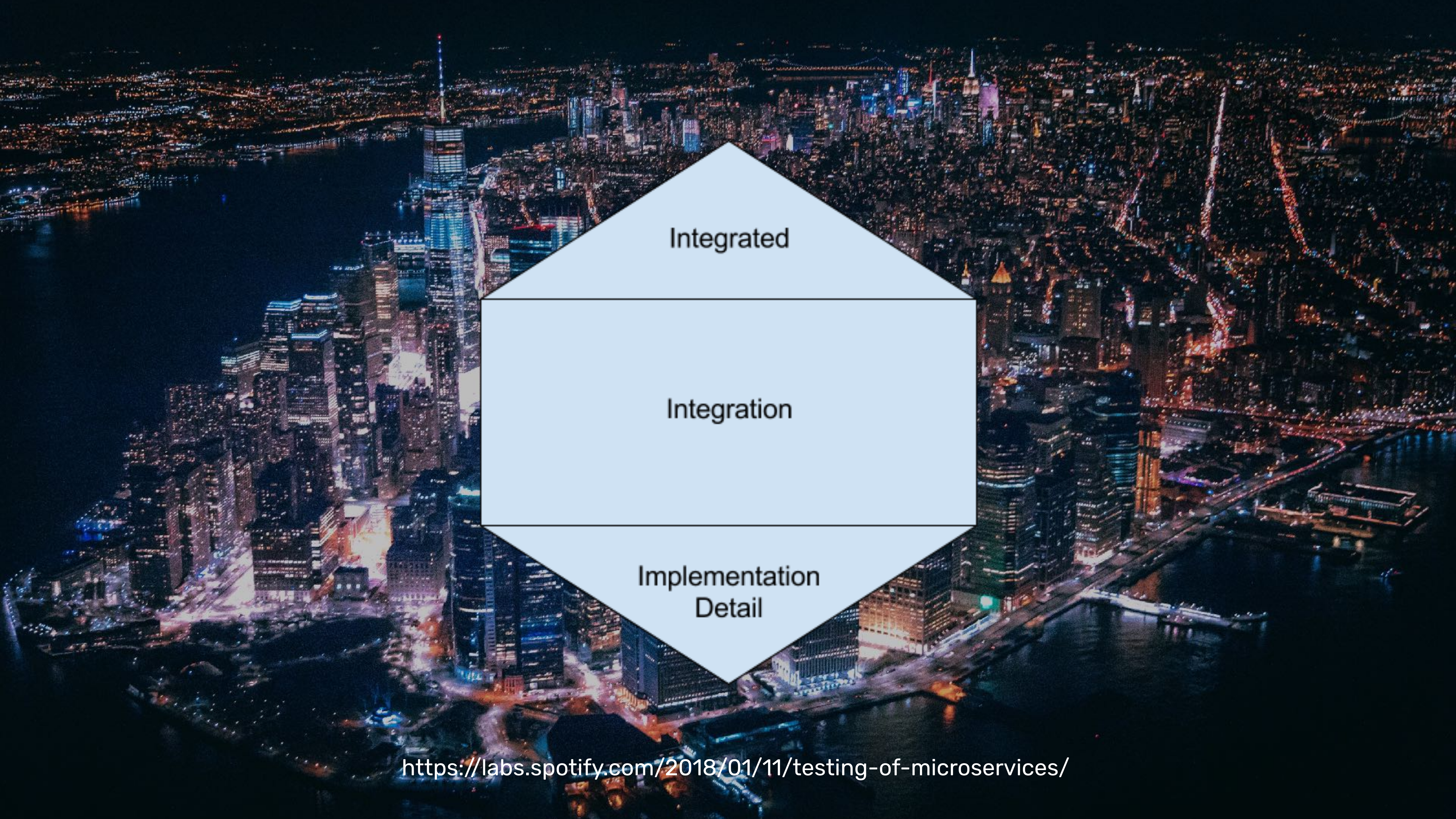


e2e

Integration  
tests

Unit tests



An aerial night photograph of New York City, showing a dense grid of illuminated skyscrapers and streets. A large white diamond shape is superimposed over the center of the image, containing three text labels. The diamond is oriented with its vertices pointing towards the top, bottom, left, and right.

Integrated

Integration

Implementation  
Detail





**Oleg Šelajev**

Developer relations

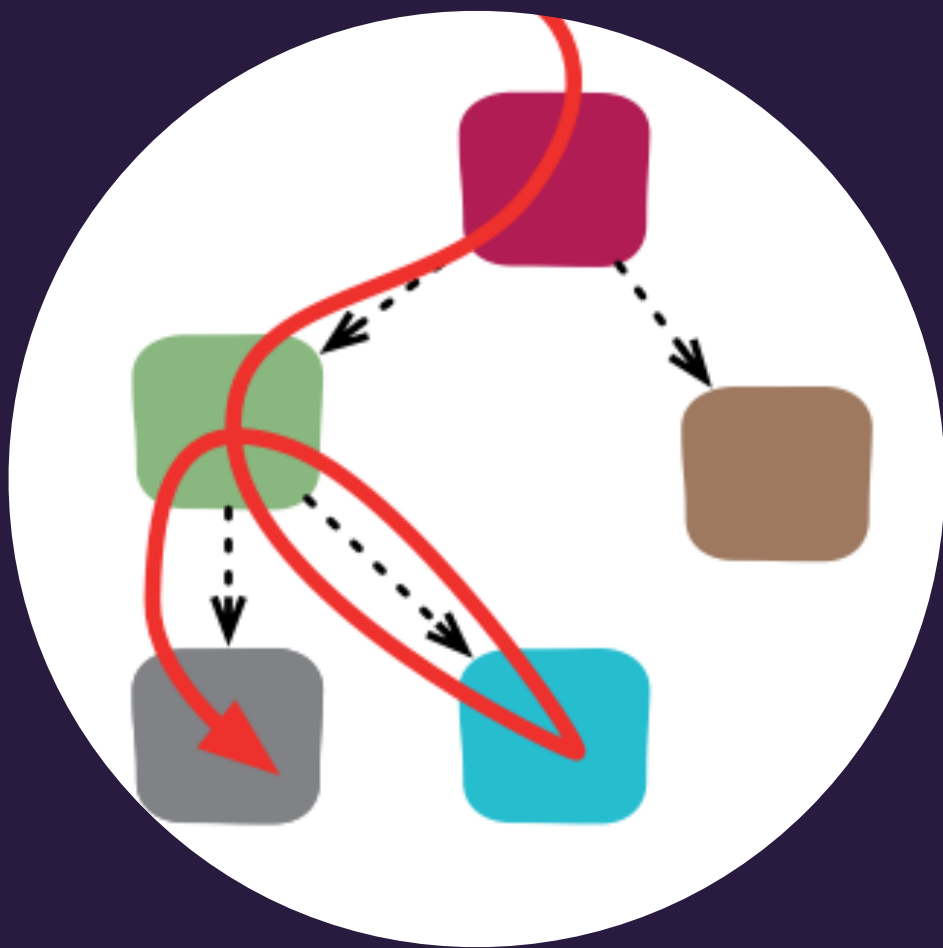
 @shelajev

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

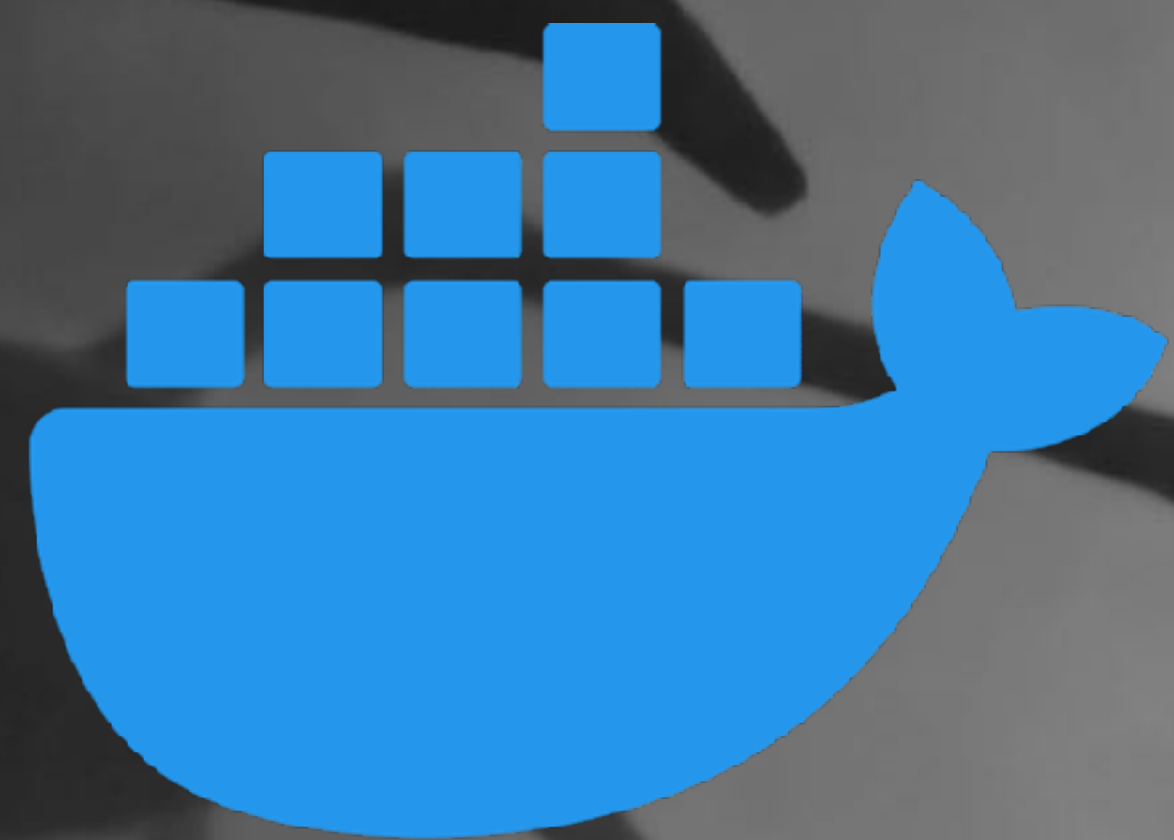
 oleg@atomicjar.com











docker®







**IT WORKS ON MY MACHINE**



**THEN WE'LL SHIP YOUR MACHINE**



**AND THAT IS HOW DOCKER WAS BORN**



**Installing  
apps**



**Running  
them  
in Docker**

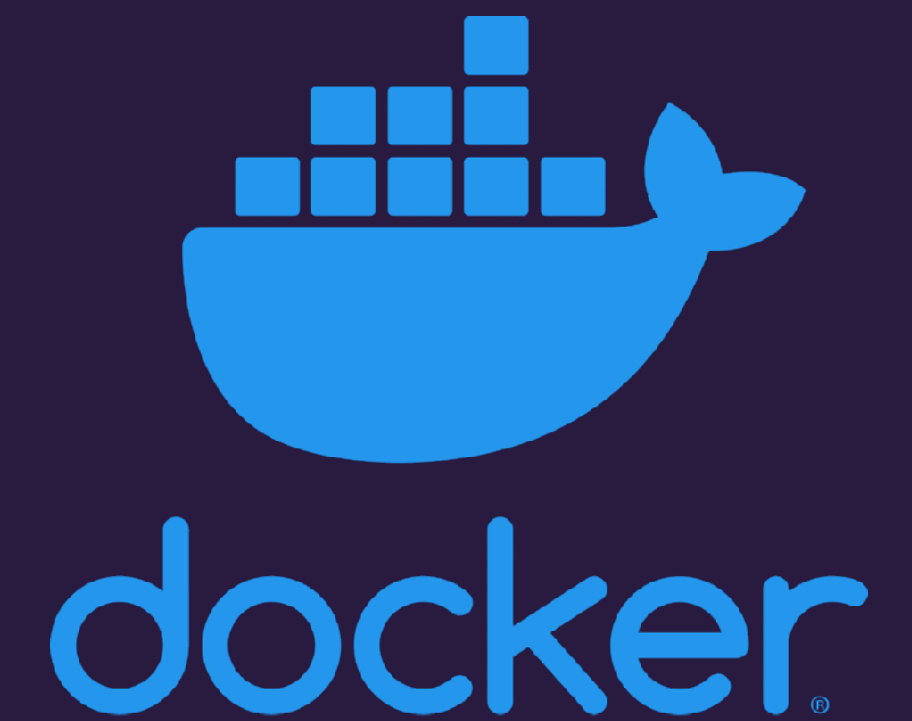




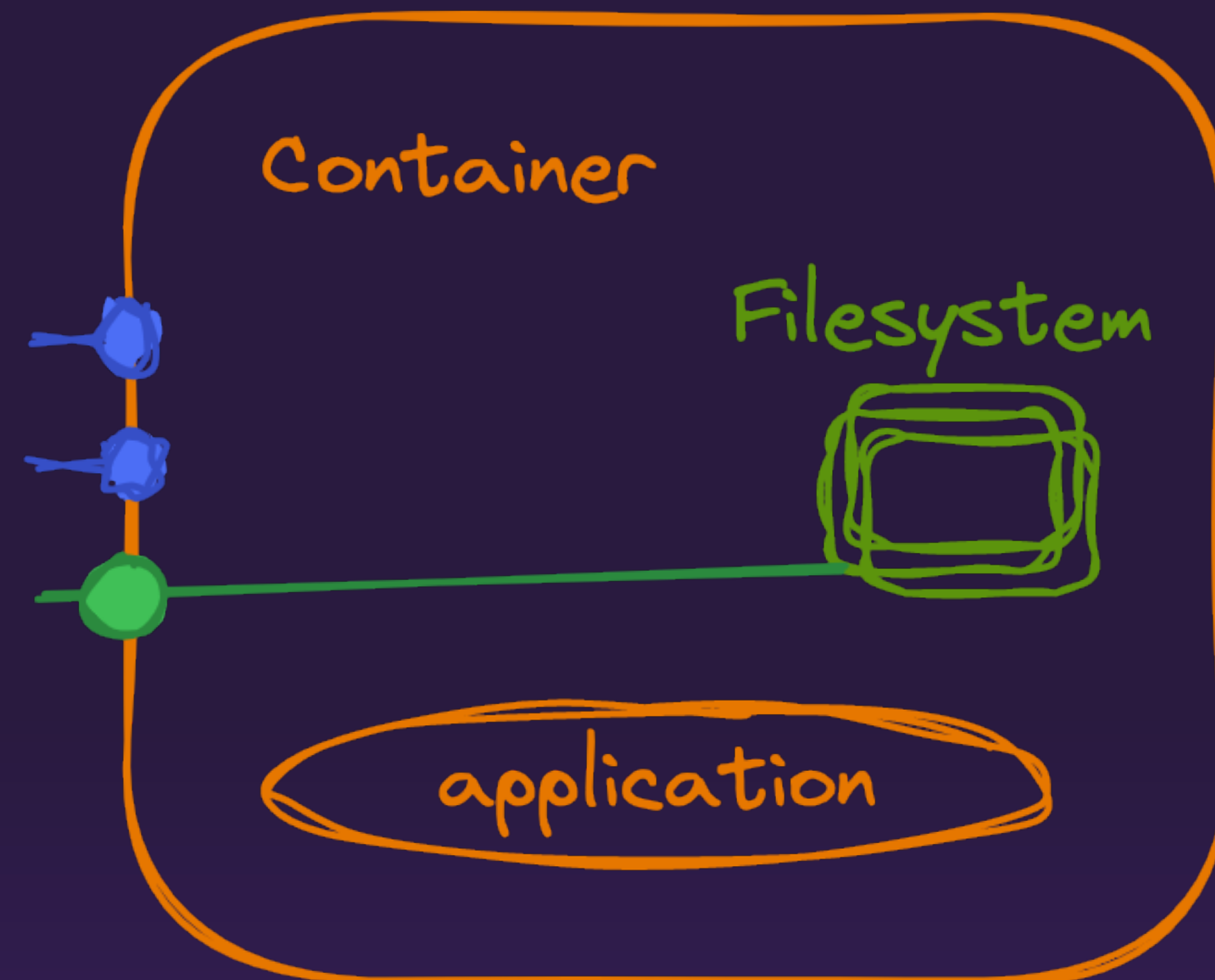
**Running  
them  
in Docker**



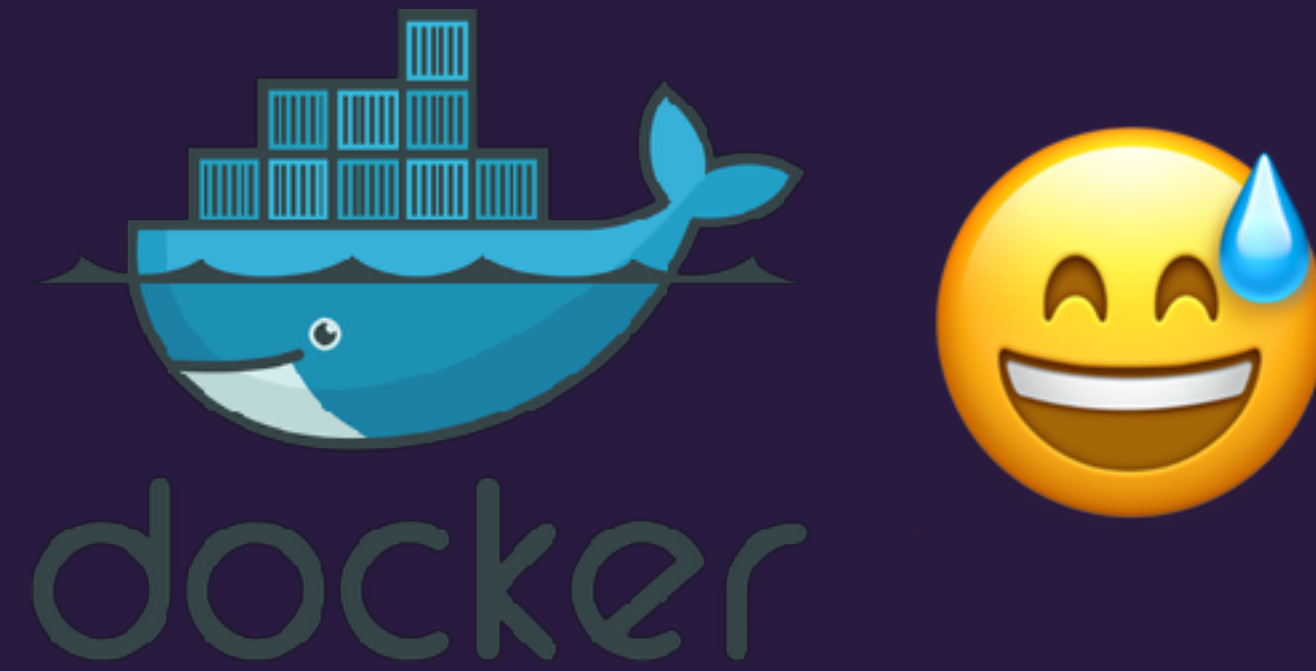
```
docker pull image:tag  
docker run -p port:port name:tag
```



- 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



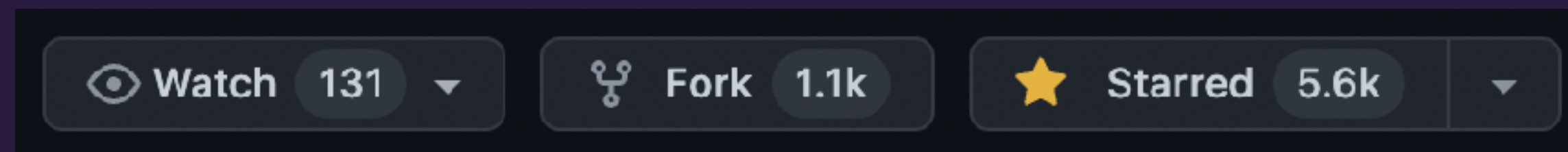


# Testcontainers

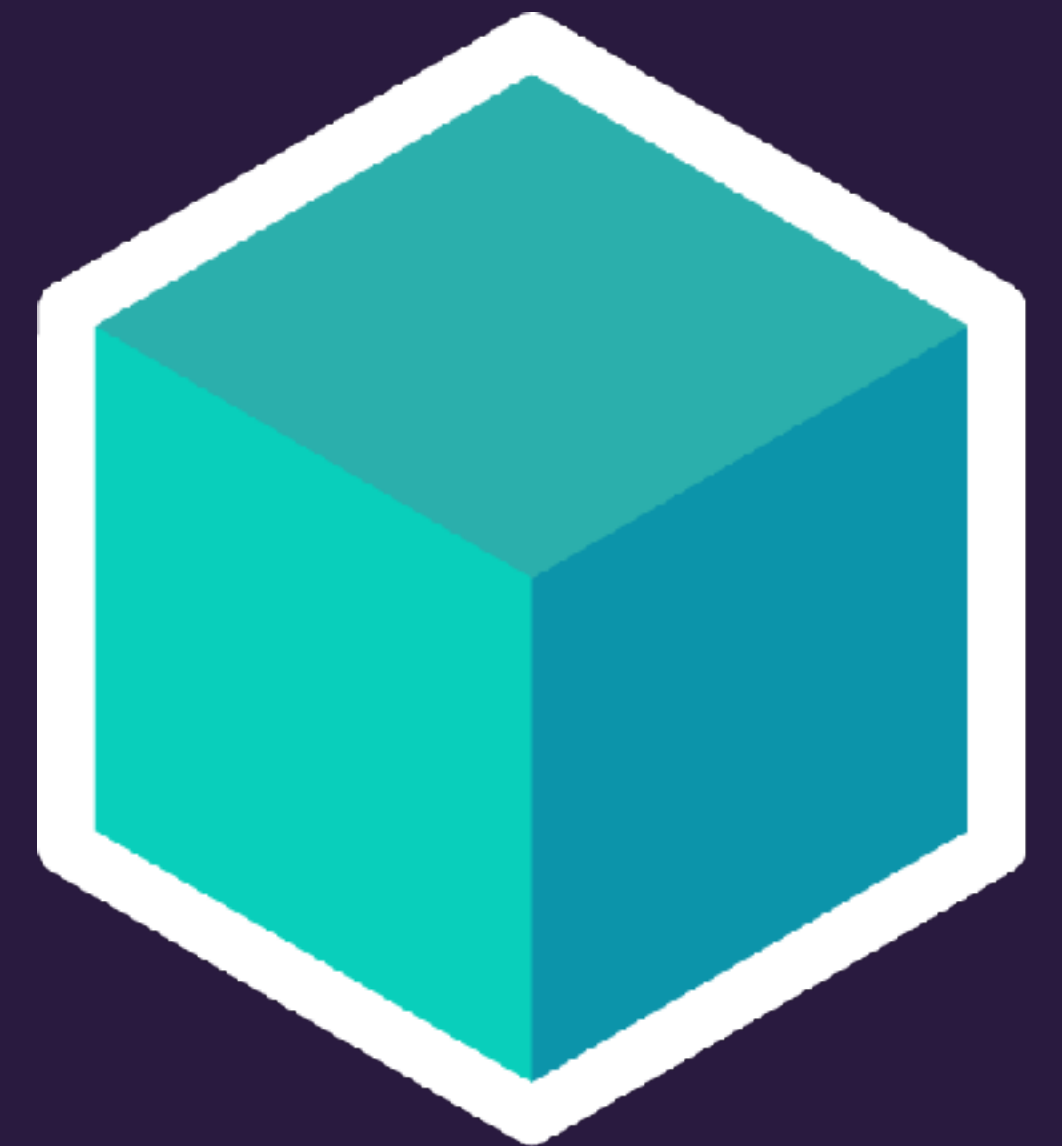


# Testcontainers-java

- 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
1d086deb291b	postgres:14-alpine	"docker-entrypoint.s..."	6 seconds ago	Up 4 seconds	0.0.0.0:54663->5432/tcp,
				clever_satoshi	
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
				beautiful_shannon	
9ba7b0670e6f	redis:6-alpine	"docker-entrypoint.s..."	35 seconds ago	Up 32 seconds	0.0.0.0:54305->6379/tcp,
				friendly_blackburn	
6594984b1654	testcontainers/ryuk:0.3.3	"/app"	46 seconds ago	Up 44 seconds	0.0.0.0:54131->8080/tcp,
				testcontainers-ryuk-d5041454-dd4f-46ff-845b-7013d55d41d2	

# After



## The problem

Port conflicts

Hard-coded  
scenarios

Slow tests



## Extra mile

Port  
randomization

Data-driven tests

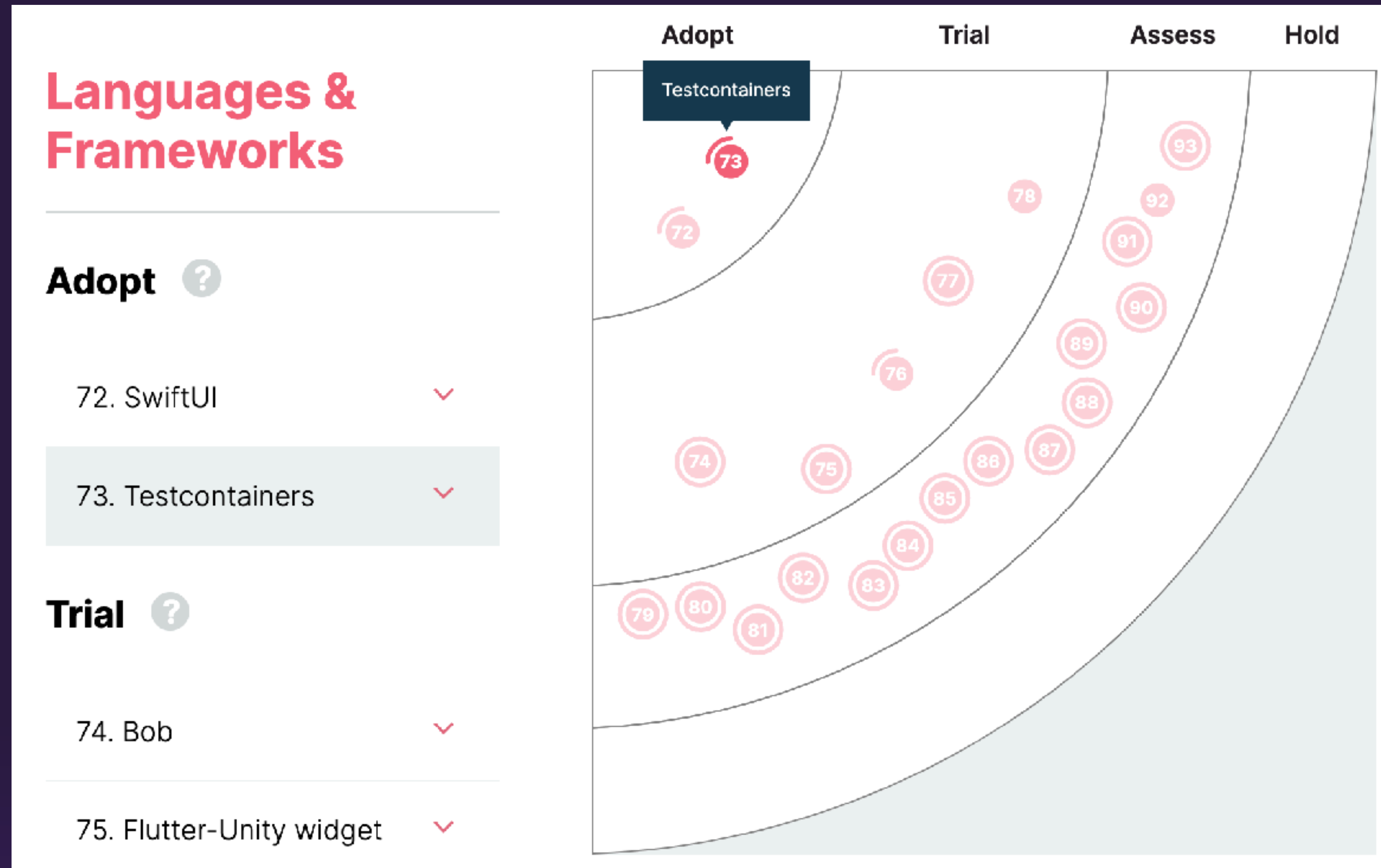
Parallelization



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.

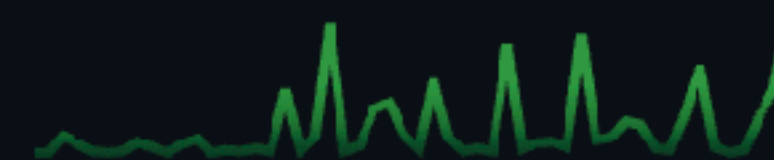
 Rust  173  50  23 (5 issues need help)  6 Updated 2 hours ago



## 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





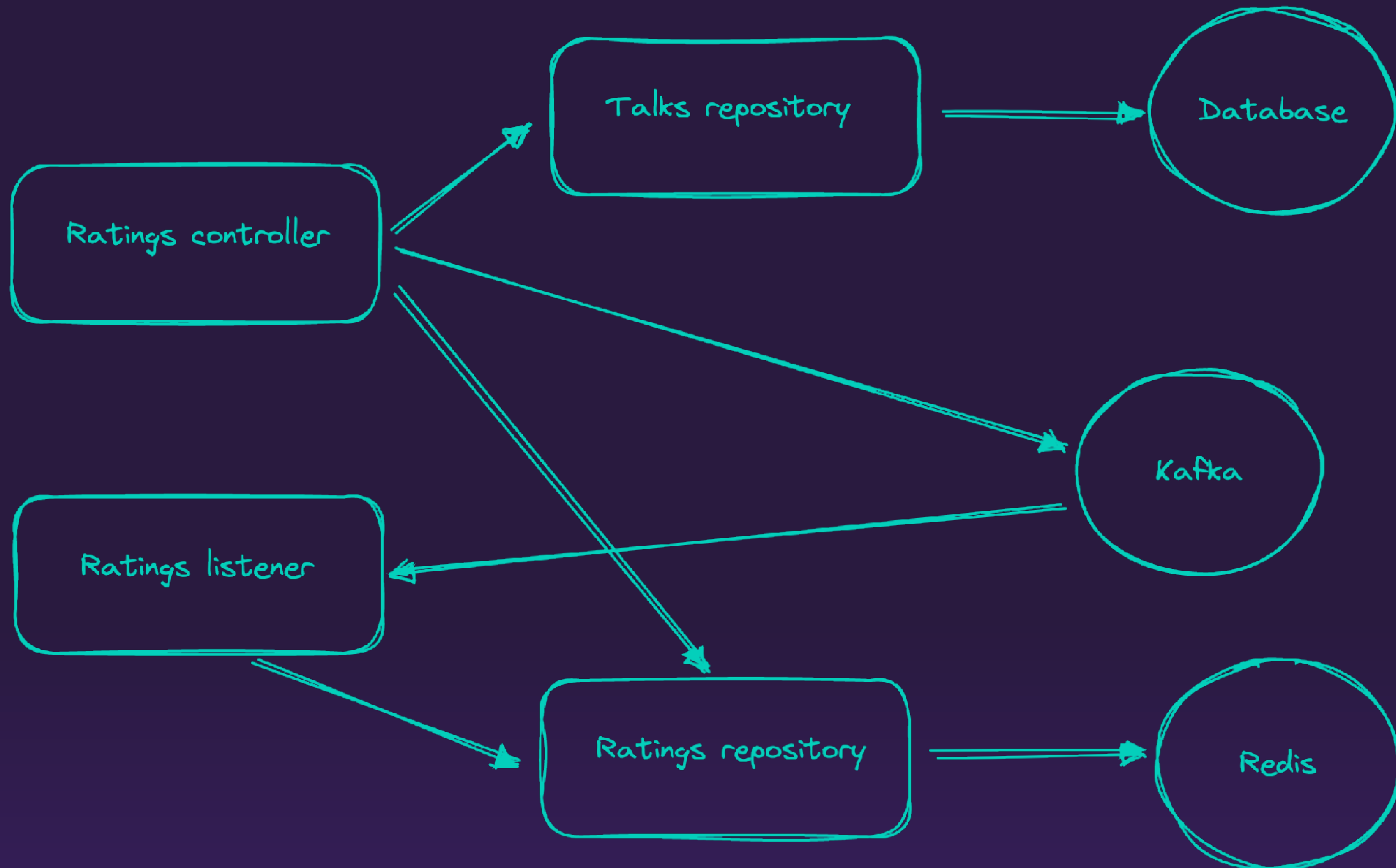


Show me the **code**



# 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

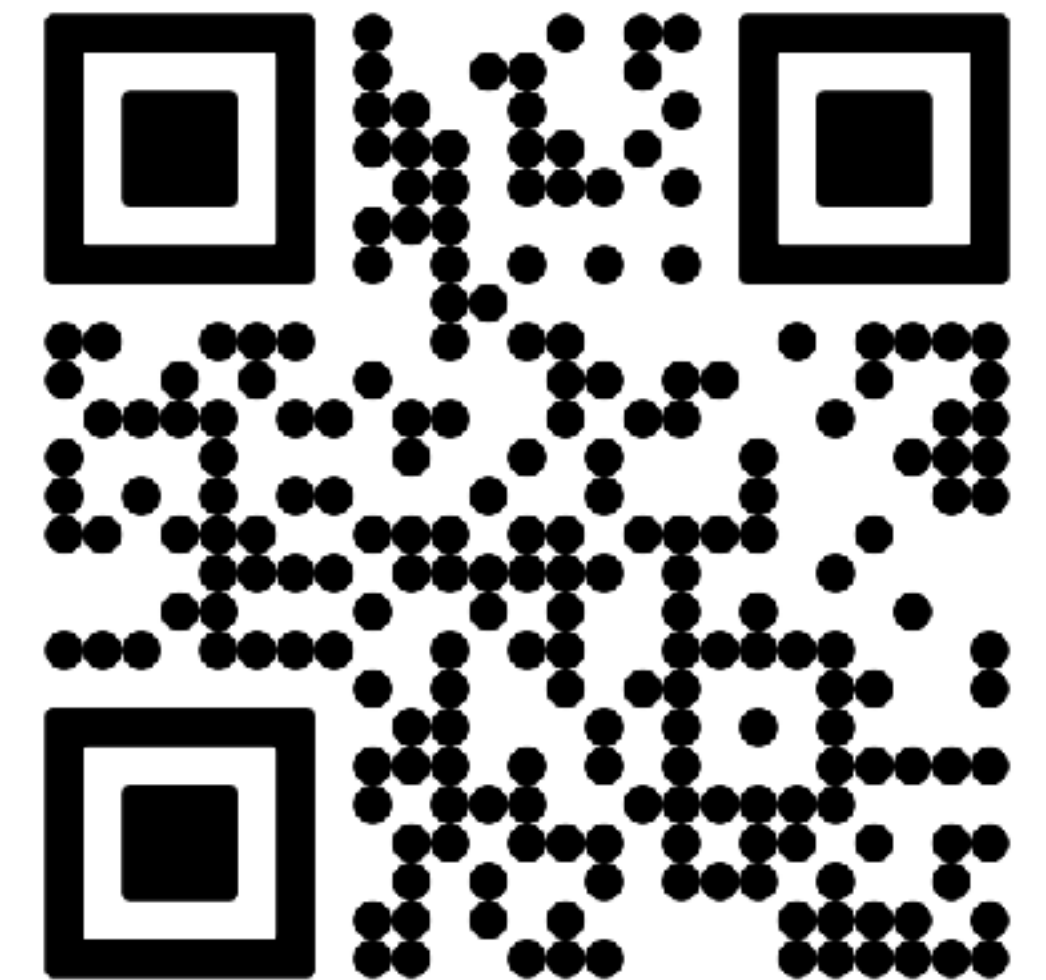
No one assigned

Labels

type: enhancement

Projects

None yet



<https://github.com/spring-projects/spring-boot/issues/29461>



# What's next?

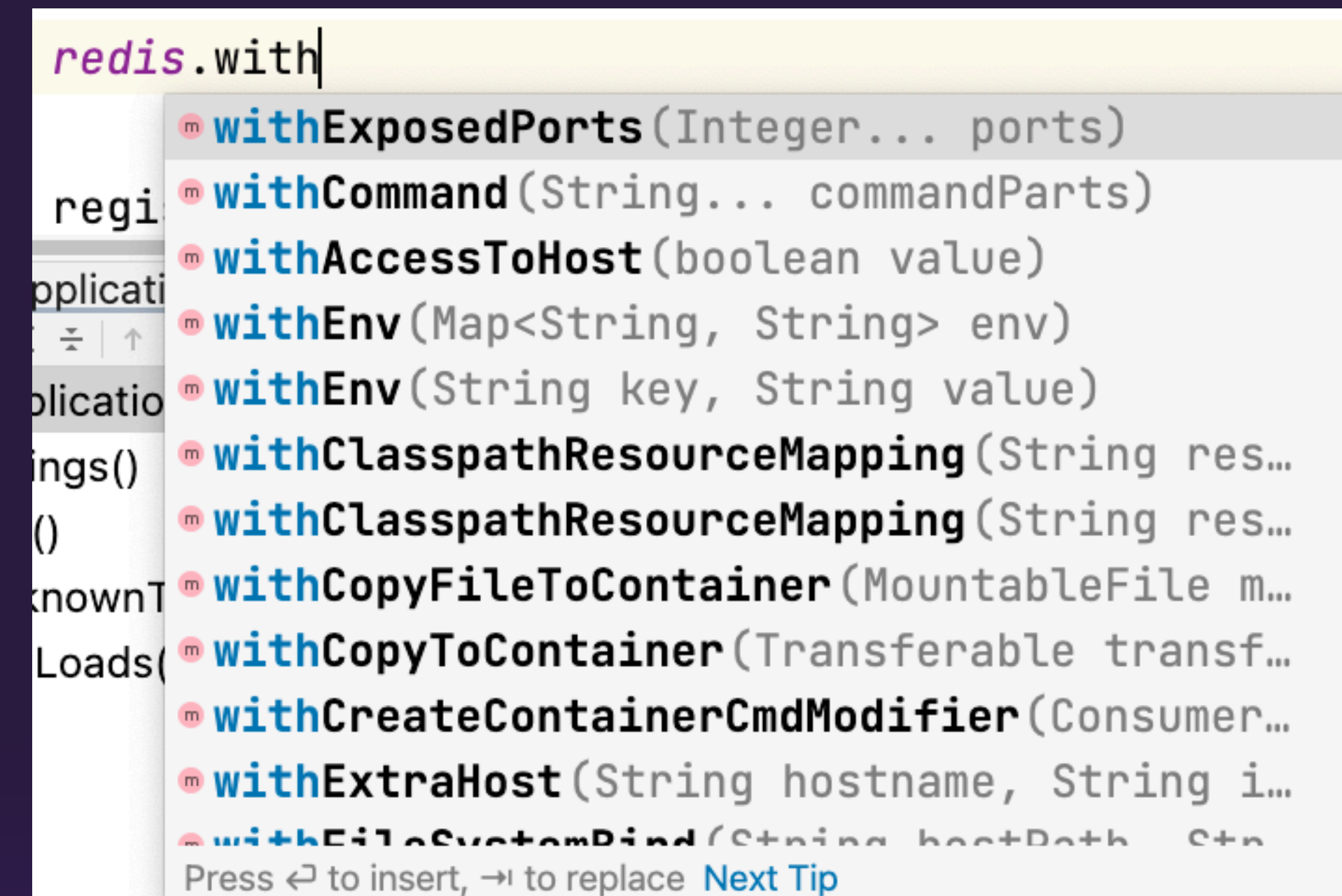
**Reusable** containers

**Networks** for more complex topologies

Custom **startup & waiting** strategies

Creating images **on-the-fly**

Logs, files, commands, limits...



```
redis.with|
  ◯ withExposedPorts(Integer... ports)
  ◯ withCommand(String... commandParts)
  ◯ withAccessToHost(boolean value)
  ◯ withEnv(Map<String, String> env)
  ◯ withEnv(String key, String value)
  ◯ withClasspathResourceMapping(String res...
  ◯ withClasspathResourceMapping(String res...
  ◯ withCopyFileToContainer(MountableFile m...
  ◯ withCopyToContainer(Transferable transf...
  ◯ withCreateContainerCmdModifier(Consumer...
  ◯ withExtraHost(String hostname, String i...
  ◯ withFileSystemBind(String hostPath, Str...
Press ↵ to insert, → to replace Next Tip
```




Three stylized eyes are positioned on the left side of the image. Two are light pink and one is tan, all with black pupils. They are set against a solid yellow background.

**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		

 **ATOMICJAR**



# Testcontainers Cloud



Andy Wilkinson  
@ankinson



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.



Asaf Mesika  
@asafmesika



This a game changer for integration and e2e testing ! Awesome idea !



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



peter royal  
@osi



Replying to @NayShins and @testcontainers

you may be interested in what @AtomicJarInc is up to!



Michael Simons  
@rotnroll666



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.



Gerrit Meier  
@meistermeier



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.



GIF



ATOMICJAR



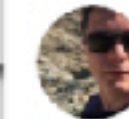
Sébastien Blanc  
@sebi2706



Red Hat

Replying to @rotnroll666 @QuarkusIO and 2 others

Is this a real thing or just a (great) idea for now ?



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.



James Ward  
@\_JamesWard



Holy amazing wowzers! 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!



Julien Dubois  
@juliendubois



Microsoft

Congrats to the team!! That's a great idea.



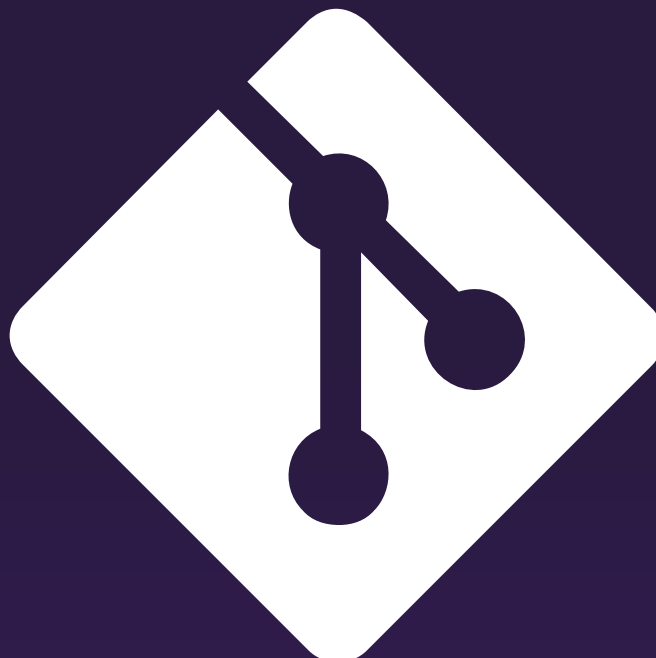
# What's next?



— [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

Go to file Code

About

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

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 / testcontainers-java Public

Sponsor Unwatch 135 Fork 1.1k Starred 5.7k

Code Issues 387 Pull requests 143 Discussions Actions Security Insights

master

Go to file Add file Code

About

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.

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 / testcontainers-go Public

Notifications Fork 189 Star 1.3k

Code Issues 55 Pull requests 21 Actions Security Insights

main

Go to file Code

About

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.

.github	Merge pull request #401 from testco...	16 days ago
docs	chore: update branding	23 hours ago

testcontainers / testcontainers-python Public

Notifications Fork 113 Star 512

Code Issues 21 Pull requests 11 Actions Projects Wiki

master

Go to file Code

About

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.

testcontainers-python.readthedocs...

python testing database selenium python3 testcontainers

.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