

Seminar Software Quality

Preliminary meeting

We will start at 3:02 pm

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Markus Schnappinger
Roland Würsching

Dr. Andreas Stahlbauer
Lena Gregor
Raphael Nömmer



Software Quality



Quality of
Code, Data and
Models

Quality of
Tests

Participating

1

Apply via matching tool

2

Application with us: Online form

- Letter of motivation
- Study program and semester
- Optional: CV + grade report
- Your 2+ favorite topics

<http://go.tum.de/070420>



February 14th

Schedule

Application

Matching

Matching results and
topic assignment

Kickoff

Individual phase

Block seminar

- Introduction to SW-Quality
- Literature research
- HowTo thesis?
- Effective presentations

Until 14th of February

April

July



Grading

Thesis

- Seminar paper: max. 15 pages (text)
- Content: Theory + **application** of the topic
(results, experiences, problems and limitations)
- Initial submission
- Final submission: 1 week after presentation

Presentation

- 20 min + 10 min discussion
- Mandatory dry run (1 week before seminar)

50/50

Questions about the
organization?

=> Topics



Clone Detection:

"Where can identical (copied) parts be found in source code?"

```
// Utilities for arrays of elements
public String showElements(ModelElement[] elements, String nomsg) {
    boolean found = false;
    StringBuffer res = new StringBuffer();
    if (elements != null) {
        Index.getInstance().setCurrentRenderer(
            FlatReferenceRenderer.getInstance());
        for (int i = 0; i < elements.length; i++) {
            ModelElement el = elements[i];
            res.append(showElementLink(el)).append(HTML.LINE_BREAK);
            found = true;
        }
        Index.getInstance().resetCurrentRenderer();
    }
    if (!found && nomsg != null && nomsg.length() > 0) {
        res.append(HTML.italics(nomsg));
    }
    return res.toString();
}
```

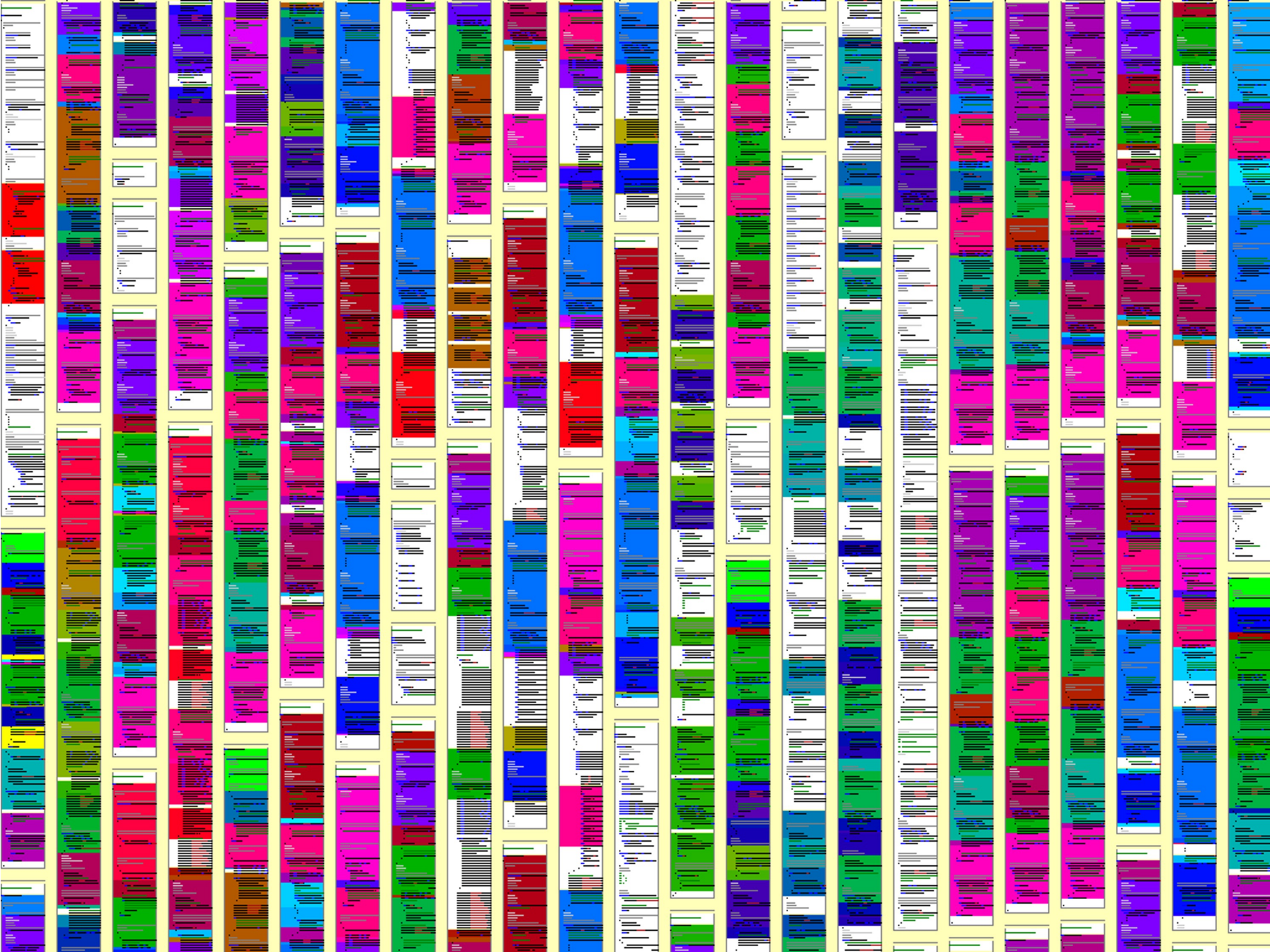
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Maintaining ML Models

Software Lifecycle vs ML Pipeline



What happens after the deployment? How are ML Models **maintained**?

Maintaining ML Models



Topic 2)

How can I detect that my deployed ML model needs maintenance?

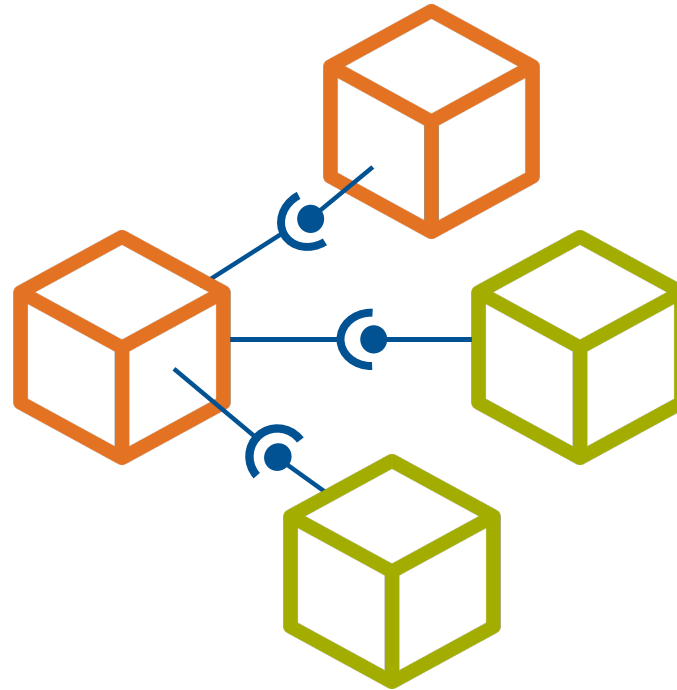
- Reasons for maintenance
- Monitoring techniques
- Detecting performance drops automatically

Topic 3)

... and what can I (automatically) do about it?

- Pipelines and techniques
- Limiting factors
- Minimizing manual intervention

Test Deficiency of Open Source Microservice Systems

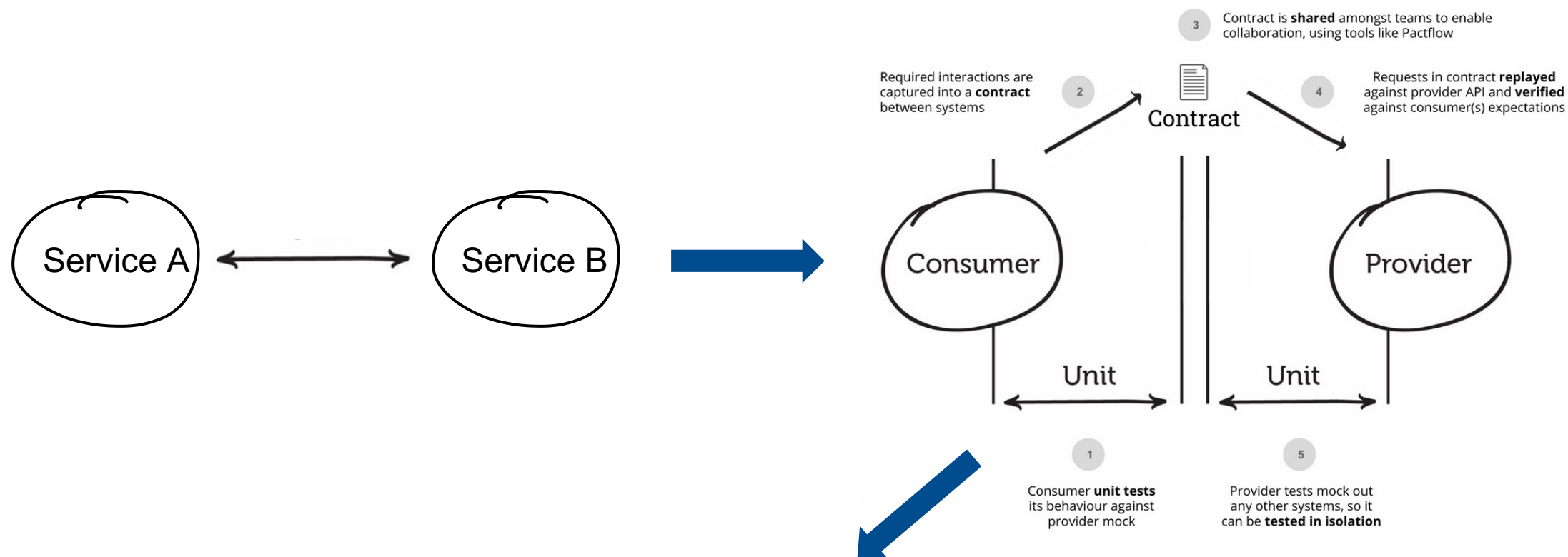


Microservice Systems



Tests

Deep Dive into Practical Contract-Based-Testing



[<https://docs.pact.io/>]

PACT

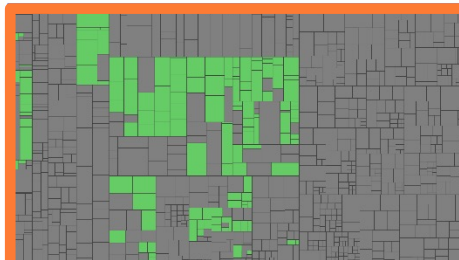
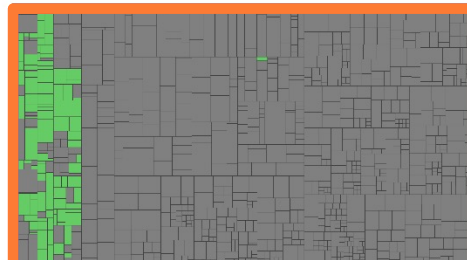
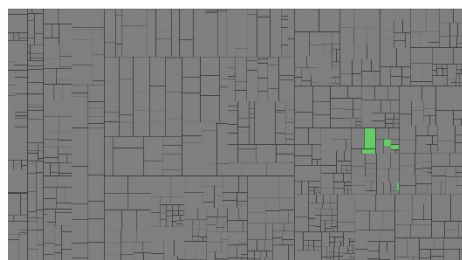
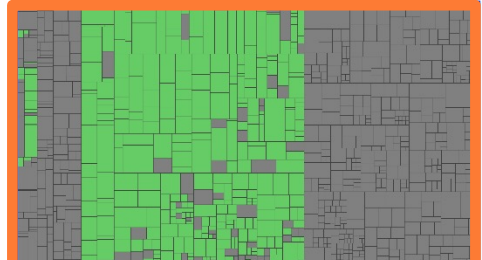
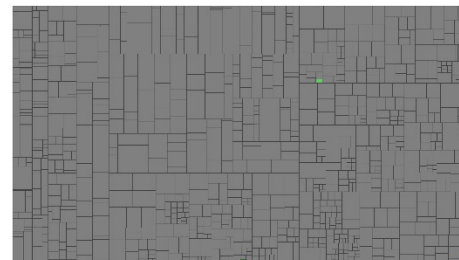
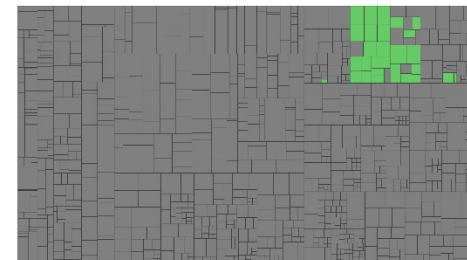
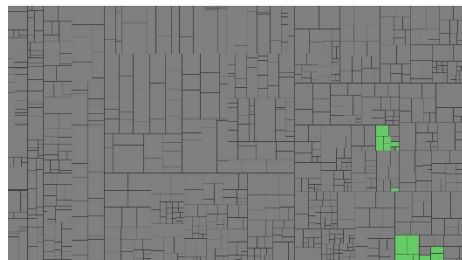
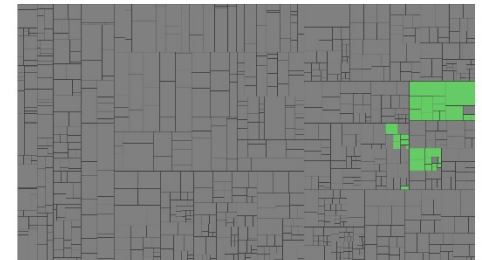
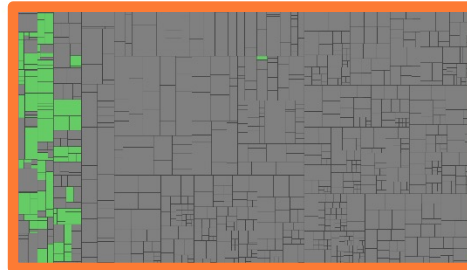
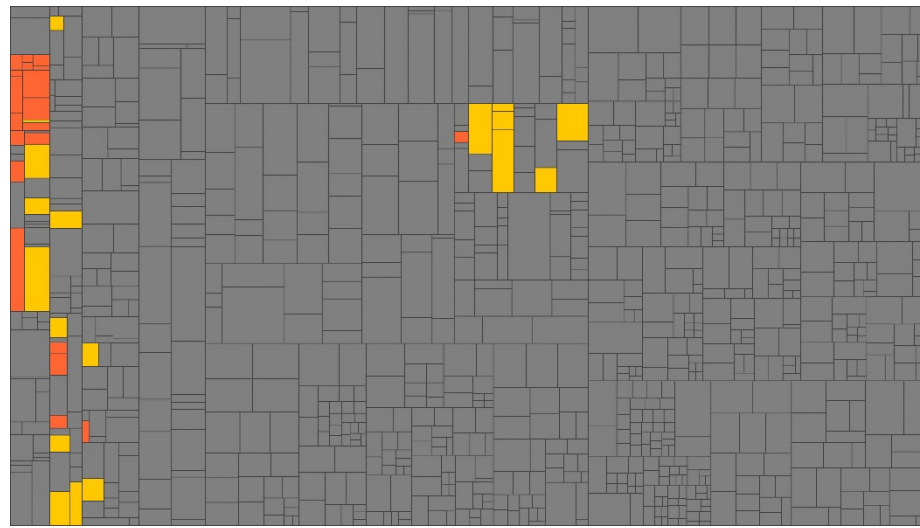
vs.



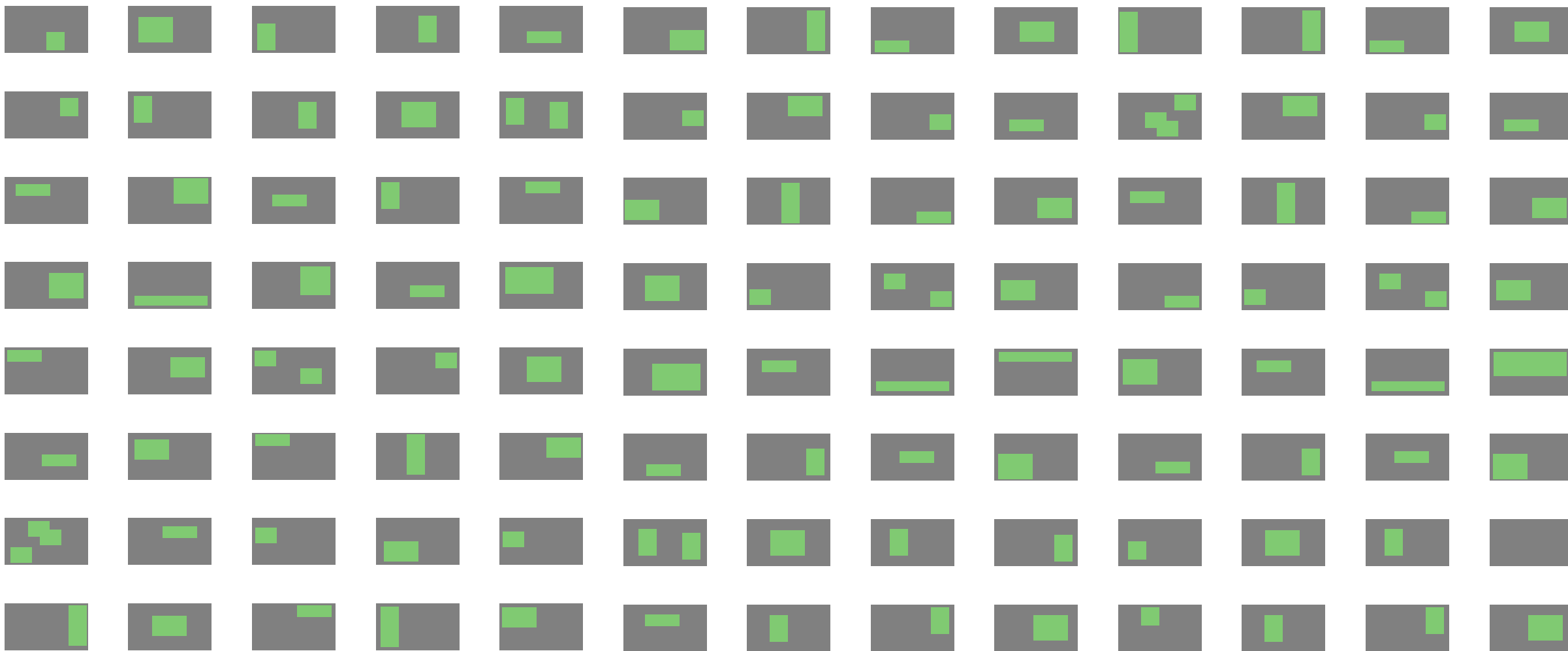
MICROCKS

Test Impact Analysis:

"Do I really need to run *all the* tests again?"



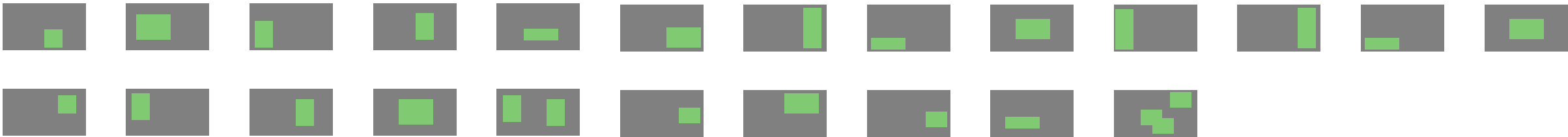
... 4000+ Test
Cases that do not
cover
Changes



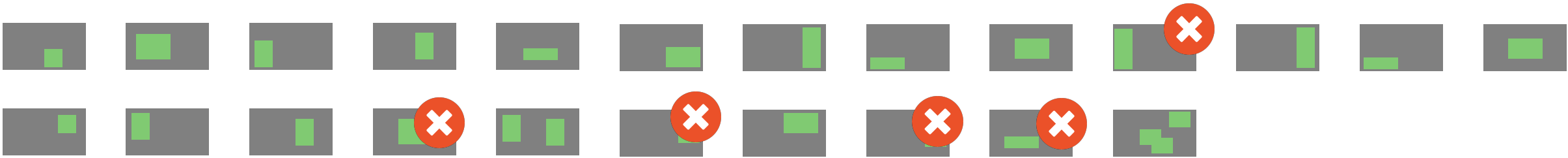
Step 1: Test Case Selection



Step 1: Test Case Selection



Step 2: Test Case Prioritization



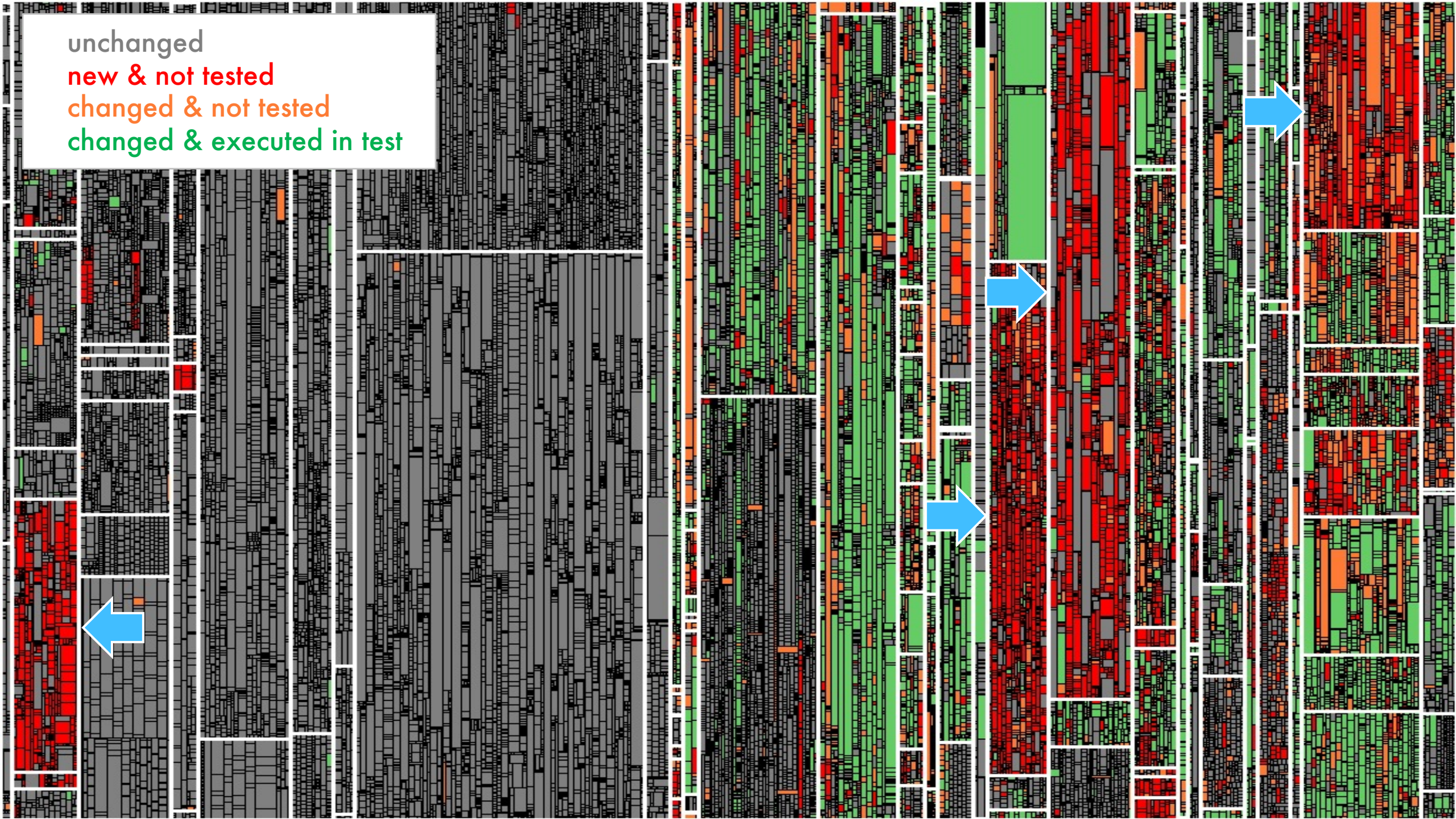
Step 2: Test Case Prioritization



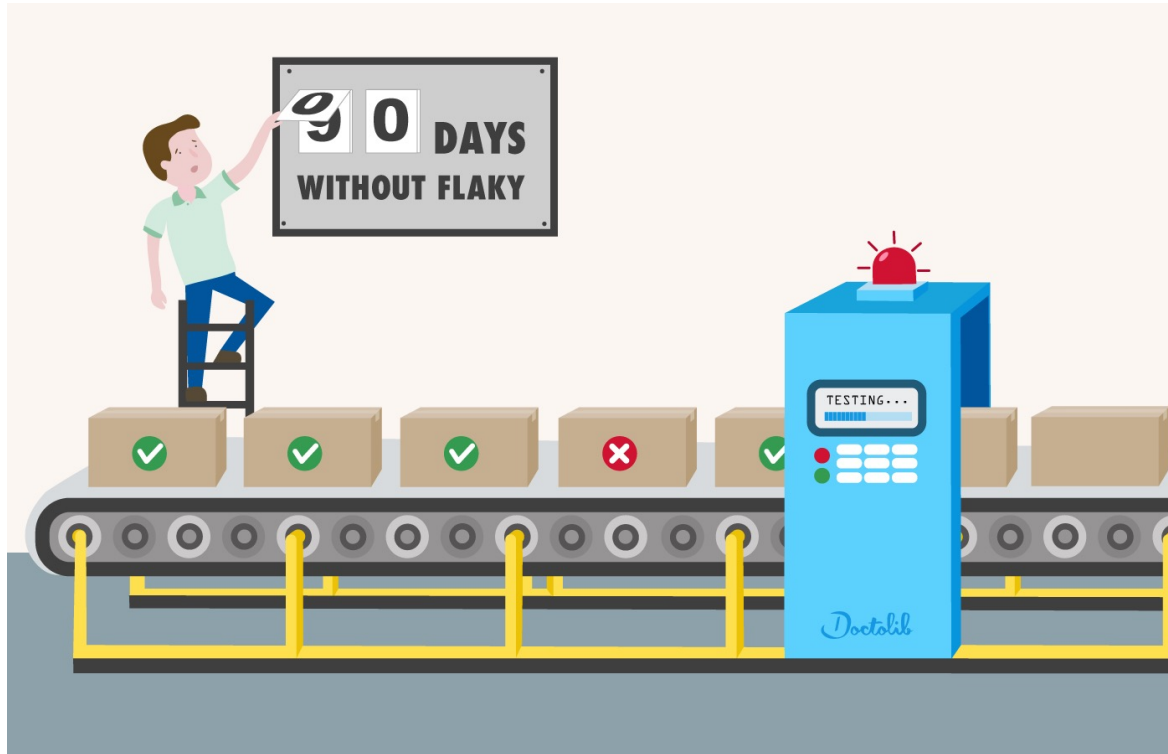
Test Gap Analysis

"Have all changes since the last release been tested?"

unchanged
new & not tested
changed & not tested
changed & executed in test



Supporting developers in handling flaky tests in CI



- Non-deterministically failing tests are called *flaky tests*
- Flaky tests hinder efficient continuous integration
- Current solutions mostly limit to rerunning tests
- Data driven solutions tailored to CI
 - Detection
 - Root causing
 - ...

Regression Test Optimization of Manual System Tests

Step	Description	Data	Expected Result	Actual Result	Status
1	...	...	...	...	Pass
2	...	...	...	...	Pass
3	...	...	...	...	Fail

How **consistent** is the test coverage?

How quickly does coverage become **outdated**?

How effective is a change-based **test selection**?

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