Everything not tested will eventually fail

2020-07-28 - NYC Data Hackers Meetup

Colin Fay - ThinkR

$ whoami

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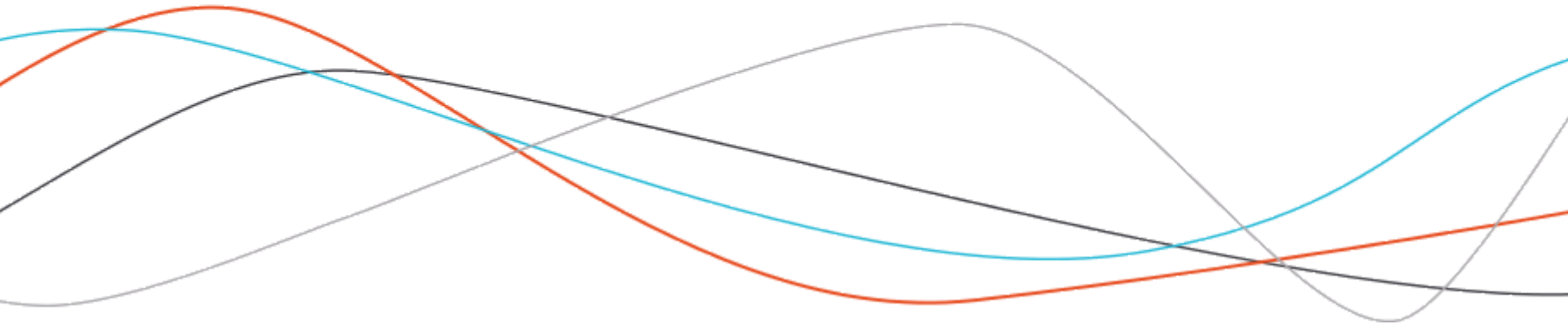
Hyperactive open source developer, lead developer of the `{golem}` project.

- https://thinkr.fr
- https://rtask.thinkr.fr
- https://twitter.com/_colinfay
- https://github.com/colinfay
- https://colinfay.me

ThinkR



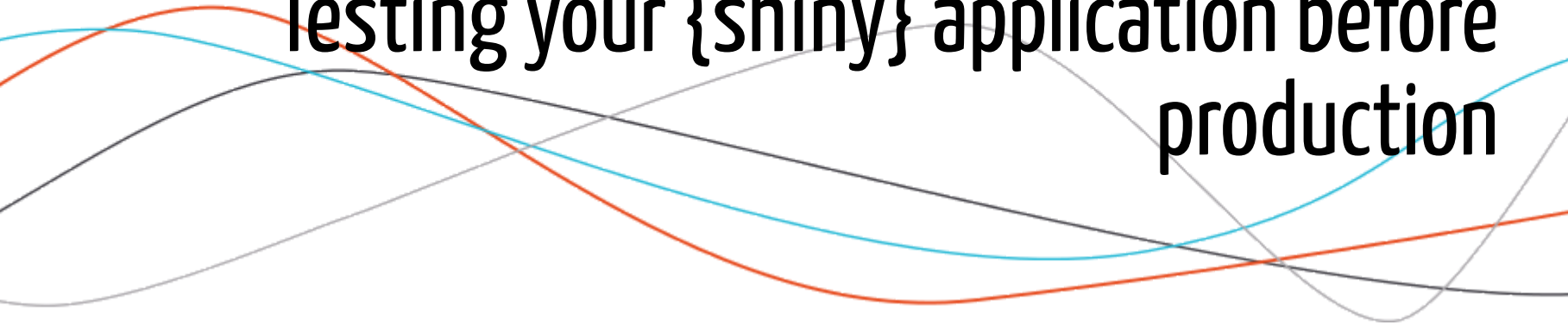
ThinkR

Data Science engineering, focused on R.

- Training
- Software Engineering
- R in production
- Consulting

Everything not tested will eventually fail

Testing your {shiny} application before production



<aside>

What does "production" even mean?

A piece of software that is:

- **USED**, even if by only one person
- **RELIED UPON**
  - by the user: to be available, and accurate
  - by the developer: to be available, accurate, modular, and resilient
- **HAS REAL LIFE IMPACT**
  - on the user, who needs the software
  - on the developer, who works on the software

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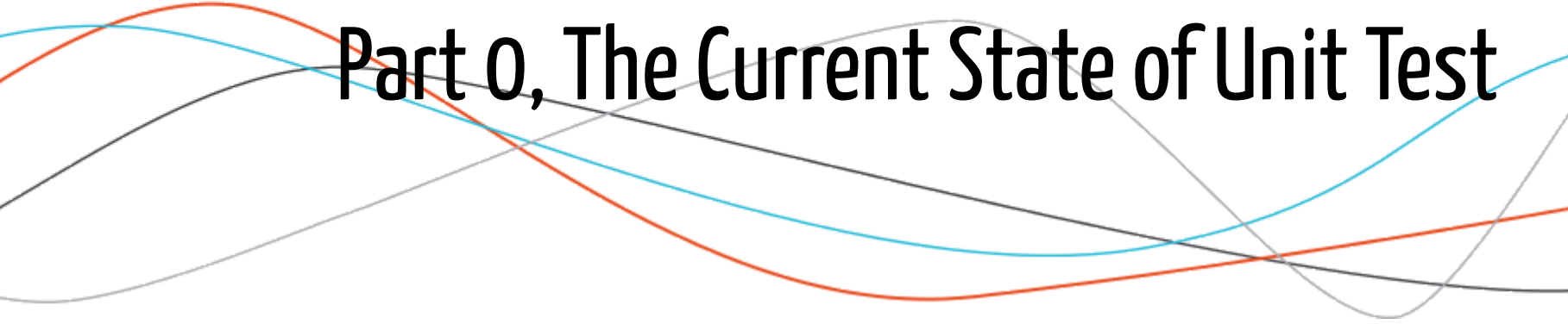
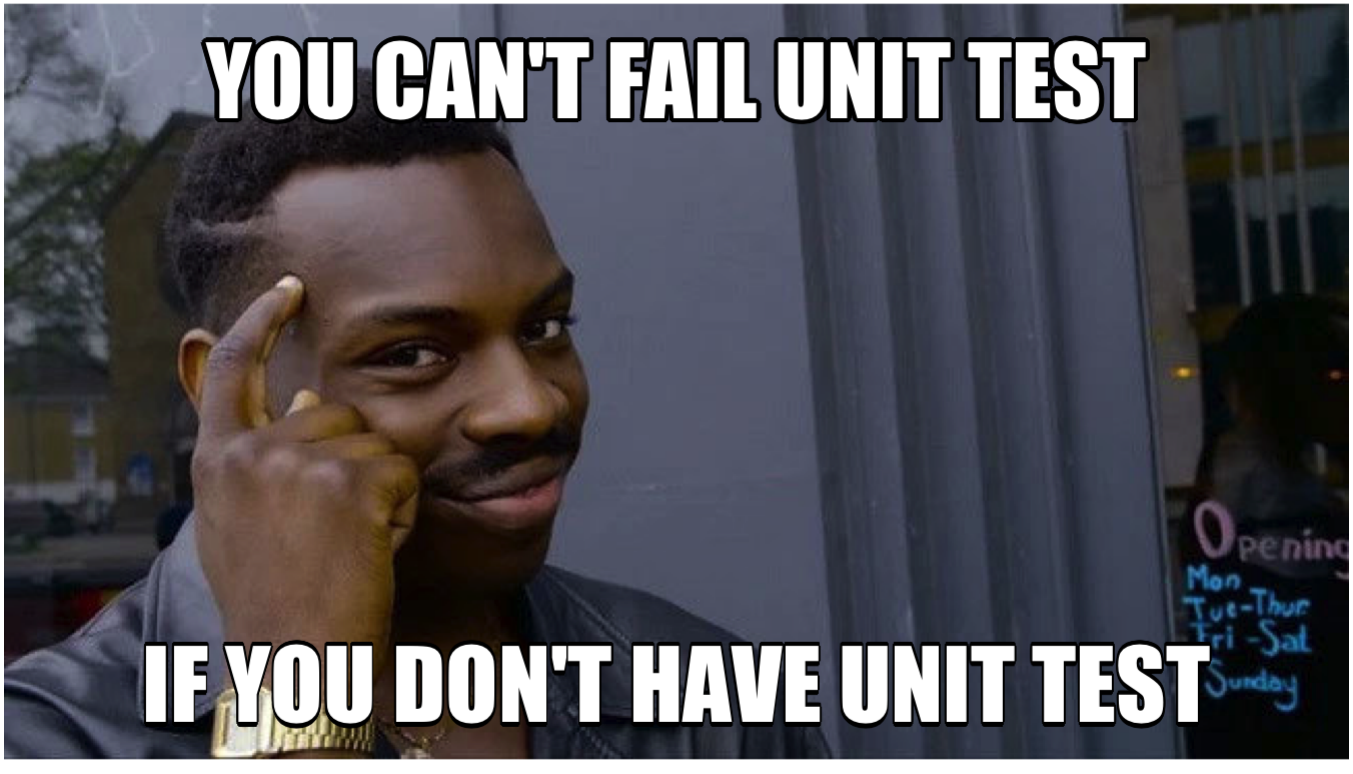
Everything not tested will eventually fail

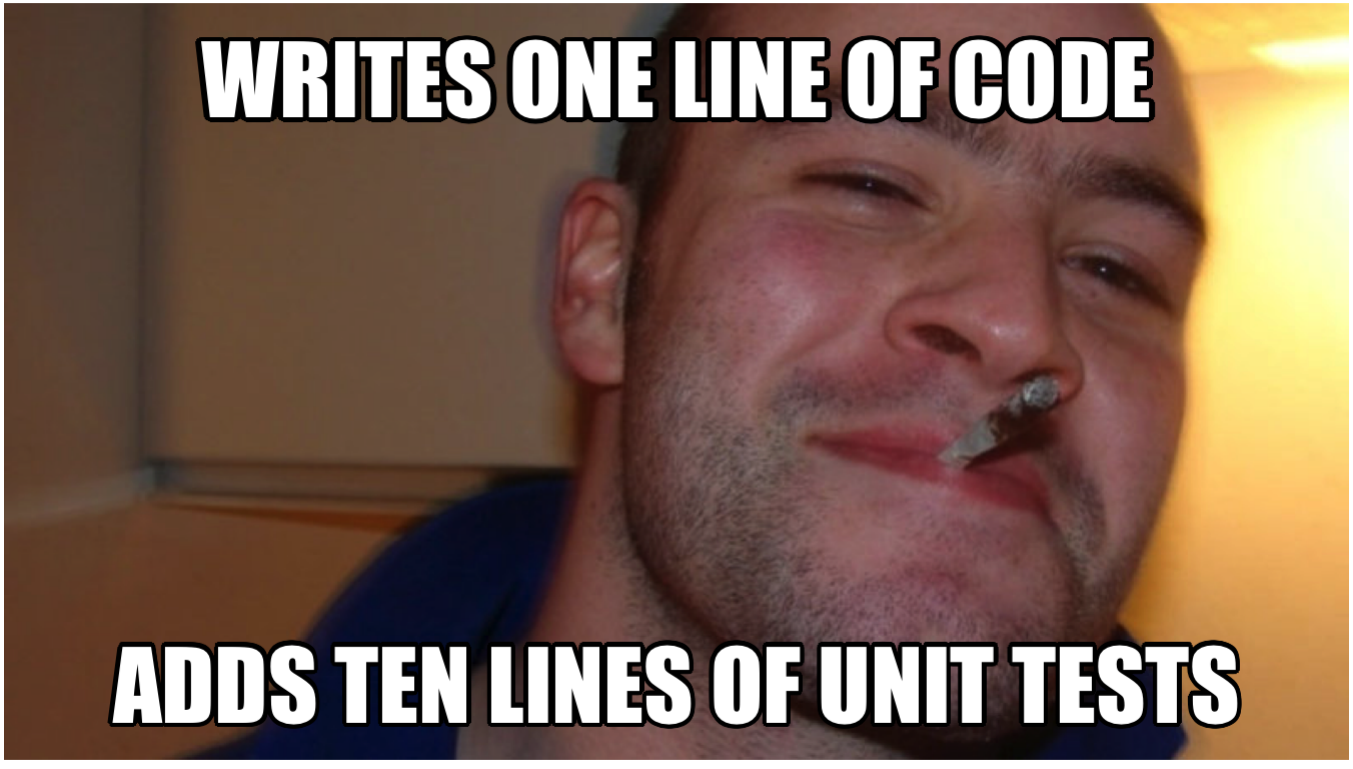
Part 0, The Current State of Unit Test



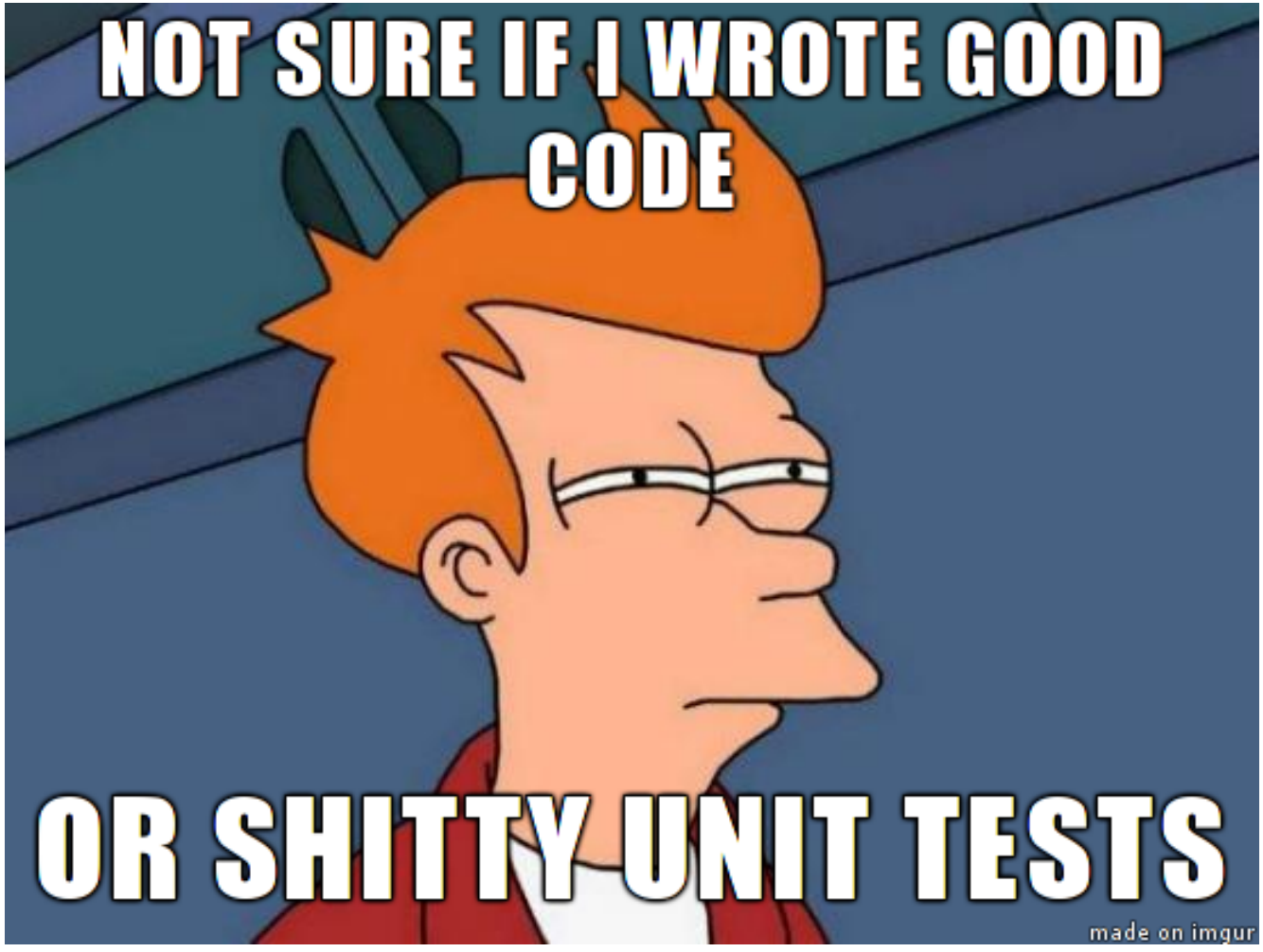
The two states of unit test



The two states of unit test



Or somewhere in the middle?



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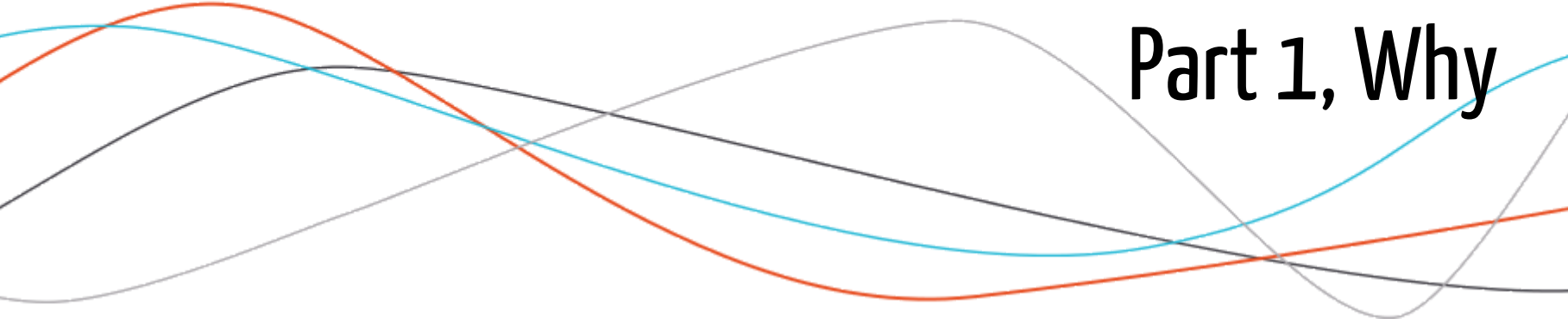
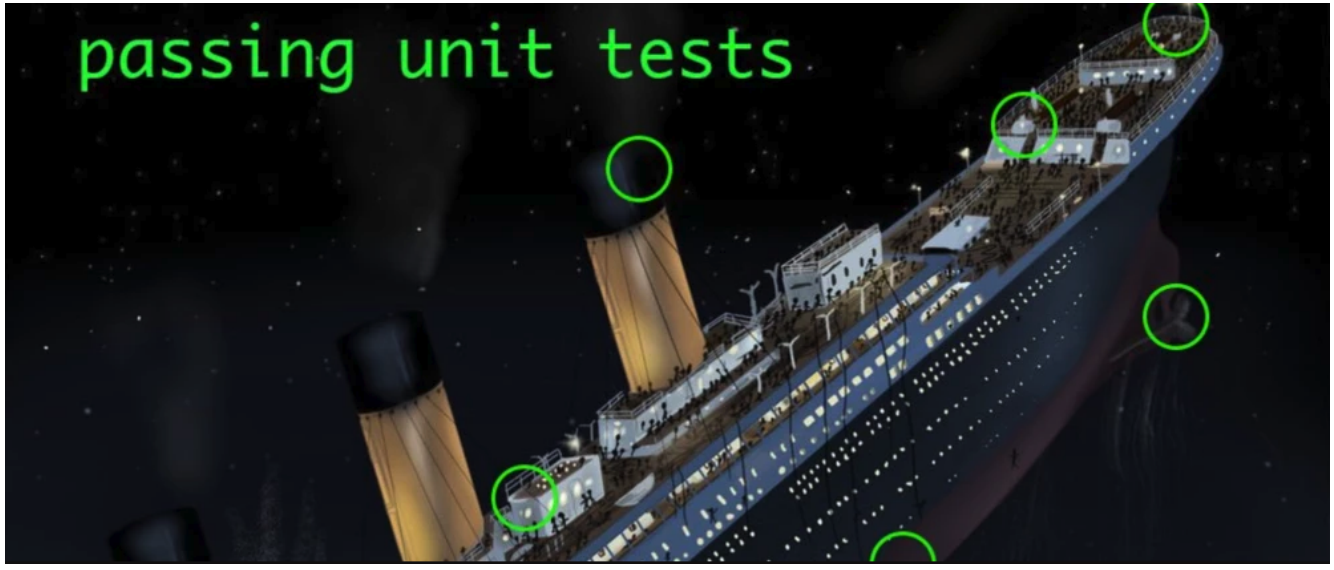
Part 1, Why



Why

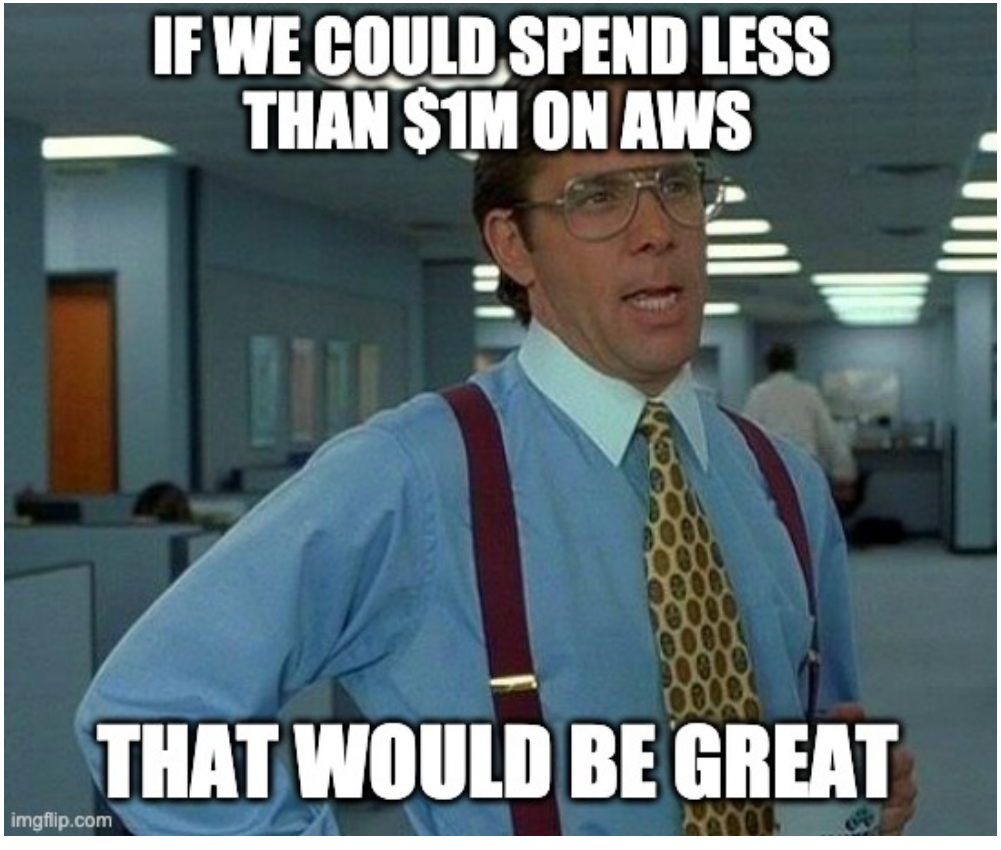


> Everything That's Not Tested Will Eventually Break

Why

> Don't let your users be your unit test

Why



> Control the application load
>
> See also: Don't DoS your own server

During dev

🔒 Safely collaborate & change elements on a project

- Making changes should be pain-free
- Bugs should be detected quickly 🐜
- New collaborators should be able to integrate a team smoothly

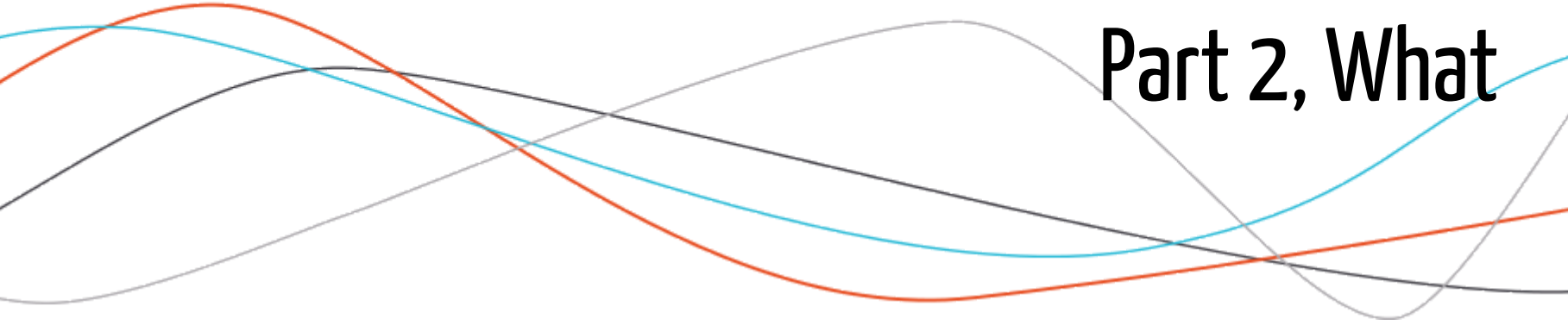
In production

👁 Safely serve application

- Your users should not be your unit tests
- Serving application cost money 💵
- (corollary) You shouldn't spend 1 million bucks on AWS (Jeff Bezos is rich enough)
- You shouldn't DoS your own server 🏋

Everything not tested will eventually fail

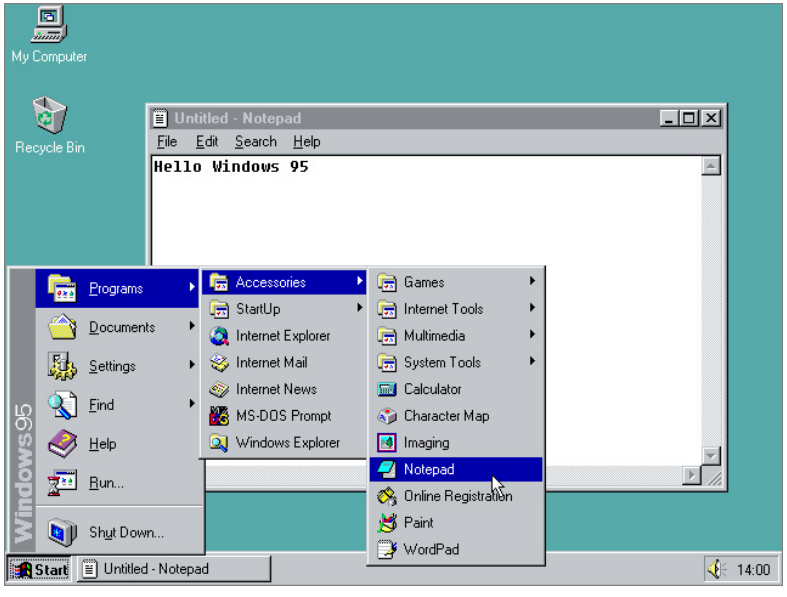
Part 2, What



What - User Interface

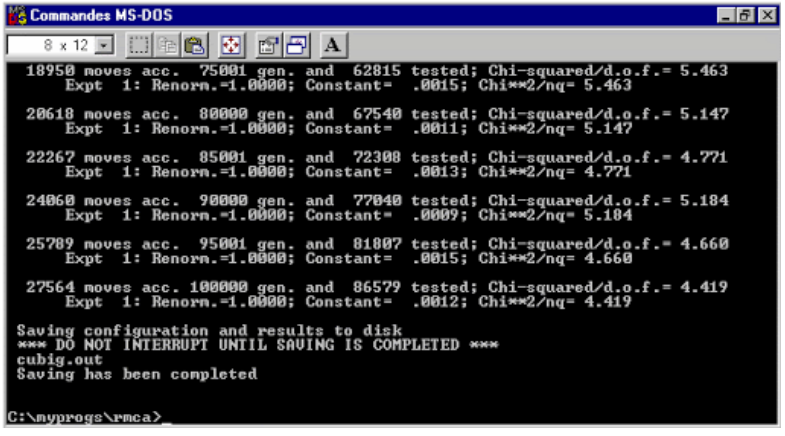
> Your time is limited, so if you have to choose don't focus too much on testint the UI only

- What the users see
- What the users interact with
- General front-end/design



What - Business logic

> Try to test business logic as extensively as possible



- Core algorithms that make your app "unique"
- Business knowledge
- What your users rely on

What - Application Load

> Poor app performances lead to bad UX, and potentially cost 💸

- How much CPU & RAM does your application need
- Bad estimate will lead to slow application performances
- If the app needs to scale, it's crucial to kow it upfront

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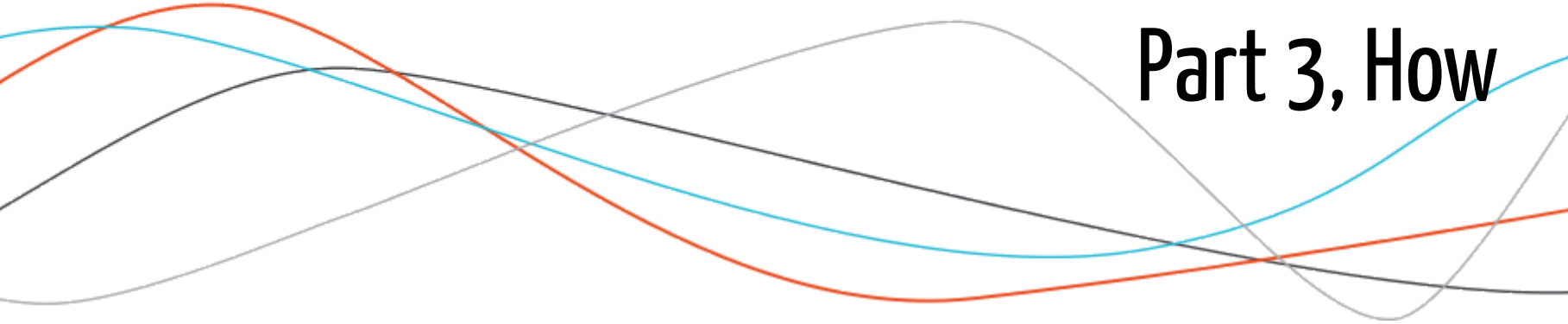
Part 3, How



How - Business logic/backend

Shiny App as a package 📦

-> Leverage standard testing frameworks

```
test_that("The meaning of life is
42", {
  expect_equal(
    meaning_of_life(),
    42
  )
})
```

How - User interface/frontend

`{shinytests}`

- 👓 Test visual regression of your application

`puppeteer`

- 🎡 Command line tool to mock a web session, in NodeJS

`{crrry}`

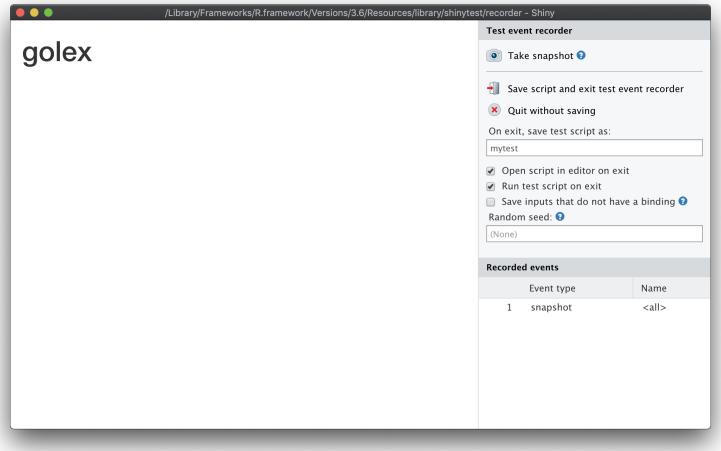
- 🚗 R tool to drive a `{shiny}` session

How - {shinytests}

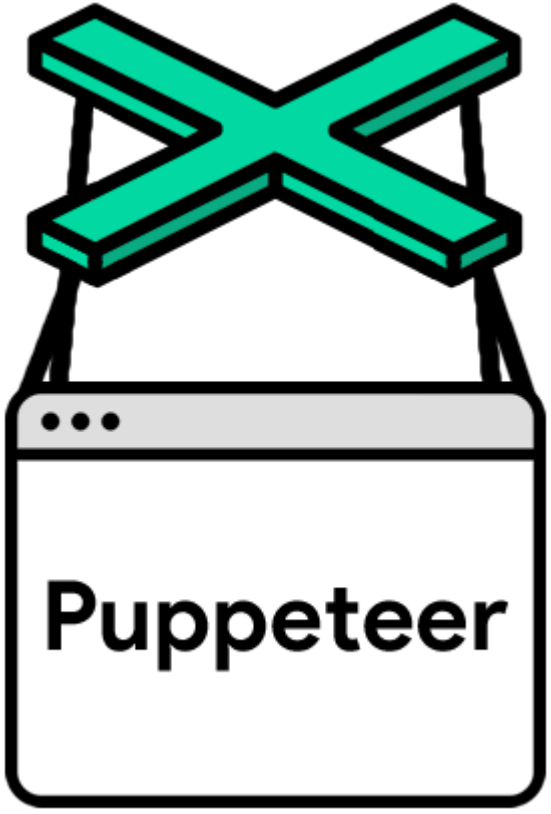
1. Records snapshots of an app

2. Replays the application

3. Detects visual regression



How - puppeteer



1. Records interaction with the application
2. Replays the application with NodeJS
3. Detects application logic changes

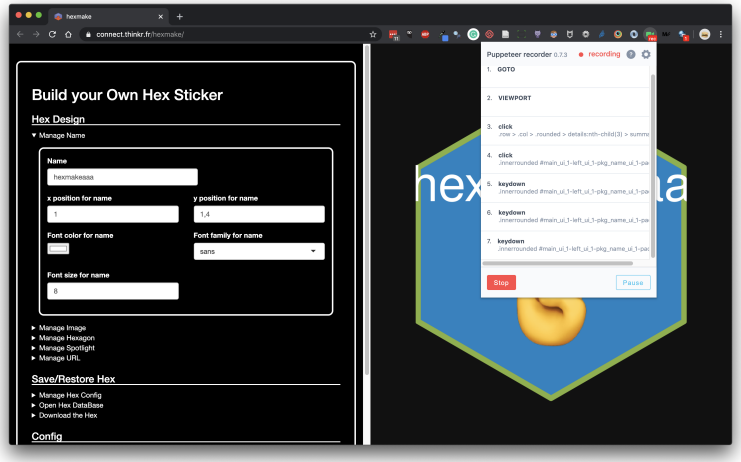
How - puppeteer

```
// Require the node module
const puppeteer = require('puppeteer');
(async () => {
  // launch puppeteer and connect to the page
  const browser = await puppeteer.launch()
  const page = await browser.newPage()
  await page.goto('http://localhost:2811/')

  // We're waiting for a DOM element to be ready
  await page.waitForSelector('.row > .col > \
    .rounded > details:nth-child(3) > summary')
  // Now it's ready, we can click on it
  await page.click('.row > .col > .rounded > \
    details:nth-child(3) > summary')

  // Now our test is over, we can close the connection
  await browser.close()
})()
```

How - puppeteer

And it has a Chrome extension 🎉

- Records the app "live"
- Returns the NodeJS code to replay the application



How - {crrry}

- Wrapper around the {crrri} 📦, for remote orchestration of Chrome, with recipes for {shiny} apps
- Connects to a running app and interact with it
- Allows to script everything

How - {crrry}

Create a new testing session

```
test <- crrry::CrrryOnPage$new(
  # Find the Chrome binary
  chrome_bin = pagedown::find_chrome(),
  # Get a random port for Chrome to use
  chrome_port = httpuv::randomPort(),
  # Connect to a page
  url = "https://connect.thinkr.fr/hexmake/"
)
```

```
test$wait_for_shiny_ready()
```

```
Shiny is computing
✔ Shiny is still running
```

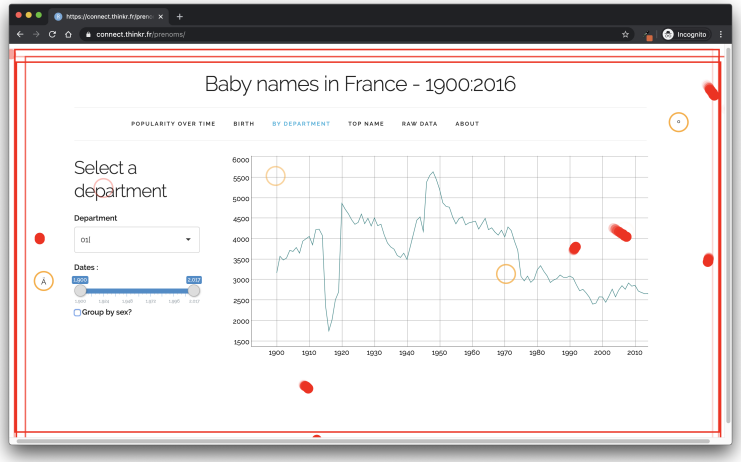
How - {crrry}

Set a series of input

```
for (i in letters[1:3]){
  # Set a value for a given input
  test$shiny_set_input(id = "main_ui_1-left_ui_1-pkg_name_ui_1-package", i)
}
```

```
── Setting id main_ui_1-left_ui_1-pkg_name_ui_1-package with value a
Shiny is computing
✓ Shiny is still running
── Setting id main_ui_1-left_ui_1-pkg_name_ui_1-package with value b
Shiny is computing
✓ Shiny is still running
── Setting id main_ui_1-left_ui_1-pkg_name_ui_1-package with value c
Shiny is computing
✓ Shiny is still running
```

How - gremlins



- JavaScript library to simulate a hordes of gremlins using an app
- Will click and scroll at random on the app
- Allows to detect unexpected behaviors

How - gremlins

```
test <- crrry::CrrryOnPage$new(
  chrome_bin = pagedown::find_chrome(),
  chrome_port = httpuv::randomPort(),
  url = "https://connect.thinkr.fr/hexmake/",
  headless = TRUE
)
test$wait_for_shiny_ready()
# Launch a hordes of gremlins
test$gremlins_horde()
# Wait for them to finish their work
Sys.sleep(20)
# Check that everything is ready
test$wait_for_shiny_ready()
# Stop the test
test$stop()
```

How - Testing the app load

`{shinyloadtest}`

- 🏋: native R package + Cli to record and replay load tests

`{dockerstats}`

- 🐋: get Docker stats inside R

`{crrry}` + `{dockerstats}`

- 👩‍❤️‍👨: replay session and watch the Docker stats

How - {shinyloadtest}

- Records a visit on the application
- Replays the app with multiple users
- Gives detailed stats about response time and load

How - {dockerstats}

- Wrapper around `docker stats`
- Turns the stats from Docker into an R dataframe
- Can be called recursively

How - {dockerstats}

```
# Launch the container from the terminal
docker run --name hexmake --rm -p 2811:80 colinfay/hexmake
```

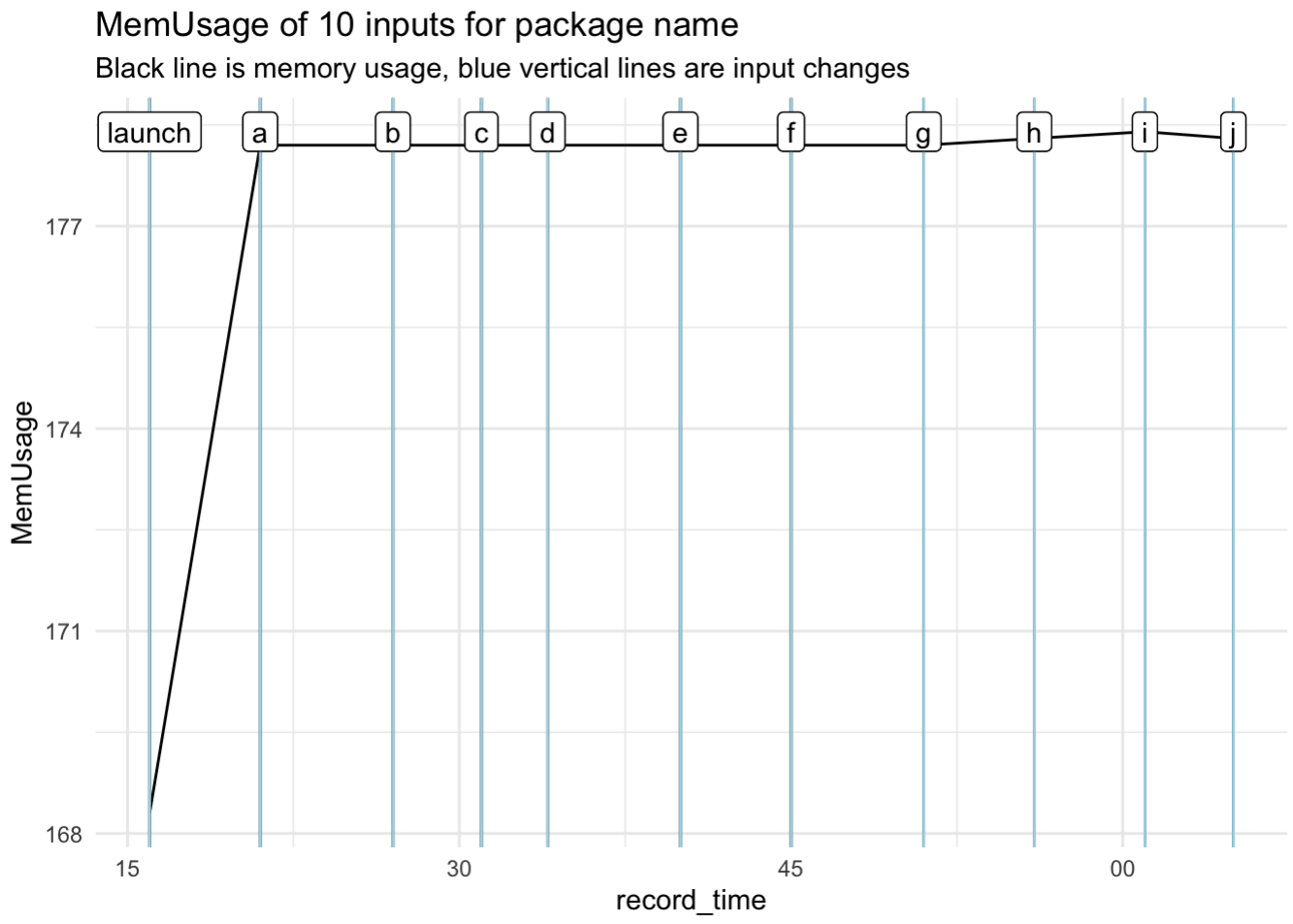
```
# Call dockerstats, only selecting specific columns
dockerstats::dockerstats("hexmake")[, c("Name", "MemUsage", "CPUPerc",
"MemPerc", "record_time")]
```

```
Warning in system(com, intern = TRUE): running command 'docker stats --no-
stream hexmake --format "{{.Container}},
{{.Name}},{{.ID}},{{.CPUPerc}},{{.MemUsage}},{{.NetIO}},{{.BlockIO}},
{{.MemPerc}},{{.PIDs}}"' had status 1

Unable to find any container running.

[1] Name        MemUsage    CPUPerc     MemPerc     record_time
<0 rows> (or 0-length row.names)
```

{dockerstats} + {crrry}

```
# Getting the result from the first launch
results <- dockerstats::dockerstats("hexmake", extra = "launch")

# Setting a series of letters as input
for (i in letters[1:10]){
  test$shiny_set_input(
    "main_ui_1-left_ui_1-pkg_name_ui_1-package",
    i
  )
  # Binding the current snapshot to the results
  results <- rbind(
    results,
    dockerstats::dockerstats("hexmake", extra = i)
  )
}
```

{dockerstats}



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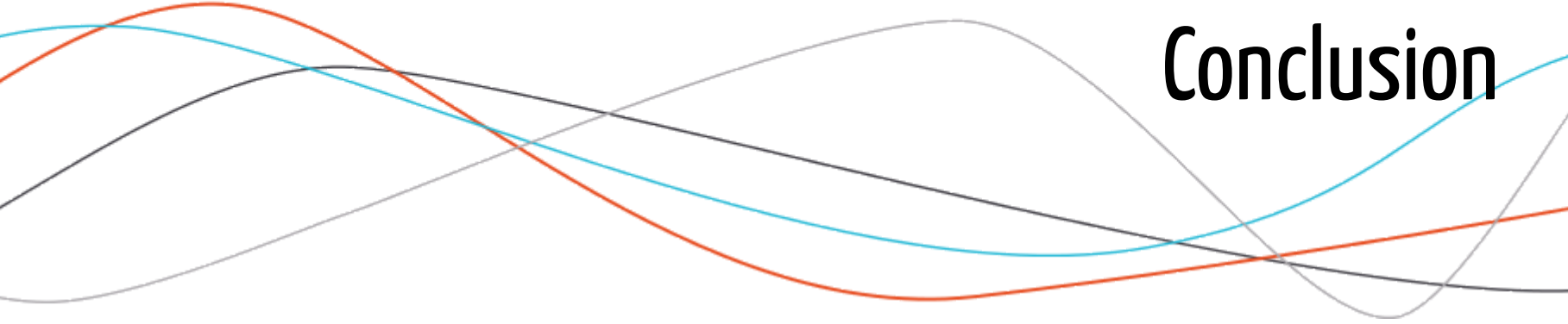
Conclusion



To conclude

- Test often, test soon
- If you have to chose, focus on the backend
- Interactive tests can (and should) be scripted
- Don't forget to test the load

- testthat.r-lib.org
- rstudio.github.io/shinytest
- pptr.dev
- github.com/ColinFay/crrry
- github.com/marmelab/gremlins.js
- rstudio.github.io/shinyloadtest
- github.com/ColinFay/dockerstats

engineering-shiny.org

Engineering Production-Grade Shiny Apps

Colin Fay, Sébastien Rochette, Vincent Guyader, Cervan Girard

2020-04-25

Introduction

This book is currently under development. It will be published in 2020 in the R Series by Chapman & Hall.

Motivation

This book will not **get you started with Shiny**, nor **talk about how to deploy into production and scale your app**. What we'll see is **the process of building the app**. Why? Lots of blog posts and books talk about starting to use `{shiny}` (**???**) or putting apps in production. Very few (if any) talk about this grey area between getting started and pushing into production.

So this is what this book is going to talk about: building Shiny application. We'll focus on the process, the workflow, and the tools we use at ThinkR when building big Shiny Apps.

Hence, if you are starting to read this book, we assume you have a working knowledge of how to build a small application, and want to know how to go one step further.

Thx! Questions?

Colin Fay

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- https://thinkr.fr/
- https://rtask.thinkr.fr/
- https://colinfay.me/

Related projects

- engineering-shiny.org
- {golem}
- {shinipsum}
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- {shinysnippets}