Integration Testing using sbt, scalatest and Docker

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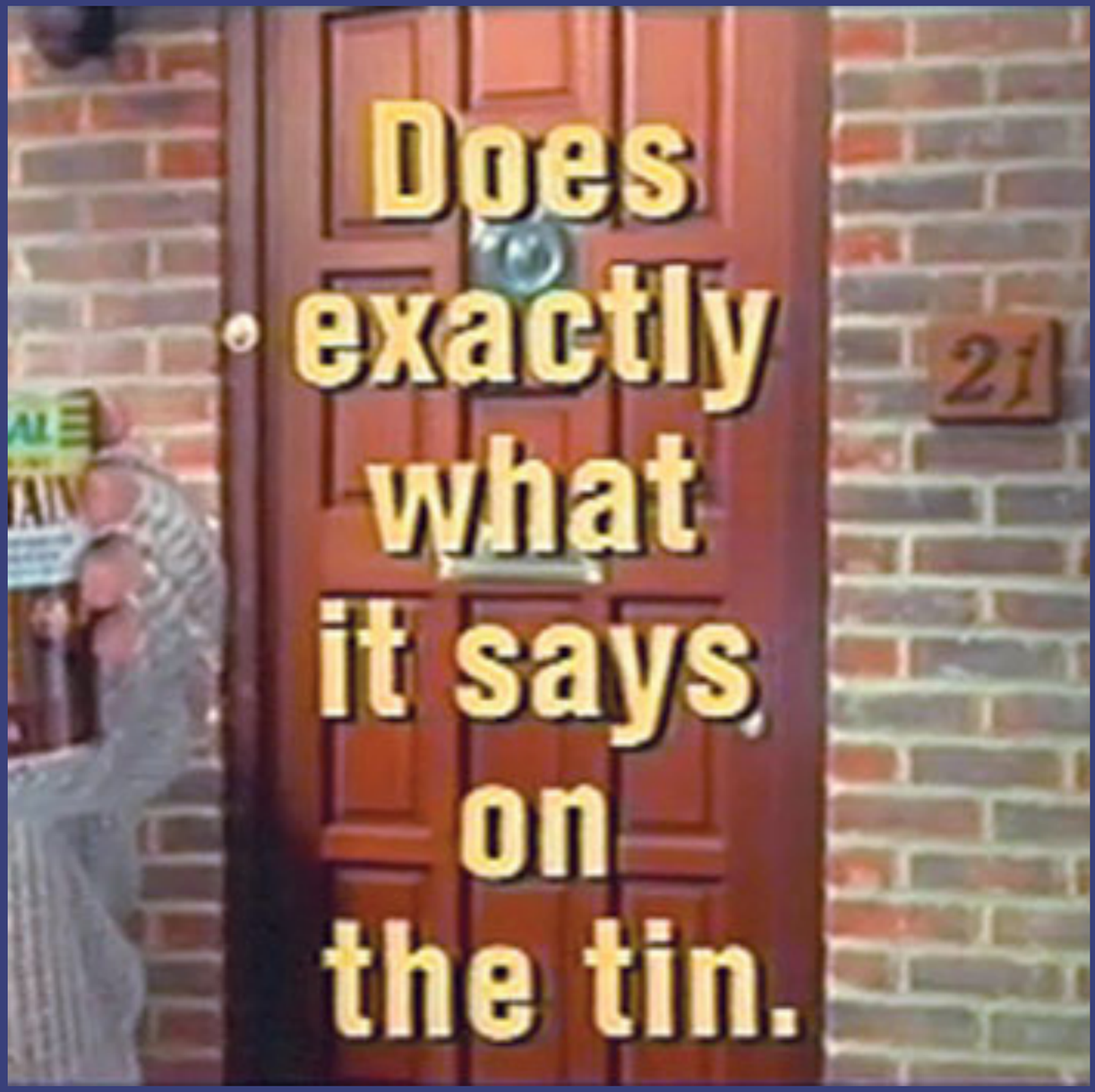
Moneyfarm

we always want to build great software

or, at least, software that works...


Does
exactly
what
it says
on
the tin.
21

unit testing

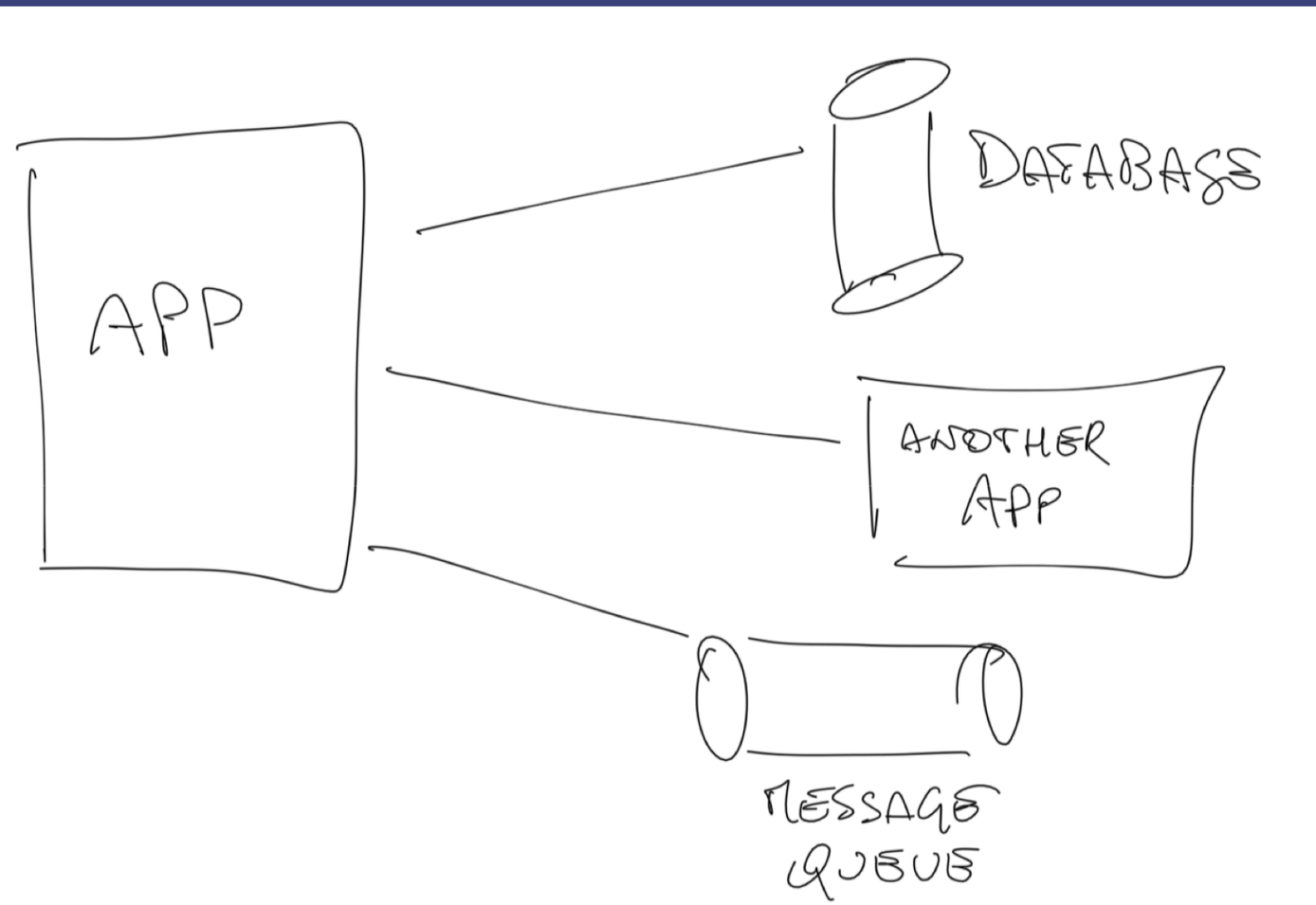
with Scalatest

```
case class Rectangle(width: Int, height: Int) {
  lazy val area: Int = width * height
}

"Rectangle" should {
  "calculate correctly the area" in {
    Rectangle(2, 3).area shouldBe 6
  }
}
```

`sbt test` runs the unit tests

are unit tests enough?


APP
DATABASE
ANOTHER APP
MESSAGE QUEUE

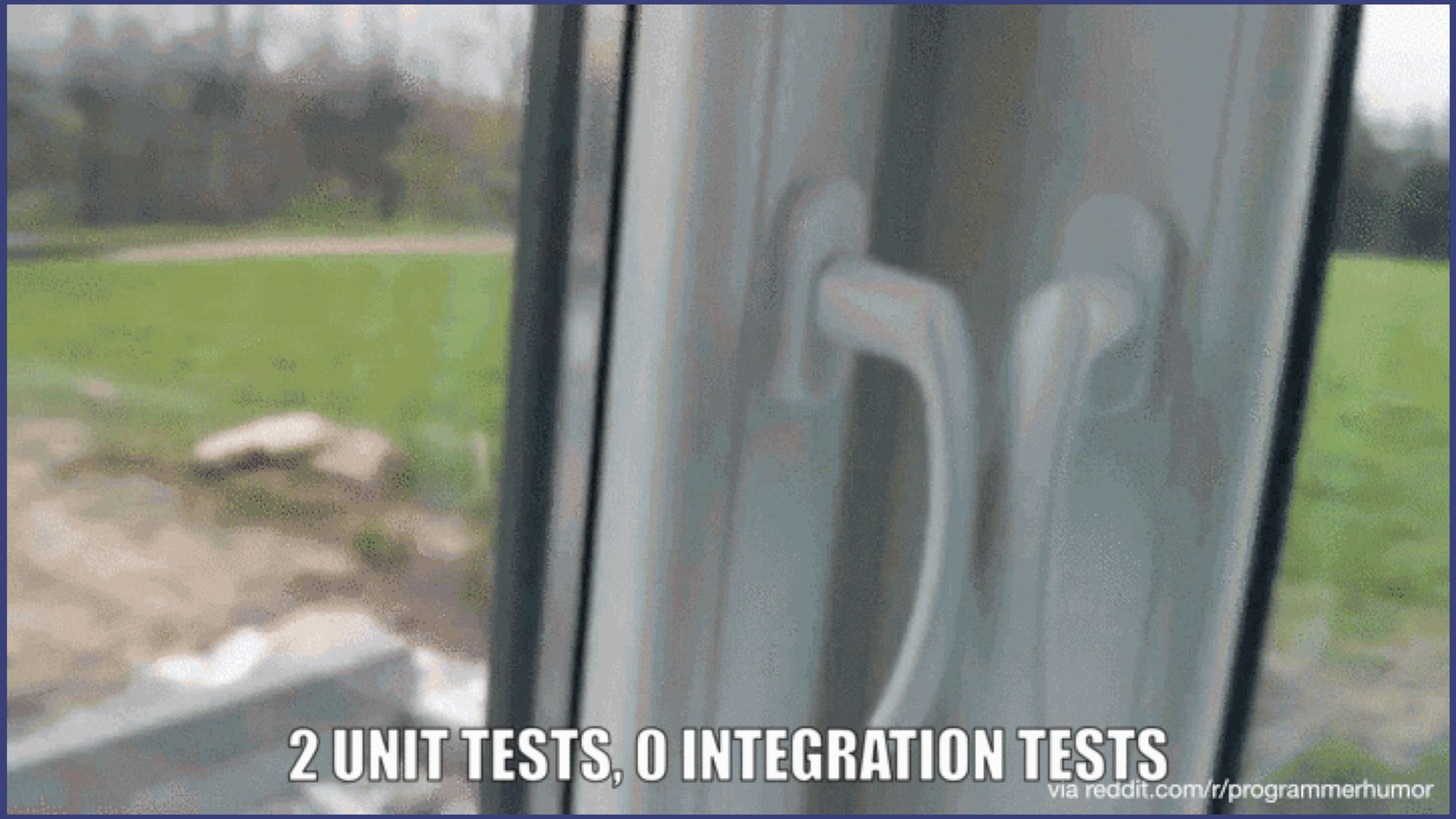
```
case class User(username: String,
                firstName: String,
                lastName: String)

class UserRepository {
  // some database configuration...

  def getAllUsers(): Task[List[User]] = ???
}
```

how can we test code that goes outside the application boundaries?

integration testing

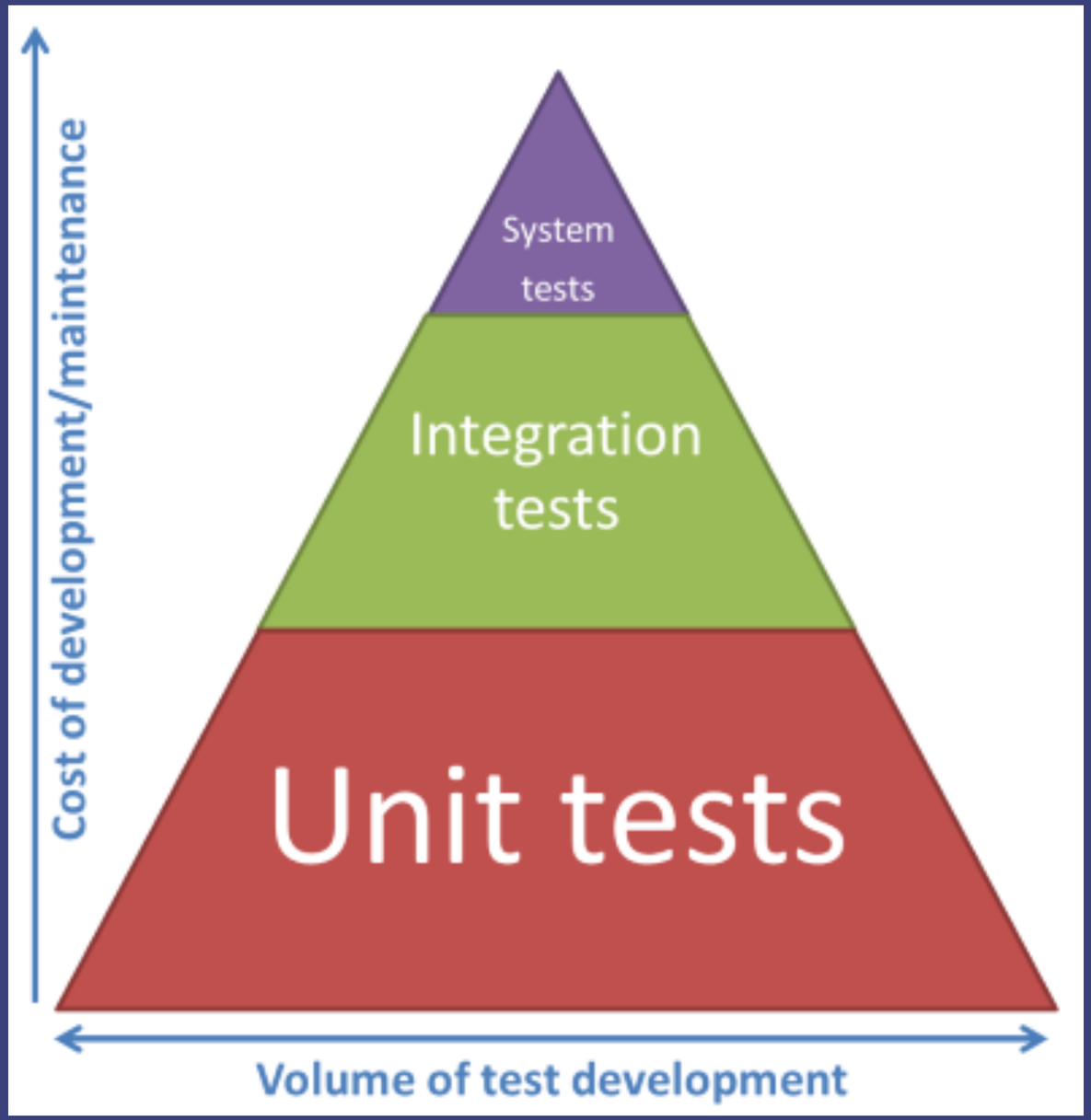

2 UNIT TESTS, 0 INTEGRATION TESTS
via reddit.com/r/programmerhumor

integration tests

→ make sure previously tested units work correctly with each other

→ can go outside the application boundaries

→ they're usually slower


Cost of development/maintenance
System tests
Integration tests
Unit tests
Volume of test development

should be isolated from other tests in your build

sbt configuration

```
lazy val root = (project in file("."))
  .configs(IntegrationTest)
  .settings(Defaults.itSettings)
```

→ the code will go in `src/it`

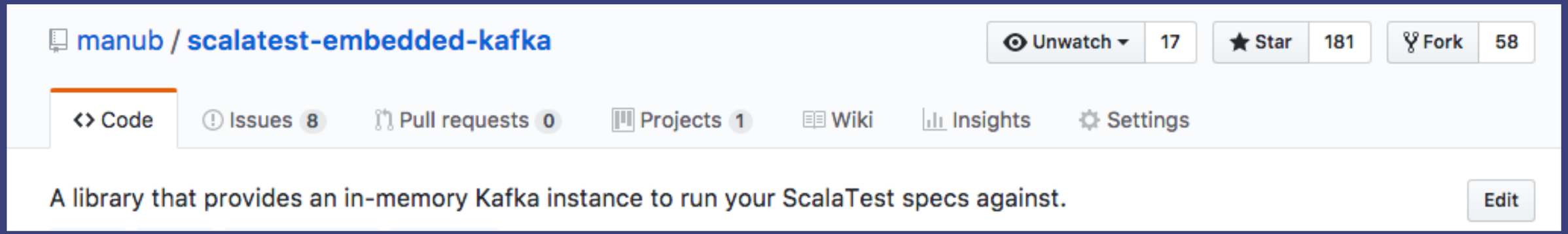
→ run those tests using `sbt it:test`

→ you can disable parallel exeuction using
`parallelExecution in IntegrationTest := false`

how to test UserRepository?

start Postgres Programmatically

if we have the sources of our dependency and it runs on the JVM, we could start it programmatically in our test


manub / scalatest-embedded-kafka
Unwatch 17
Star 181
Fork 58
Code
Issues 8
Pull requests 0
Projects 1
Wiki
Insights
Settings
A library that provides an in-memory Kafka instance to run your ScalaTest specs against.
Edit

but Postgres doesn't run on the JVM 😟

H2

H2 is a in-memory database written in Java. It has a compatibility mode for Postgres and MySQL amongst others but:

→ it's not like-for-like (see here)

→ SQL triggers are not supported

→ in the end **is not the same database as the one we will use in production**

Use a Real Postgres instance

→ could be shared with other clients

→ requires additional resources (i.e. a server)

can we provision a Postgres instance on demand?


docker

Docker

→ runs applications (distributed as images) in containers

→ the applications run in the same environment (the container), regardless of the host

→ most vendors publish images of their software...

→ including postgres!! 🎉

starting Postgres on Docker

```
docker run
  --name my-postgres
  -e POSTGRES_USER=user
  -e POSTGRES_PASSWORD=mysecretpassword
  -d
  postgres:latest
```

starting Postgres on Docker for integration tests

two different approaches

→ control container lifecycle outside the test (i.e. running the container before the `it:test` phase)

→ write a docker integration within your tests, to control the container lifecycle

docker-it-scala

https://github.com/whisklabs/docker-it-scala

→ allows you to use Docker Java or the Spotify client to connect to Docker

→ supports both Scalatest and Specs2

```
libraryDependencies ++= Seq(
    "com.whisk" %% "docker-testkit-scalatest" % "0.9.5" % IntegrationTest,
    "com.whisk" %% "docker-testkit-impl-spotify" % "0.9.5" % IntegrationTest
  )
```

```
trait DockerKit {
  implicit def dockerFactory: DockerFactory

  def dockerContainers: List[DockerContainer] = Nil

  // other values
}

trait DockerKitSpotify extends DockerKit { ... }
```

```scala
trait DockerPostgresService extends DockerKit with PostgresConfiguration {

  import scala.concurrent.duration._

  val PostgresAdvertisedPort = 5432

  lazy val postgresContainer: DockerContainer =
    DockerContainer("postgres:latest")
      .withPorts(PostgresAdvertisedPort -> Some(postgresPort))
      .withEnv(s"POSTGRES_USER=$postgresUsername",
               s"POSTGRES_PASSWORD=$postgresPassword",
               s"POSTGRES_DB=$postgresDatabase")
      .withReadyChecker(
        new PostgresReadyChecker(postgresUrl,
                                 postgresUsername,
                                 postgresPassword).looped(15, 1.second)
      )

  abstract override def dockerContainers: List[DockerContainer] =
    postgresContainer :: super.dockerContainers

}
```

```
class PostgresReadyChecker(url: String, username: String, password: String)
    extends DockerReadyChecker {

  override def apply(container: DockerContainerState)(
      implicit docker: DockerCommandExecutor,
      ec: ExecutionContext): Future[Boolean] =
    container
      .isRunning()
      .map(_ =>
        Try {
          DriverManager
            .getConnection(url, username, password)
            .close()
          true
        }.getOrElse(false))
}
```

```scala
class UserRepositorySpec extends WordSpec
  with Matchers // plus other scalatest goodies
  with DockerTestKit // scalatest support
  with DockerKitSpotify // docker client implementation
  with DockerPostgresService { // define the container

    val repository = new UserRepository

    "UserRepository" should {
      "get all the users" in {

        val user = User("manub", "Emanuele", "Blanco")

        insertIntoDb(user)

        val retrievedUsers = repository.getAllUsers()

        retrievedUsers.unsafeRunAsyncFuture().futureValue shouldBe List(user)
      }
    }

    private def insertIntoDb(user: User) = {
      // inserts a user into the db, but not using the class under test
    }
  }
```

code sample (and slides) available at:

https://github.com/manub/it-testing

Thanks!