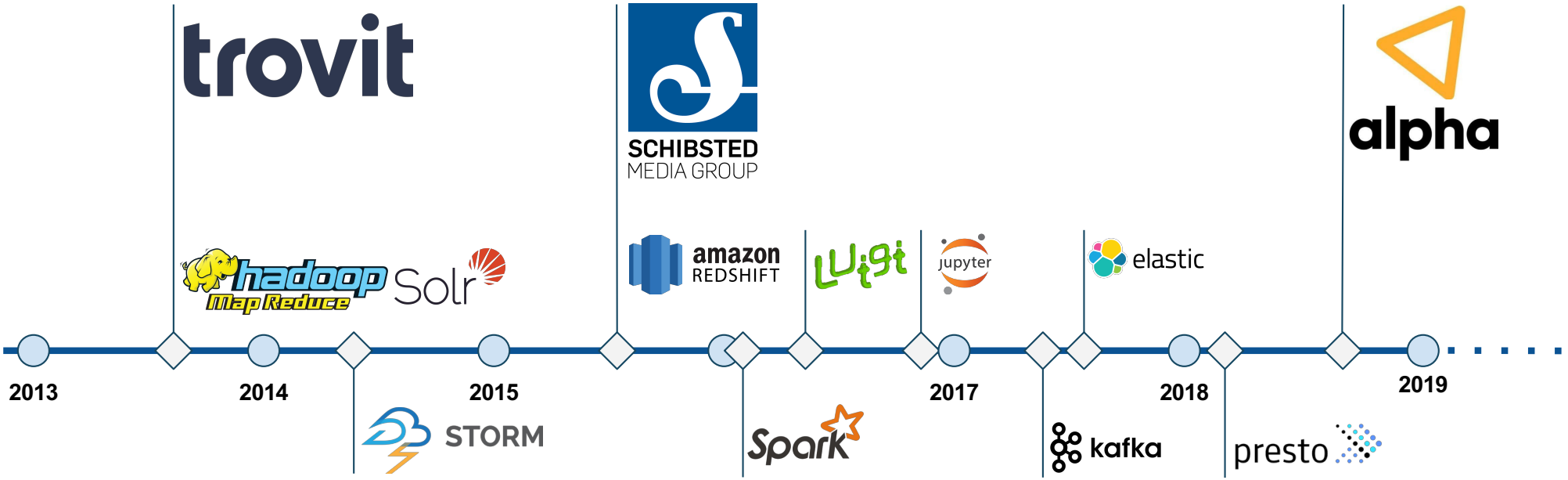
Modular Apache Spark: Transform Your Code into Pieces

Albert Franzi (@FranziCros), Alpha Health

Slides available in:

http://bit.ly/SparkAI2019-afranzi

About me


trovit
SCHIBSTED
MEDIA GROUP
alpha
hadoop
MapReduce
Solr
amazon
REDSHIFT
Luigi
jupyter
elastic
2013
2014
2015
2017
2018
2019
STORM
Spark
kafka
presto

Modular Apache Spark:
Transform Your Code into Pieces

We will learn:

- How we simplified our spark code by modularizing

- How we increased our test coverage in our spark code by using the spark-testing-base provided by Holden Karau

- How we reduced the test time execution by skipping unaffected tests -- > less coffees

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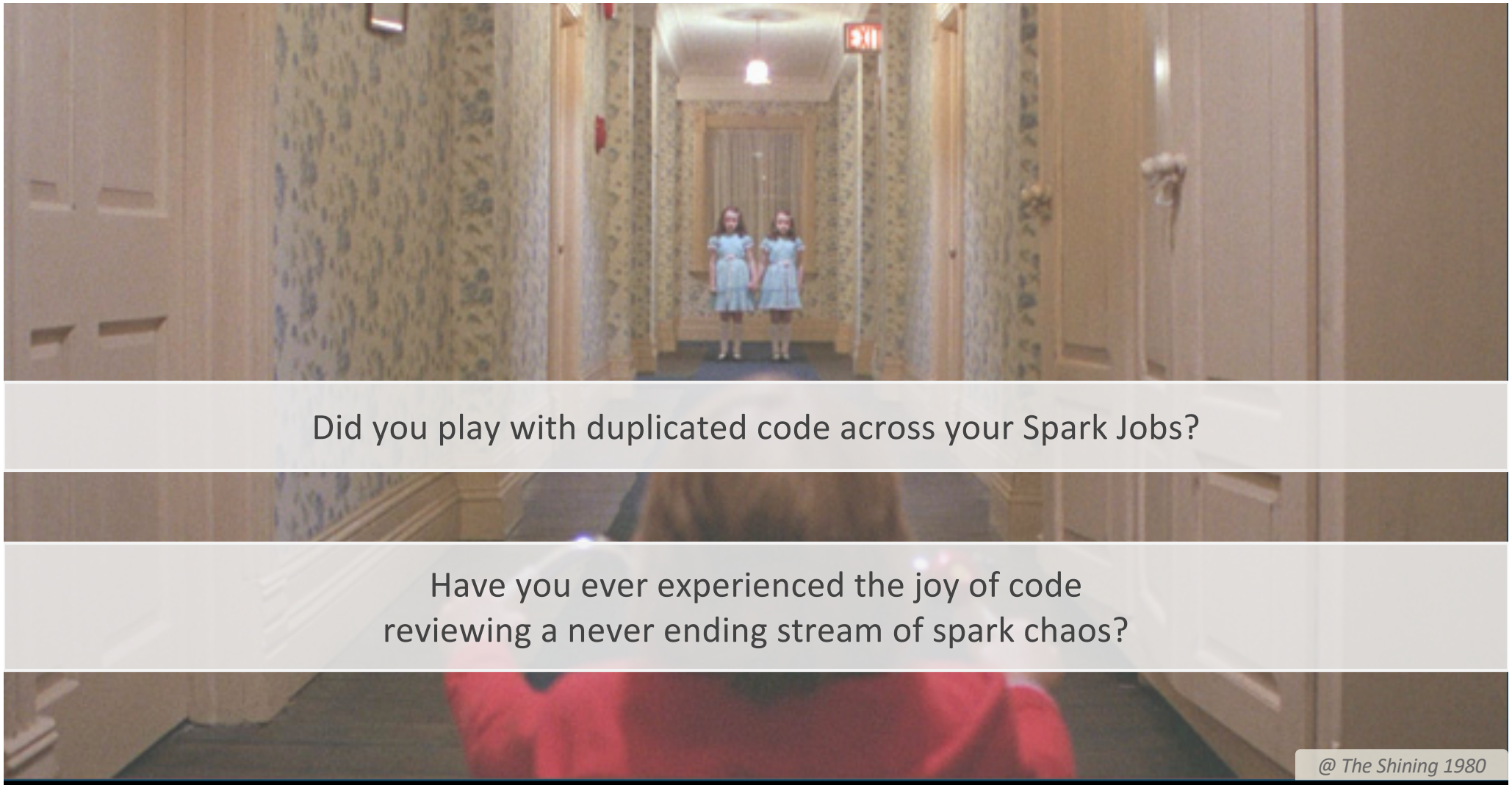


Did you play with duplicated code across your Spark Jobs?

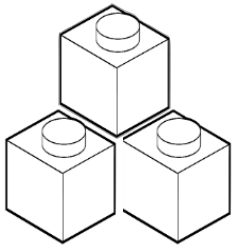
Have you ever experienced the joy of code
reviewing a never ending stream of spark chaos?

@ The Shining 1980

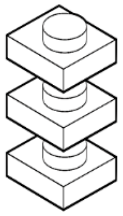
Please! Don’t play with duplicated code never ever!

@ The Shining 1980

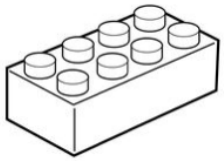
Fragment the Spark Job



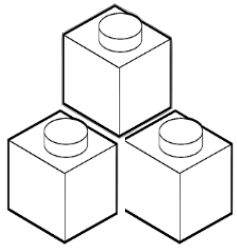
Spark Readers



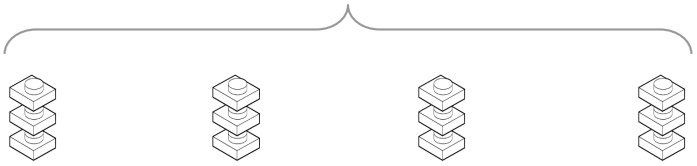
Transformation



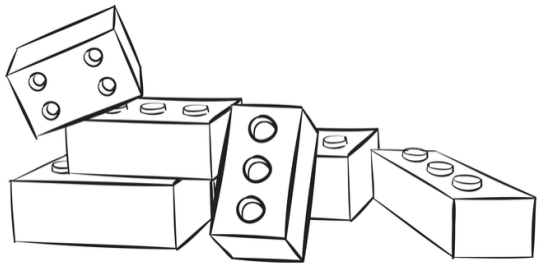
Task Context



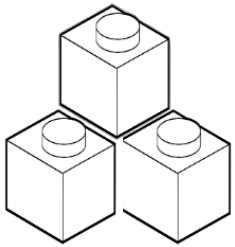
Spark Writers



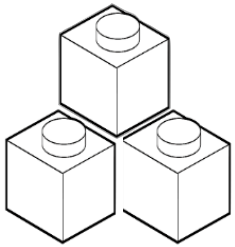
Aliases Joins Formatters ...



Readers / Writers



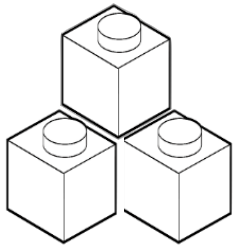
Spark Readers



Spark Writers

- Enforce schemas
- Use schemas to read only the fields you are going to use
- Provide Readers per Dataset & attach its sources to it
- Share schemas & sources between Readers & Writers
- GDPR compliant by design

Readers

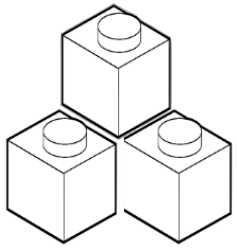


Spark Readers

```
val userBehaviourSchema: StructType = ???

val userBehaviourPath =
   Path("s3://<bucket>/user_behaviour/year=2018/month=10/day=03/hour=12/gen=27/")

val userBehaviourReader = ReaderBuilder(PARQUET)
   .withSchema(userBehaviourSchema)
   .withPath(userBehaviourPath)
   .buildReader()

val df: DataFrame = userBehaviourReader.read()
```

GDPR

Readers



Spark Readers

```
val userBehaviourSchema: StructType = ???

// Path structure - s3://<bucket>/user_behaviour/[year]/[month]/[day]/[hour]/[gen]/
val userBehaviourBasePath = Path("s3://<bucket>/user_behaviour/")

val startDate: ZonedDateTime = ZonedDateTime.now(ZoneOffset.UTC)
val halfDay: Duration = Duration.ofHours(12)

val userBehaviourPaths: Seq[Path] = PathBuilder
   .latestGenHourlyPaths(userBehaviourBasePath, startDate, halfDay)

val userBehaviourReader = ReaderBuilder(PARQUET)
   .withSchema(userBehaviourSchema)
   .withPath(userBehaviourPaths: _*)
   .buildReader()

val df: DataFrame = userBehaviourReader.read()
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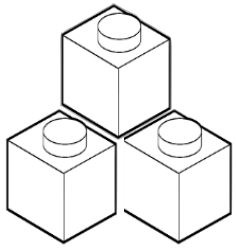
Readers



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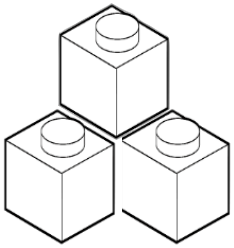
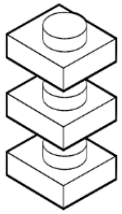
Readers



Spark Readers

```
val df: DataFrame = UserBehaviourReader.read(startDate, halfDay)
```

Transforms

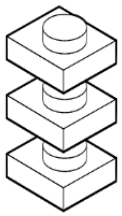


Transformation

```
def transform[U](t: (Dataset[T]) ⇒ Dataset[U]): Dataset[U]
```

```
Dataset[T] ⇒ magic ⇒ Dataset[U]
```

Transforms

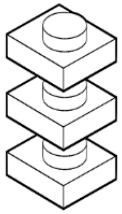


Transformation

```
def withGreeting(df: DataFrame): DataFrame = {
  df.withColumn("greeting", lit("hello world"))
}

def extractFromJson(colName: String,
                    outputColName: String,
                    jsonSchema: StructType)(df: DataFrame): DataFrame = {
  df.withColumn(outputColName, from_json(col(colName), jsonSchema))
}
```

Transforms



Transformation

```
def onlyClassifiedAds(df: DataFrame): DataFrame = {
  df.filter(col("event_type") === "View")
    .filter(col("object_type") === "ClassifiedAd")
}

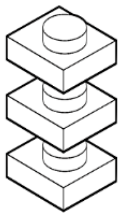
def dropDuplicates(df: DataFrame): DataFrame = {
  df.dropDuplicates()
}

def cleanedCity(df: DataFrame): DataFrame = {
  df.withColumn("city", getCityUdf(col("object.location.address")))
}
```

```
val cleanupTransformations: Seq[DataFrame => DataFrame] = Seq(
  dropDuplicates,
  cleanedCity,
  onlyClassifiedAds
)

val df: DataFrame = UserBehaviourReader.read(startDate, halfDay)
val classifiedAdsDF = df.transforms(cleanupTransformations: _*)
```

Transforms



Transformation

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)

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```
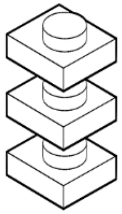

"As a data consumer, I only need to pick up which transformations I would like to apply, instead of coding them from scratch."

"It's like cooking, engineers provide manufactured ingredients (transformations) and Data Scientists use the required ones for a successful receipt."

Transforms - Links of Interest

github.com/MrPowers/spark-daria
"Spark helper methods to maximize developer productivity."



Transformation

"DataFrame transformations can be defined with arguments so they don't make assumptions about the schema of the underlying DataFrame." - by Matthew Powers.

bit.ly/Spark-ChainingTransformations

bit.ly/Spark-SchemaIndependentTransformations

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Did you put untested Spark jobs into production?

"Mars Climate Orbiter destroyed
because of a Metric System Mixup (1999)"

Testing with Holden Karau

github.com/holdenk/spark-testing-base
"Base classes to use when writing tests with Spark."

- Share Spark Context between tests
- Provide methods to make tests easier
  - Fixture Readers
  - Json to DF converters
  - Extra validators

github.com/MrPowers/spark-fast-tests
*"An alternative to spark-testing-base to **run tests in parallel without restarting Spark Session** after each test file."*

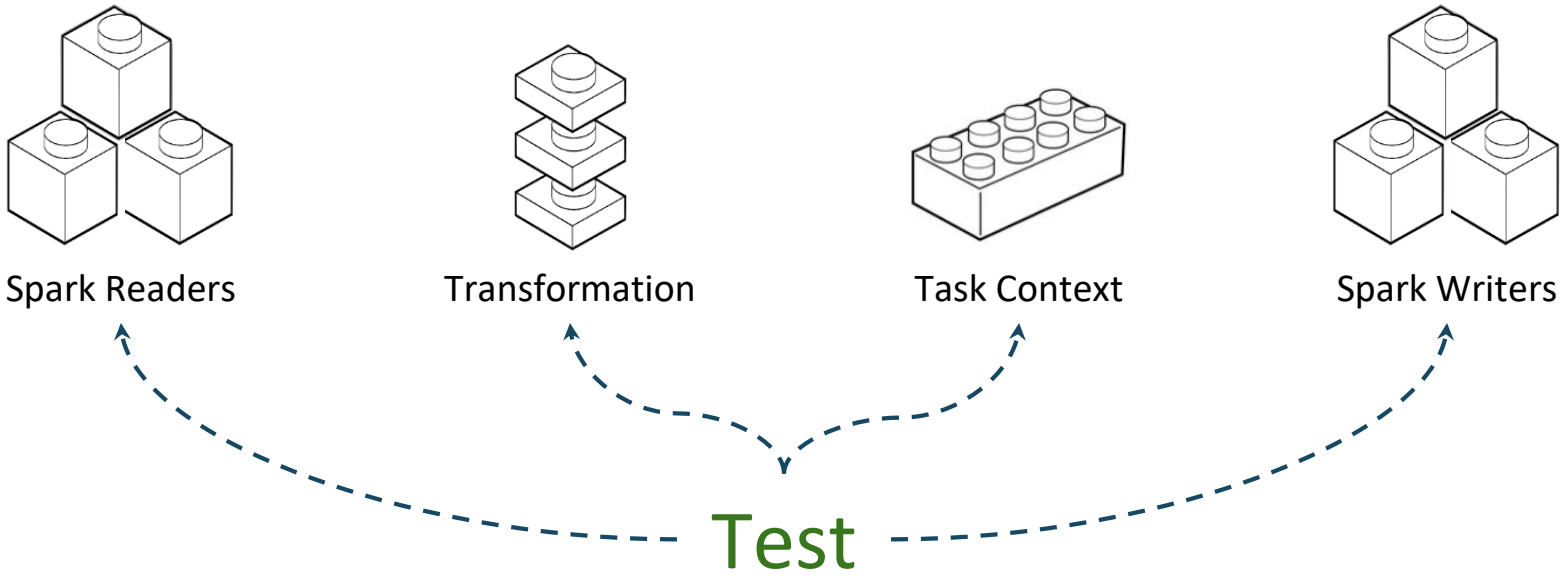
Testing SharedSparkContext

```
package com.holdenkarau.spark.testing

import java.util.Date

import org.apache.spark._
import org.scalatest.{BeforeAndAfterAll, Suite}

/**
 * Shares a local `SparkContext` between all tests in a suite
 * and closes it at the end. You can share between suites by enabling
 * reuseContextIfPossible.
 */
trait SharedSparkContext extends BeforeAndAfterAll with SparkContextProvider {
  self: Suite =>

  ...

  protected implicit def reuseContextIfPossible: Boolean = false

  ...

}
```

Testing

```
package com.alpha.data.test

trait SparkSuite extends DataFrameSuiteBase {
  self: Suite =>

  override def reuseContextIfPossible: Boolean = true

  protected def createDF(data: Seq[Row], schema: StructType): DataFrame = {
    spark.createDataFrame(spark.sparkContext.parallelize(data), schema)
  }

  protected def jsonFixtureToDF(fileName: String, schema: Option[StructType] = None): DataFrame = {
    val fixtureContent = readFixtureContent(fileName)
    val fixtureJson = fixtureContentToJson(fixtureContent)
    jsonToDF(fixtureJson, schema)
  }

  protected def checkSchemas(inputSchema: StructType, expectedSchema: StructType): Unit = {
    assert(inputSchema.fields.sortBy(_.name).deep == expectedSchema.fields.sortBy(_.name).deep)
  }

  ...
}
```

Testing



Testing each piece independently helps testing all together.

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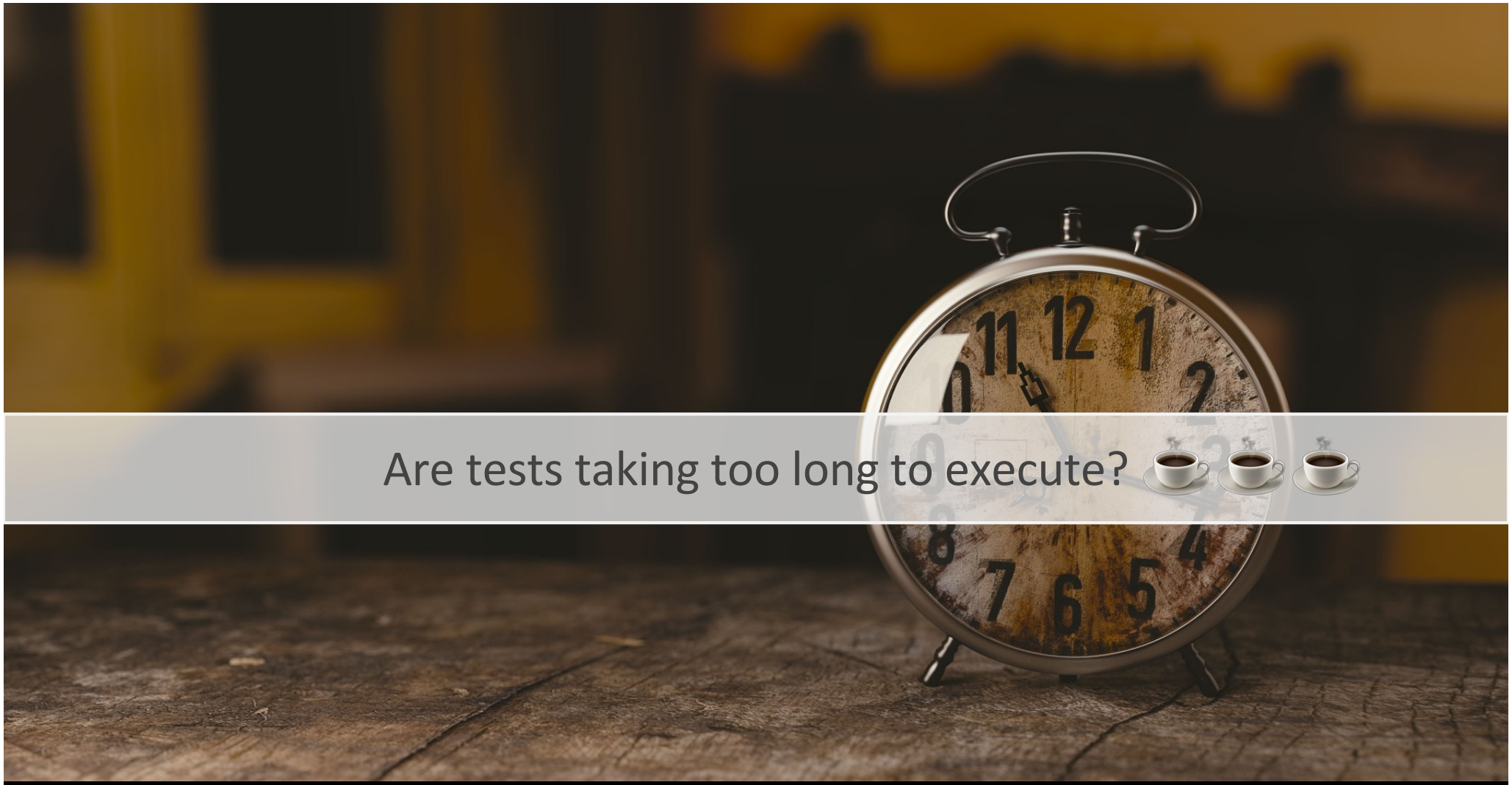

Are tests taking too long to execute? ☕☕☕

Junit4Git by Raquel Pau

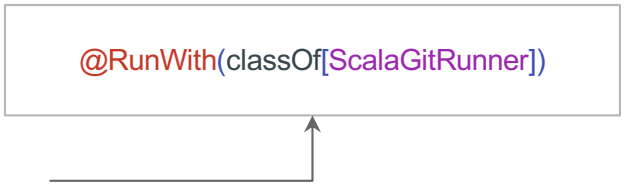
github.com/rpau/junit4git
"Junit Extensions for Test Impact Analysis."

Junit4Git

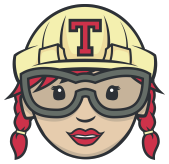
"This is a JUnit extension that ignores those tests that are not related with your last changes in your Git repository."

Junit4Git - Gradle conf

```
configurations {
    agent
}

dependencies {
    testCompile("org.walkmod:scalatest4git_2.11:${version}")

    agent "org.walkmod:junit4git-agent:${version}"
}

test.doFirst {
    jvmArgs "-javaagent:${configurations.agent.singleFile}"
}
```



Junit4Git - Travis with Git notes



.travis.yml

```
before_install:
  - echo -e "machine github.com\n  login $GITHUB_TOKEN" >> ~/.netrc
after_script:
  - git push origin refs/notes/tests:refs/notes/tests
```

Junit4Git - Runners

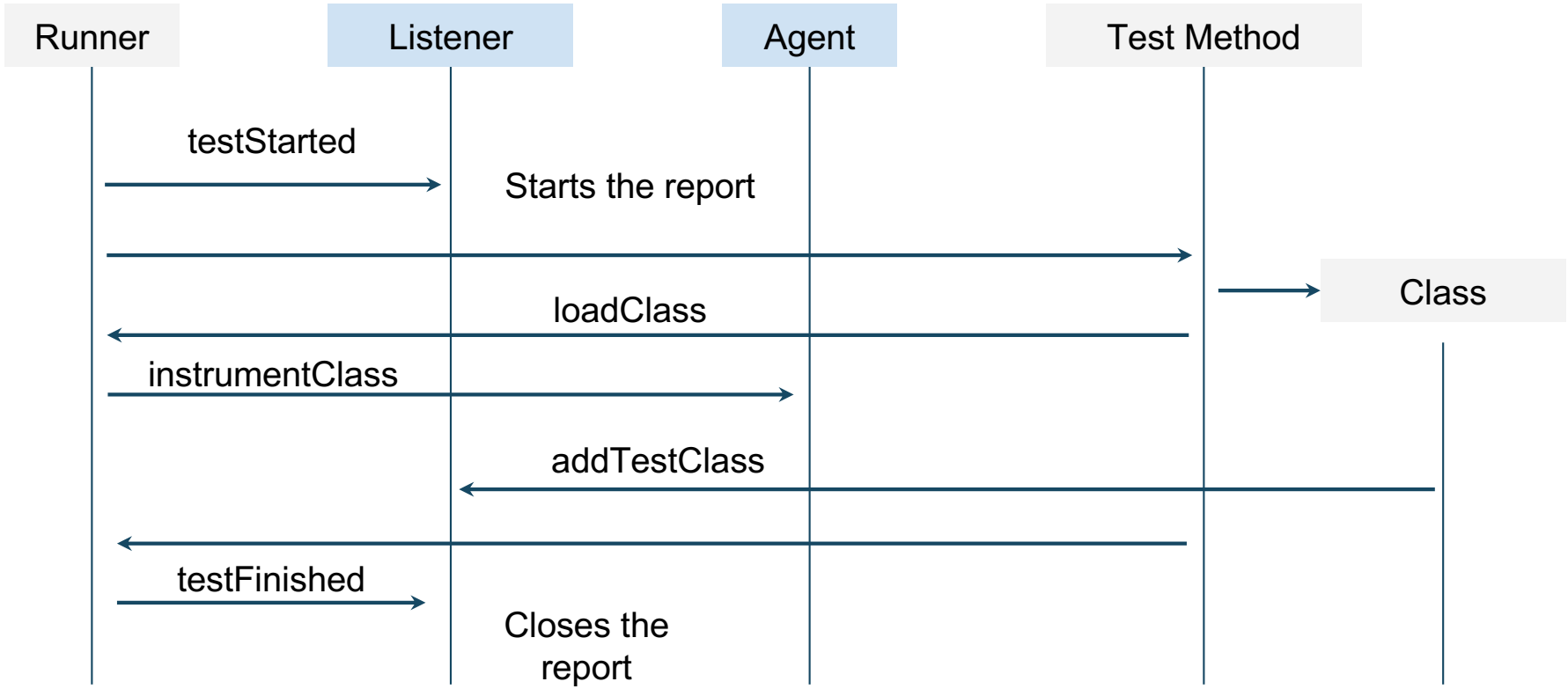
```
import org.scalatest.junit.JUnitRunner

@RunWith(classOf[JUnitRunner])
abstract class UnitSpec extends FunSuite
```

Tests to run always

```
import org.scalatest.junit.ScalaGitRunner

@RunWith(classOf[ScalaGitRunner])
abstract class IntegrationSpec extends FunSuite
```

Tests to run on code changes

Junit4Git


Runner
Listener
Agent
Test Method
testStarted
Starts the report
Class
loadClass
instrumentClass
addTestClass
testFinished
Closes the report

Junit4Git - Notes

```
afranzi:~/Projects/data-core$ git notes show
[
  {
    "test": "com.alpha.data.core.ContextSuite",
    "method": "Context Classes with CommonBucketConf should contain a commonBucket Field",
    "classes": [
      "com.alpha.data.core.Context",
      "com.alpha.data.core.ContextSuite$$anonfun$1$$anon$1",
      "com.alpha.data.core.Context$",
      "com.alpha.data.core.CommonBucketConf$class",
      "com.alpha.data.core.Context$$anonfun$getConfigParamWithLogging$1"
    ]
  }
  ...
]
```

com.alpha.data.core.ContextSuite > Context Classes with CommonBucketConf should contain a commonBucket Field **SKIPPED**

com.alpha.data.core.ContextSuite > Context Classes with BucketConf should contain a bucket Field **SKIPPED**

Junit4Git - Links of Interest

Real Impact Testing Analysis For JVM

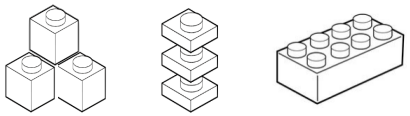
bit.ly/SlidesJunit4Git

The Rise of Test Impact Analysis

bit.ly/TestImpactAnalysis

Summary

- Use Transforms as pills
- Don’t duplicate code between Spark Jobs
- Modularize your code
- Don’t be afraid of testing everything



Share all you built as a library, so others can reuse your code.