

# Test-Gap-Analyse

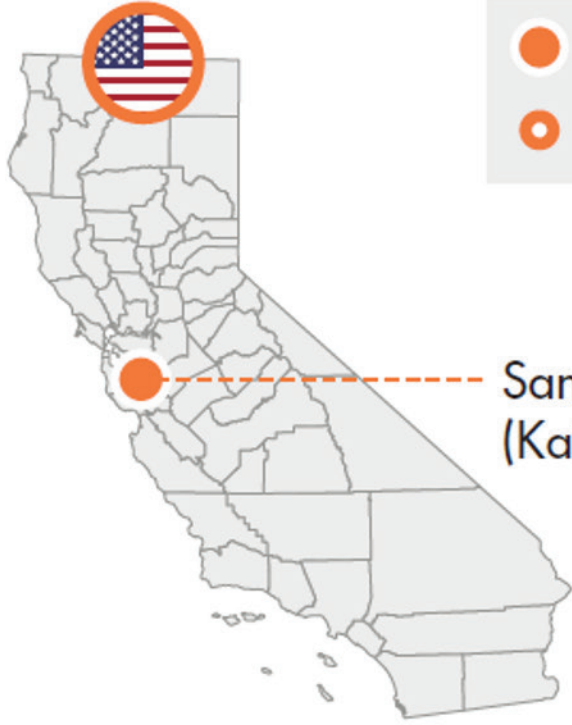
Ungetestete Änderungen im Quelltext aufdecken

Dr. Elmar Jürgens

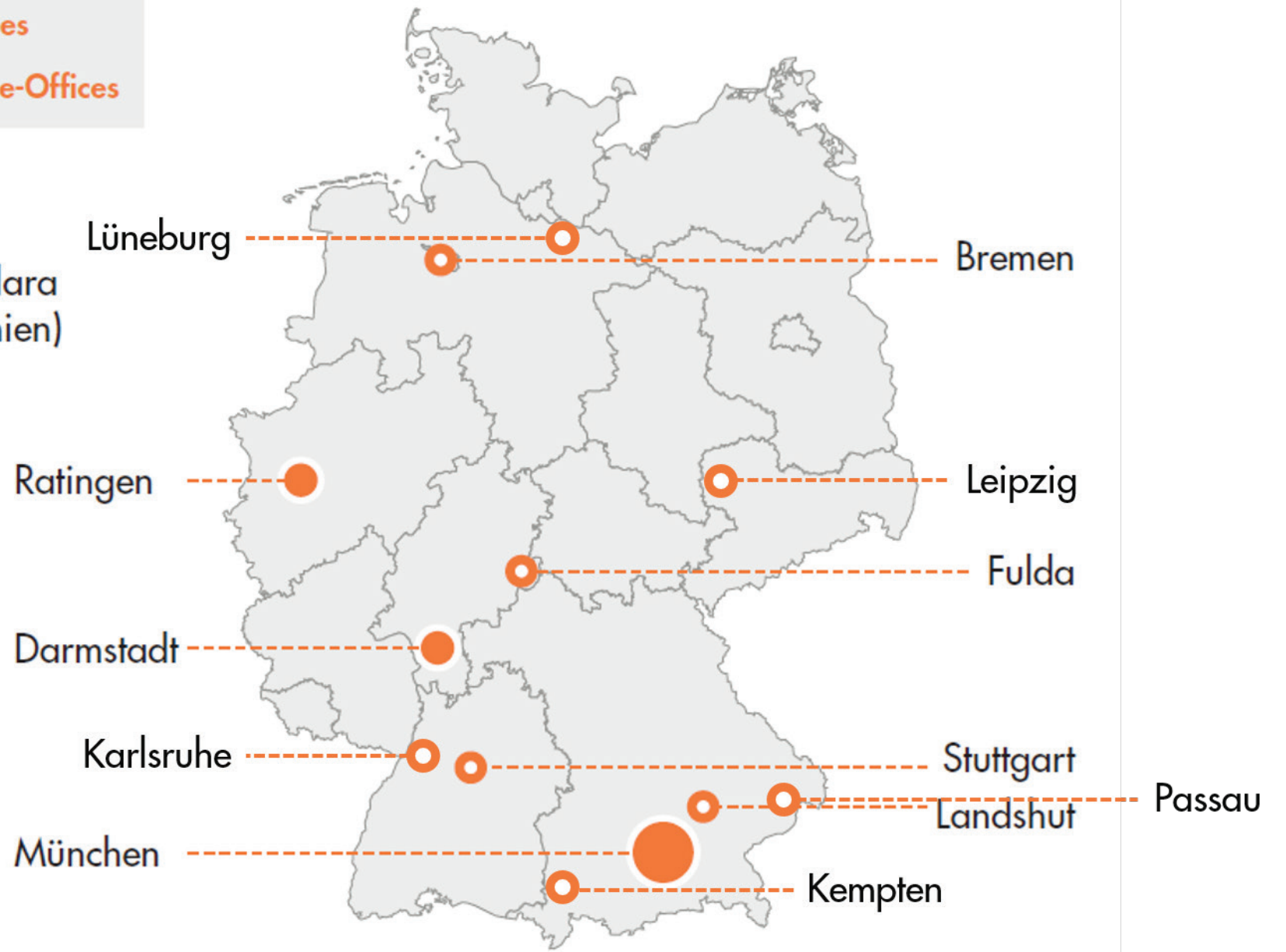
Jakob Rott

Fabian Streitl





- Offices
- Home-Offices



» Wie hole ich in Anbetracht  
begrenzter Ressourcen das meiste  
aus meinem Test raus? «





Hide Search Description

Status: UNCONFIRMED, NEW, ASSIGNED, REOPENED Product: clone Component: clone Alias: clone

83 bugs found.

ID	Summary
3382	Remove old filtering framework
4608	Improve progress monitoring for clone detection
3613	Make MetricOverview more flexible w.r.t. to database table names
3811	Incorrect offset reported by two-phased scanners
4610	Clone compare view does not open clone pair at correct position
1000	Integrate ConQAT and Clone Detection to allow for flexible filtering
1013	Rebuild CloneDetective Pipeline as ConQAT processors
1014	Integrate cdct, clonetective and bundles into single source
872	Remove ClassFileCollector
2397	Review cd_core
1824	More fine grained file e
1945	Consolidate identifiers
2199	Automatically close old
2216	Clone Tracking
2221	Consolidate normaliza
2223	Problem with gap posi
2327	Clean up old clone trac
2328	Add clone tracing for r
2367	Compute type of chan
2417	Create batch file gener
2428	Implement constraints
2431	Create Clone Detection
2439	Unload detection resul
2476	Improve parameteriza



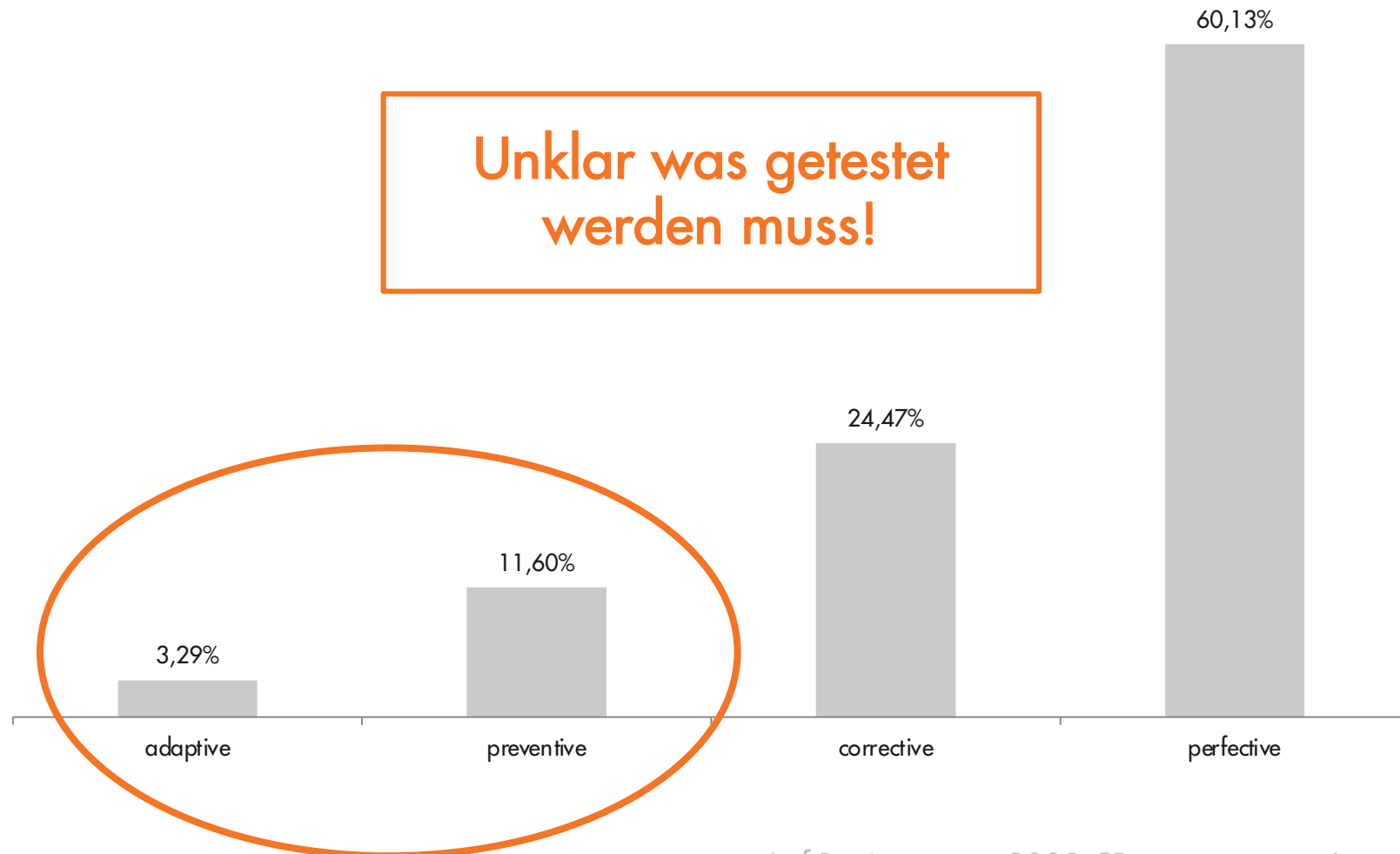
Jira Software

Denali Next Backlog

Denali Sprint 4 20 issues ACTIVE

- TS-21509 TGA Trend numbers do not match TGA treemap and Test perspective
- TS-23631 C/C++: False-positive with "Null pointer dereference" check when variables have the same names as struct members
- TS-23630 C/C++: False-positive with Unused parameter (dataflow) check when using \_\_unused
- TS-23597 C/C++: False-positive with "Unused variable or parameter" check (dataflow) when writing
- TS-22861 Multi-selection pre-commit analysis (all projects in same SVN checkout) sometimes misses files
- TS-23714 Performance of the process-based clang-tidy integration is low
- TS-23768 IndexOutOfBoundsException in check 'Don't assign to wider essential type'
- TS-23852 C++: Teamscale preprocessor confuses macro call with constructor call
- TS-23866 StructuringAnalysis: Expecting metric value for edited path
- TS-23367 Code Coverage for Go (implement report parser)
- TS-19211 Coverage upload not integrated when backup is downloaded during running analysis and before upload is processed
- TS-22210 Error in ExternalAnalysisResultsPersister: Predecessor commits [...] can't come after commit ...
- TS-21687 TGA: Merge Commits should show method changes
- TS-23137 Some tests fail with "Global Role Assignments" tab not clickable
- TS-23949 PL/SQL parser: define not parsed correctly
- TS-23584 [Seidenader EPS] Arch Editor Implement "Focus on transitive dependencies"
- TS-20689 C/C++/Objective-C: Check for correct formatting string in log statement
- TS-22648 PreCommitServiceTest.testDeletingFile fails/flickers
- TS-23033 TestGapTreeMapWidgetTest.testCR20004 is flickering consistently
- TS-23973 No timeouts for clang-tidy processes

# CRs in der Wartung

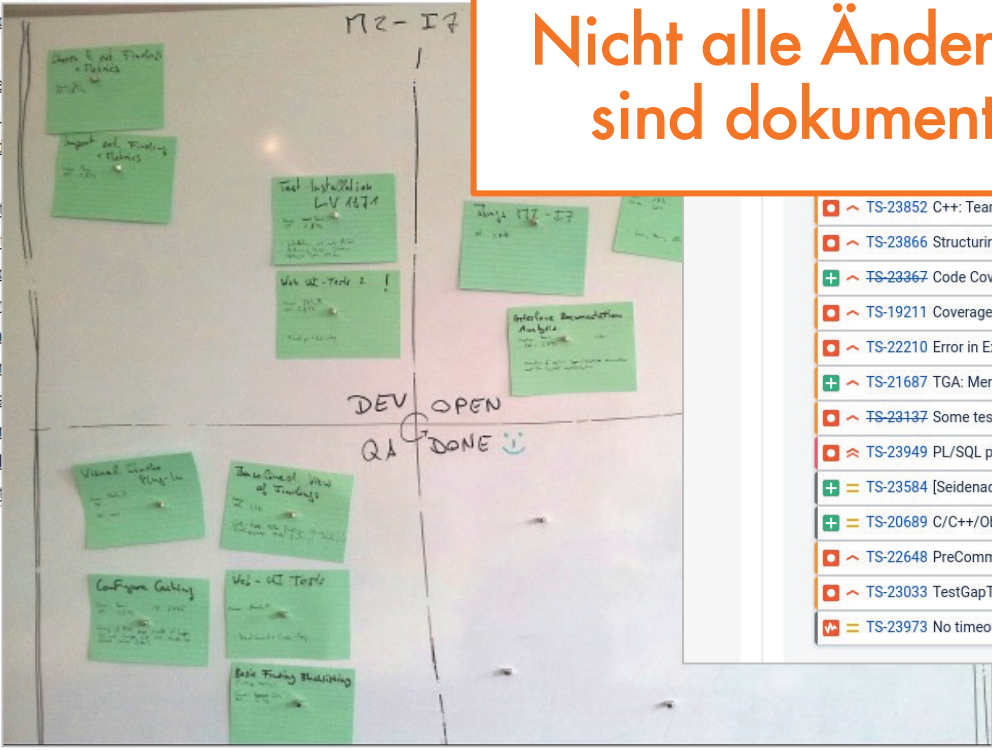


Auf Basis von ca. 2000 CRs aus unserem Issue Tracker

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2439	Unload detection resul
2476	Improve parameteriza



Nicht alle Änderungen sind dokumentiert!

Jira Software

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- TS-22648 PreCommitServiceTest.testDeletingFile fails/flickers
- TS-23033 TestGapTreeMapWidgetTest.testCR20004 is flickering consistently
- TS-23973 No timeouts for clang-tidy processes

# Wieviele Änderungen sind ungetestet?

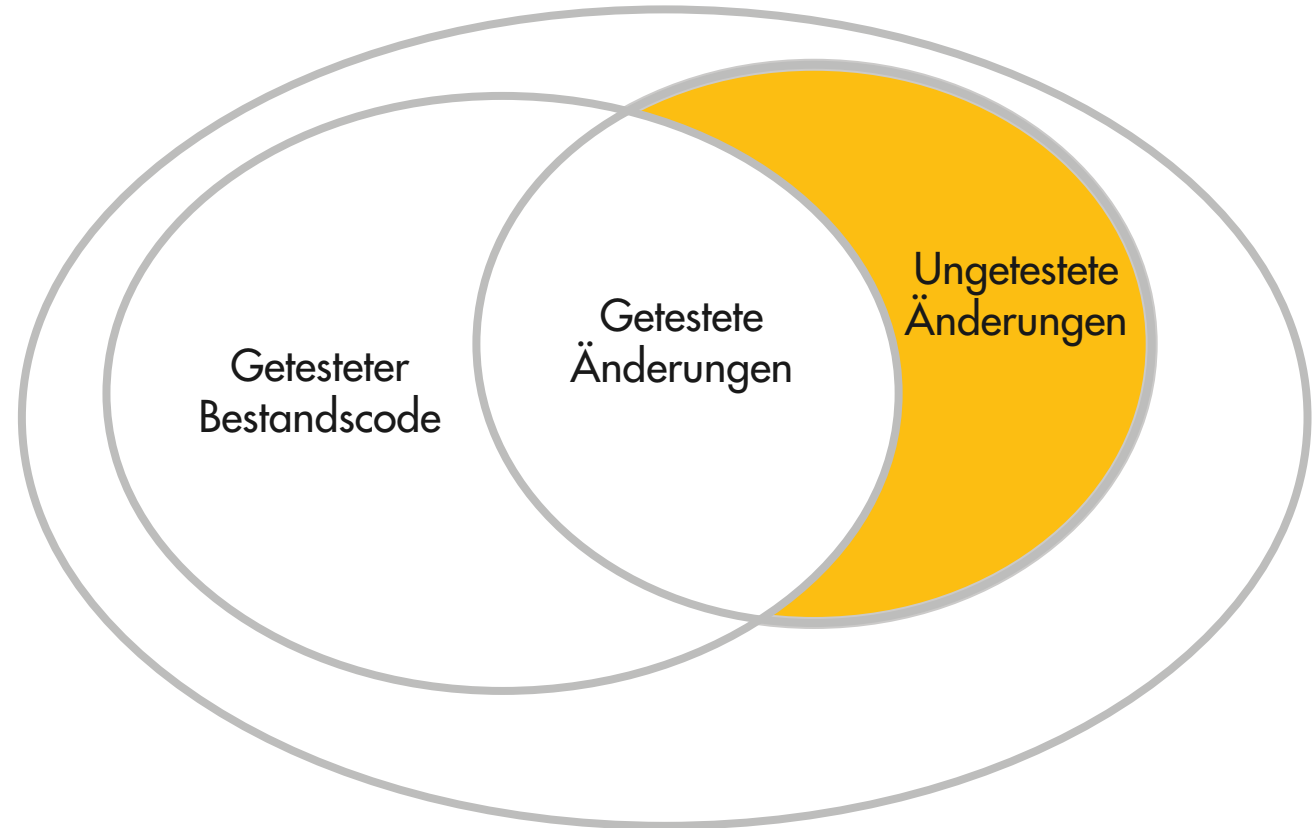
Studie: C# System @ Munich Re

**Release A:**

15% Code neu/geändert,  
**>50% ungetestet**

**Release B:**

15% Code neu/geändert,  
**>60% ungetestet**



**Feldfehlerwahrscheinlichkeit 5x höher für ungetestete Änderungen!**



# Test-Gap-Analyse

Änderungen

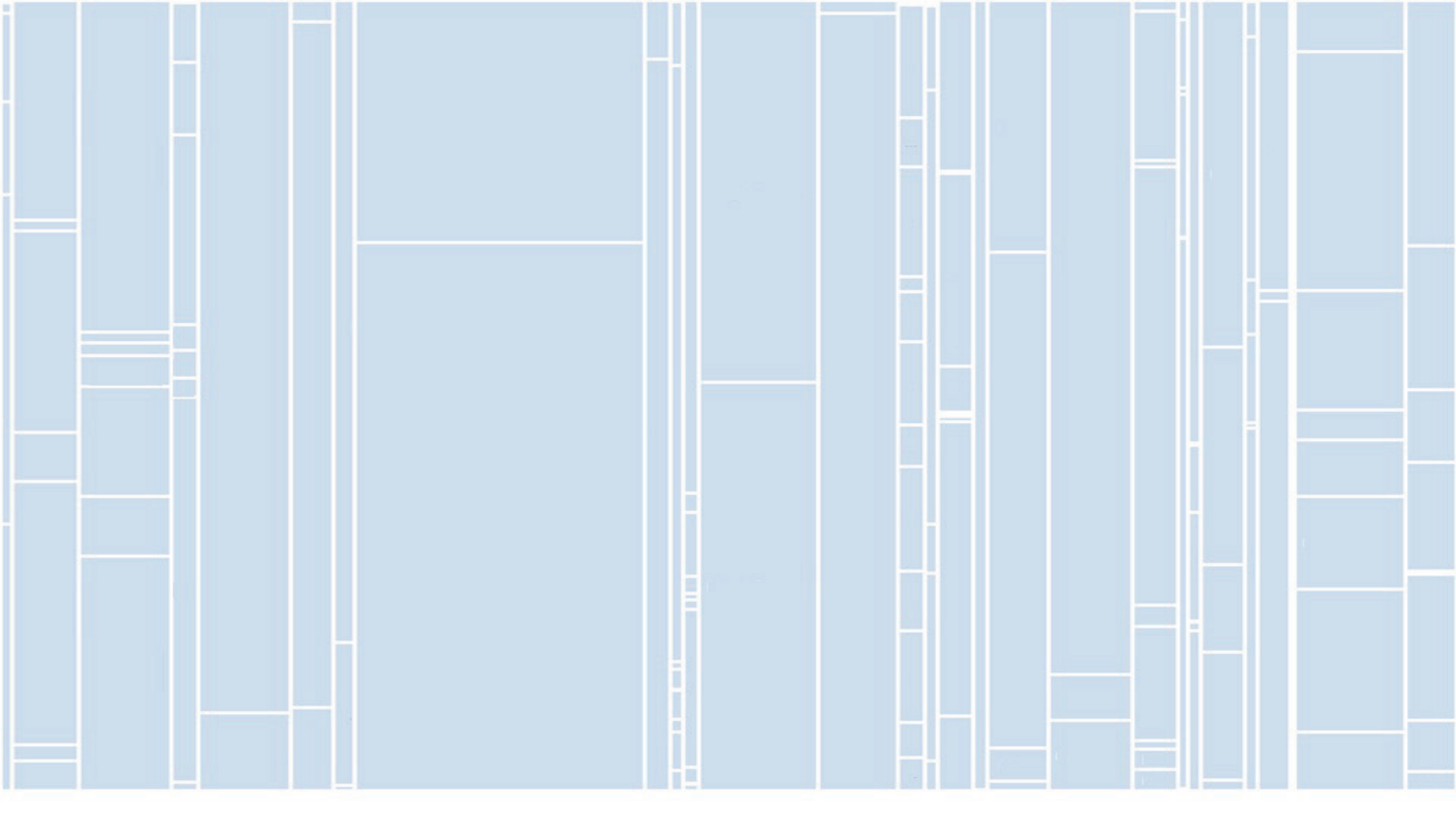


Test-Gap-Analyse

Ausführung



Ungetestete  
Änderungen





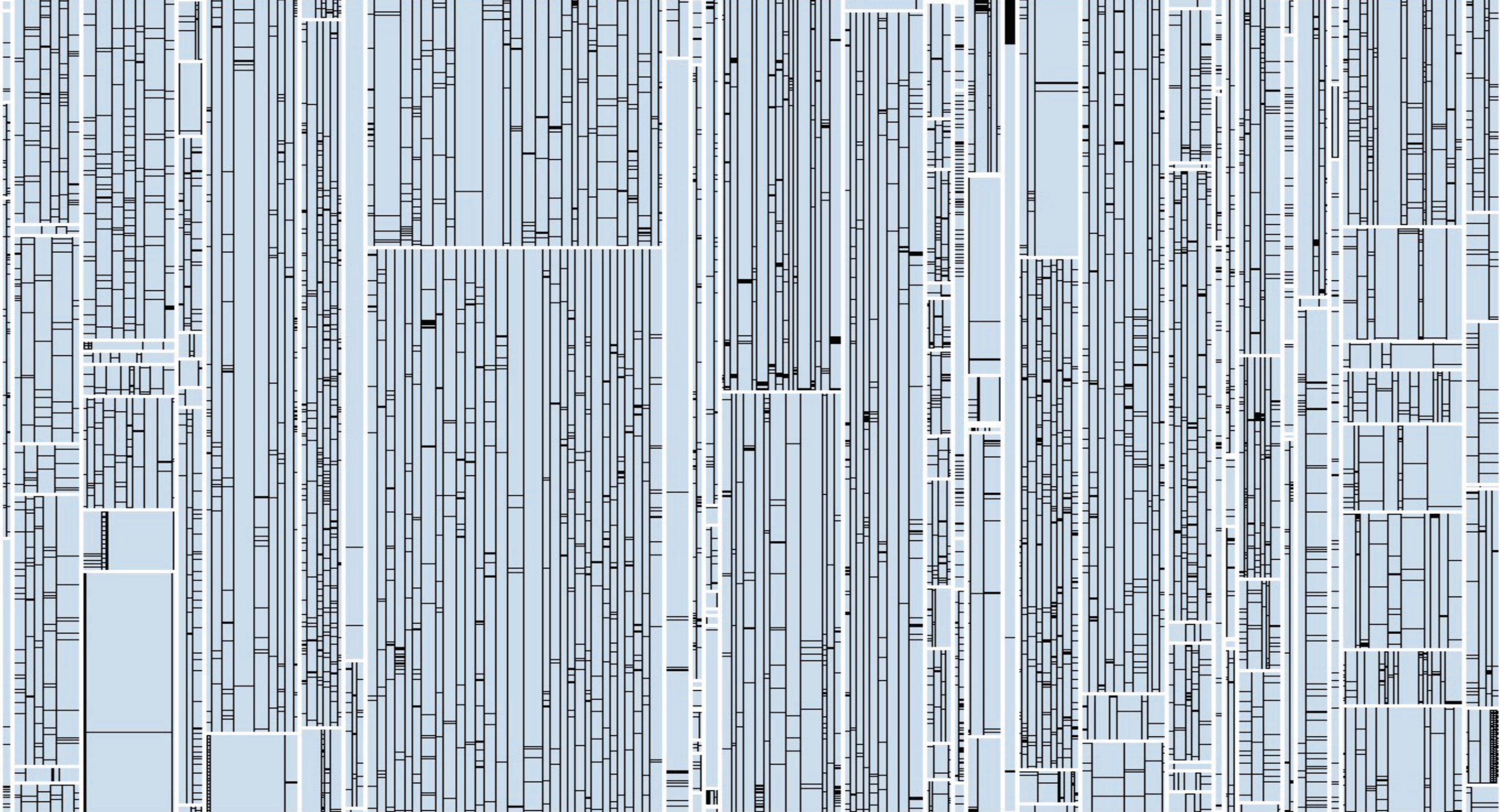
GUI.Dialogs

UI Controls

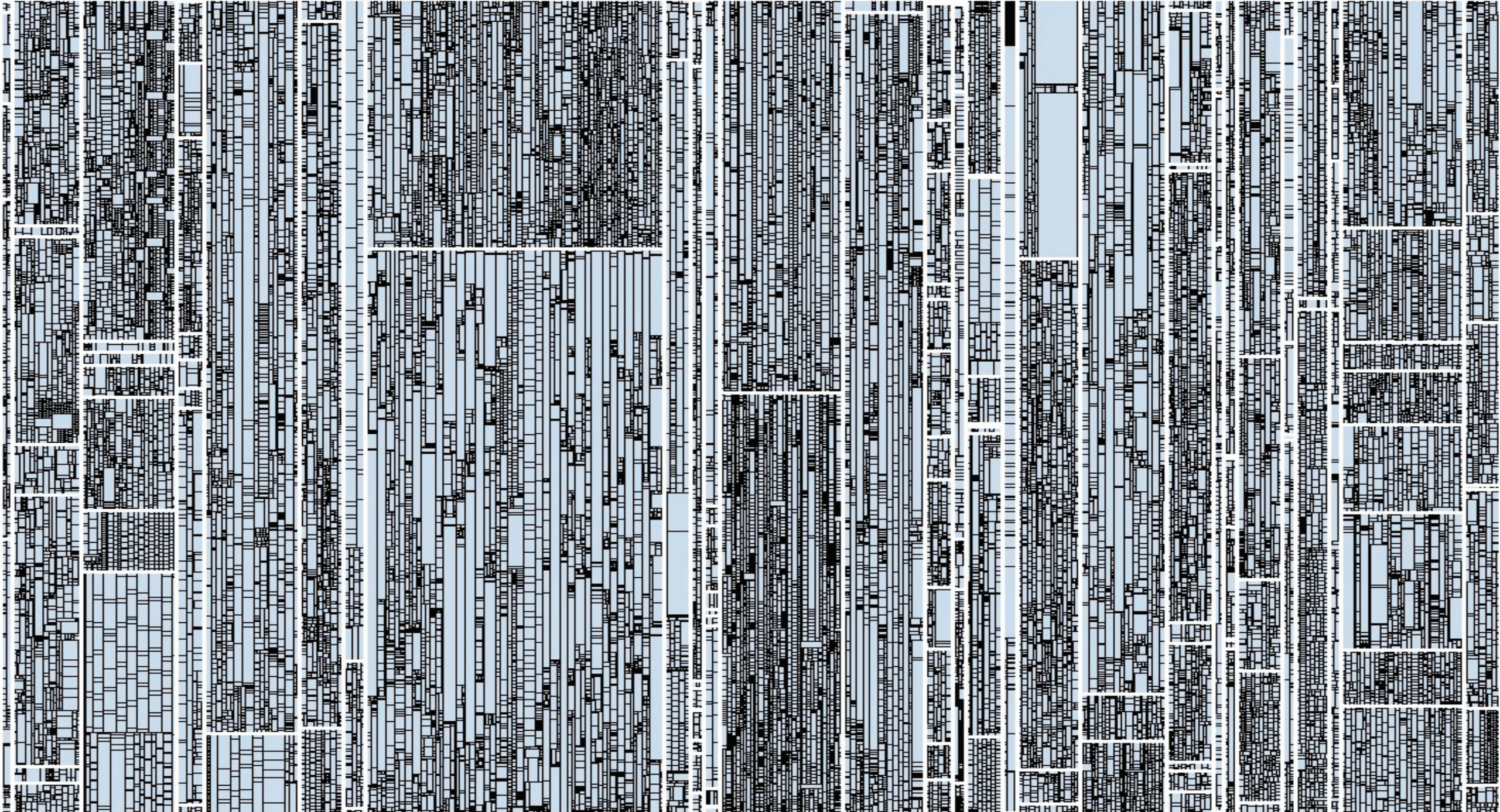
Authentication

GUI.Base

Data Validation







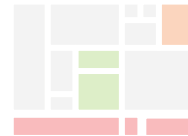


Änderungen



Test-Gap-Analyse

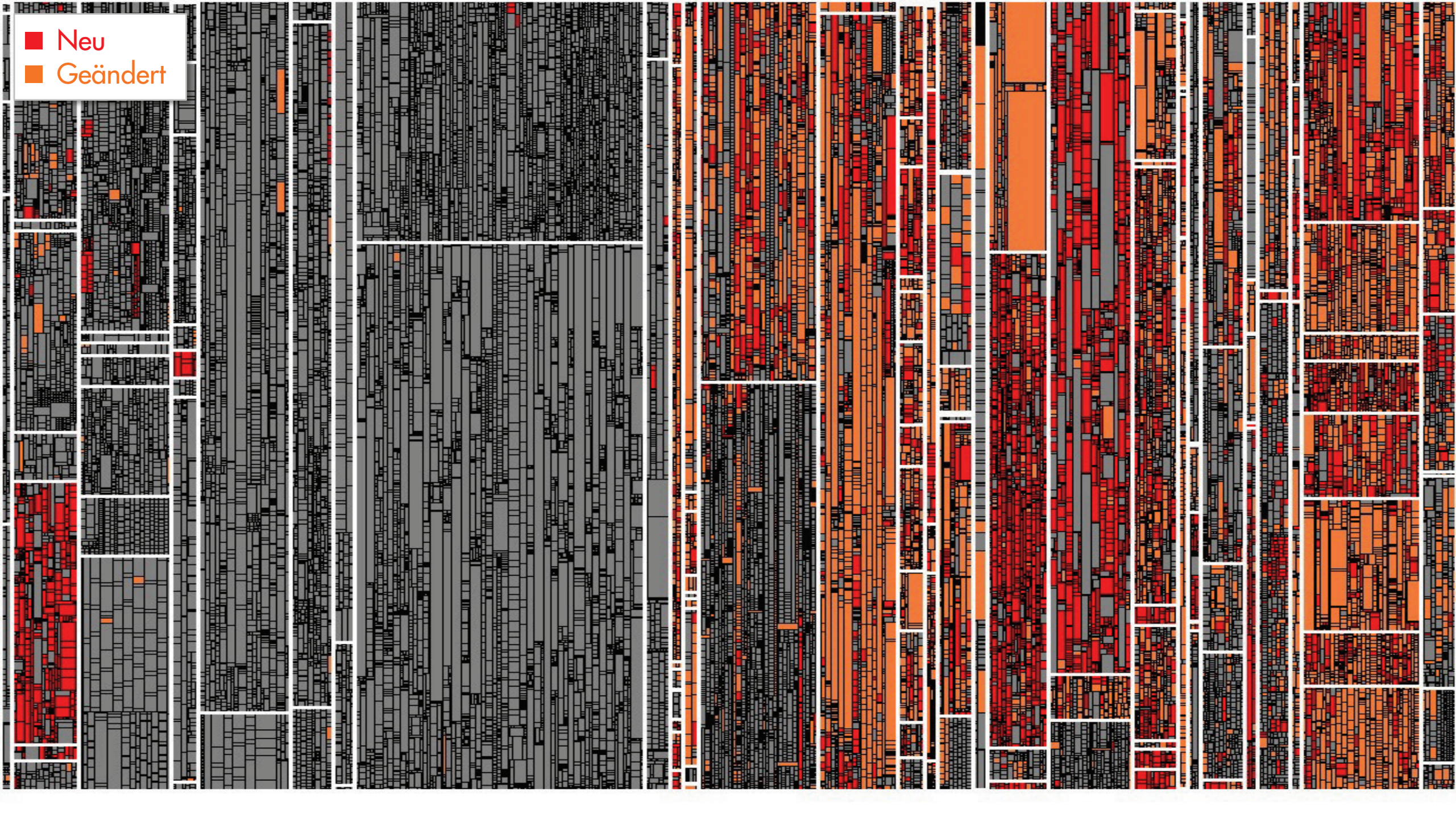
Ausführung



Ungetestete  
Änderungen

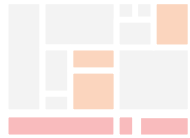


■ Neu  
■ Geändert



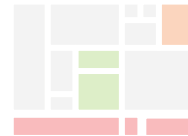


Änderungen



Test-Gap-Analyse

Ausführung

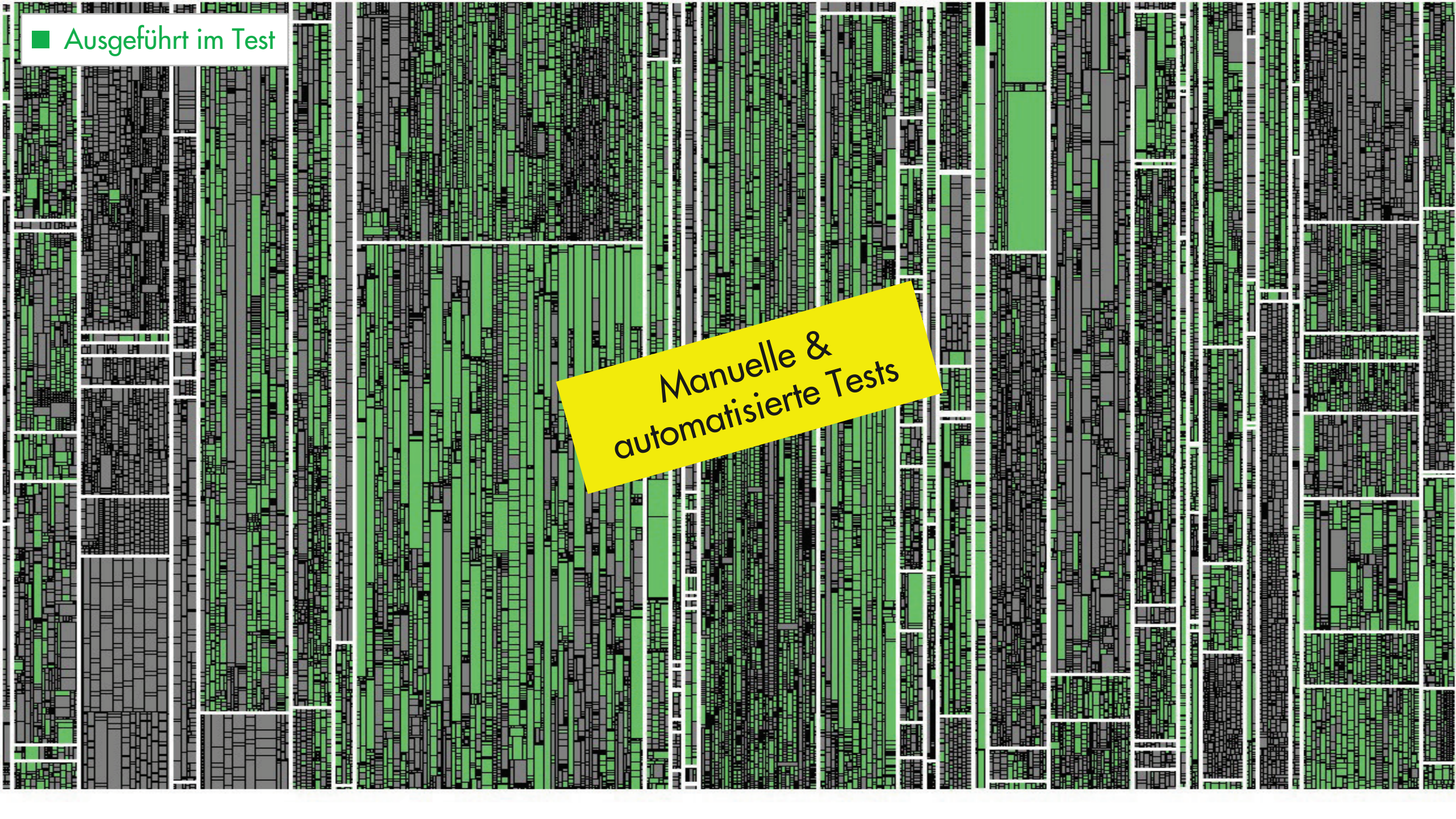


Ungetestete  
Änderungen



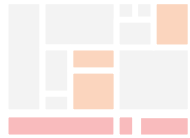
■ Ausgeführt im Test

Manuelle & automatisierte Tests





Änderungen



Test-Gap-Analyse

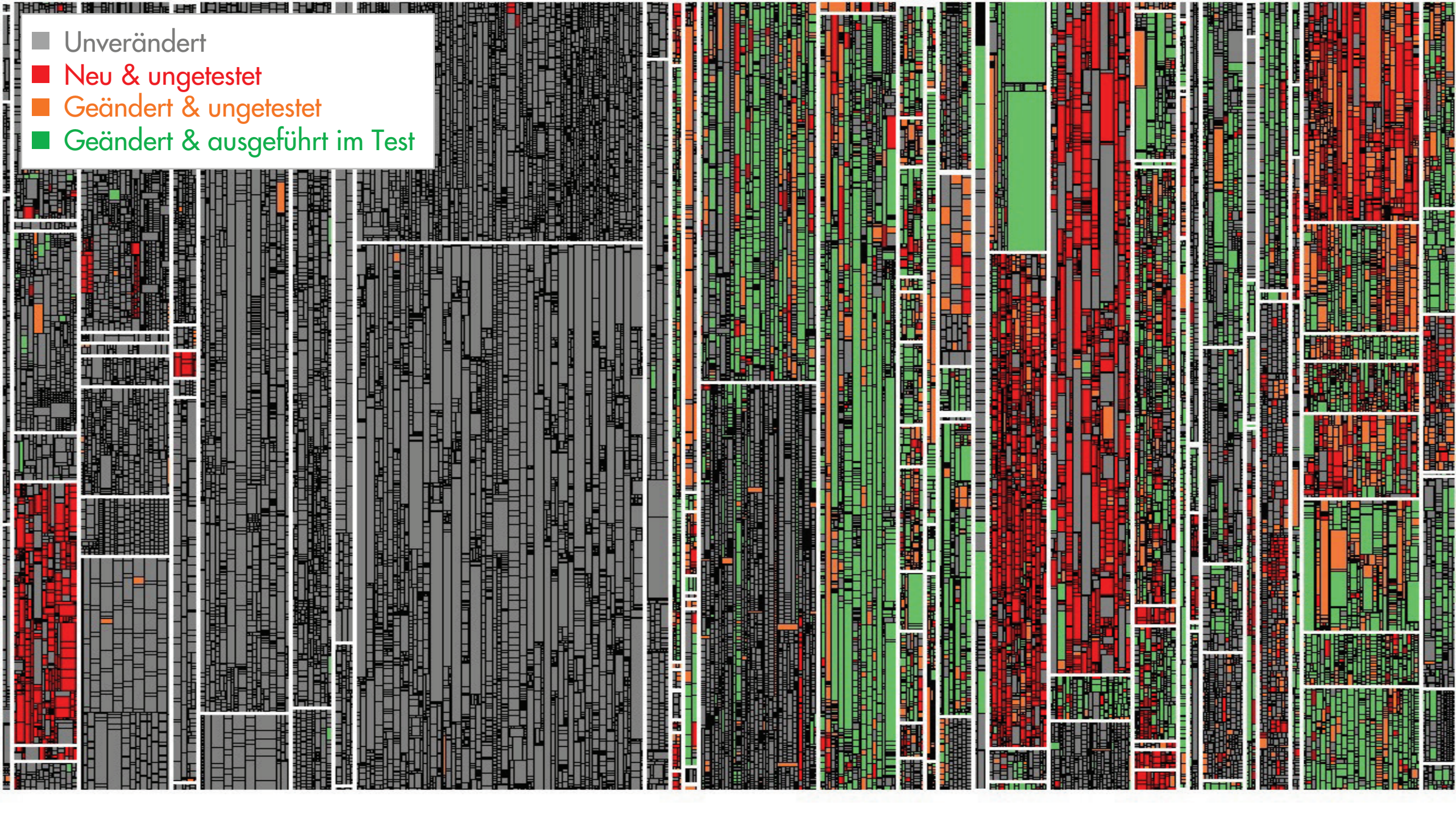
Ausführung



Ungetestete  
Änderungen



- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test





# Einsatz im Testprozess

Änderungen



Test-Gap-Analyse

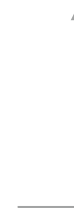
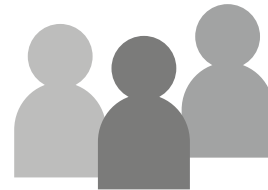


Ungetestete  
Änderungen

Ausführung



Testfälle



Entwickler, Tester, Testmanager

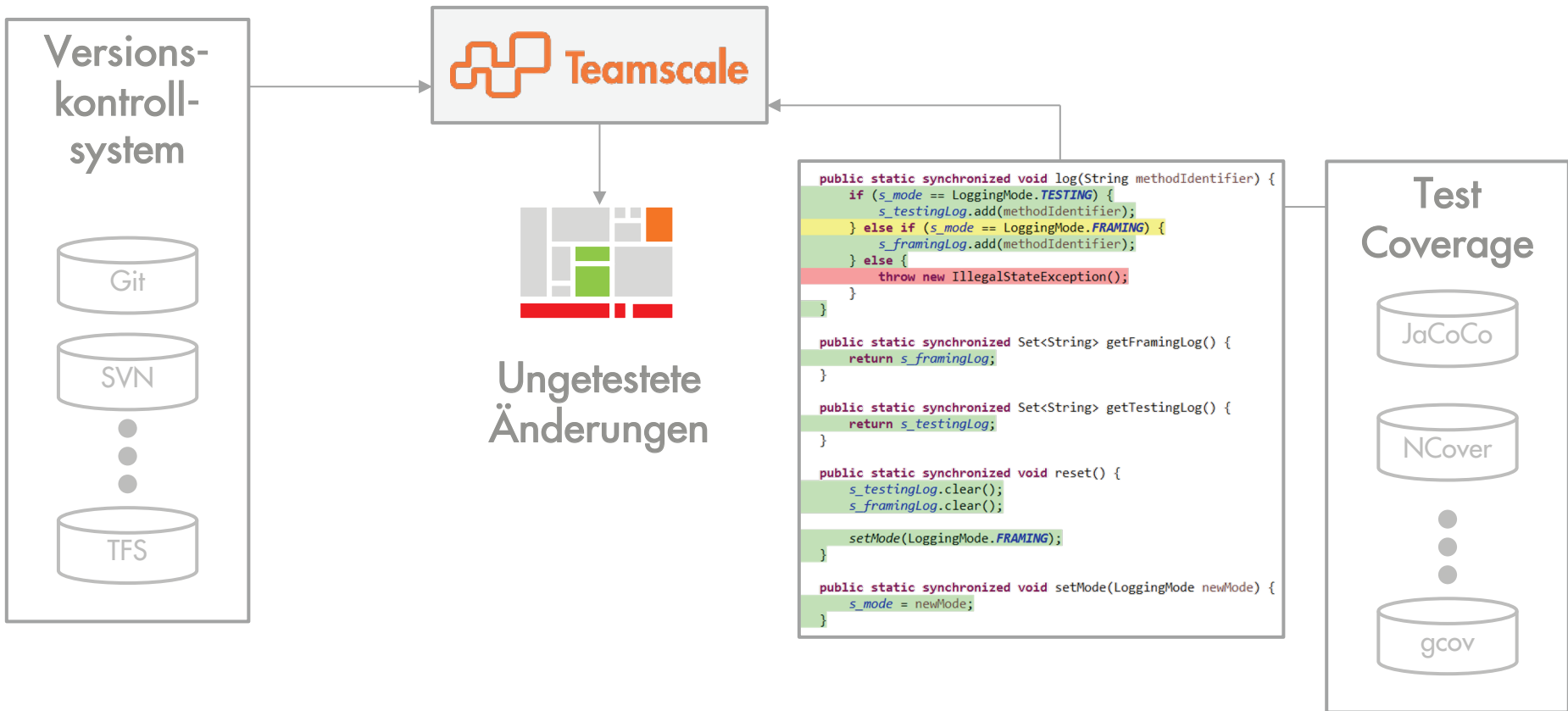


100% Change Coverage

100% Change Coverage → 0 Fehler

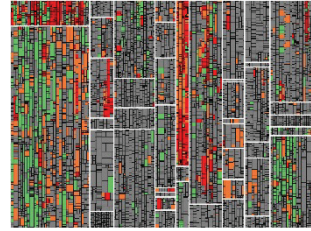
**Einsatz in der Praxis**

CR#9838: Added TODO	26.07.16 16:38
CR#9838: Adjust naming	26.07.16 15:33
CR#9533: RED	26.07.16 15:13
CR#9533: GREEN	26.07.16 15:12
CR#10181: Added new finding for deprecated classes, methods and fields	26.07.16 14:43
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CR#9838: Fix: only one color of a threshold is specified in a corridor	26.07.16 11:14
CR#0: Fix findings	26.07.16 11:01
CR#9838: minor improvement	26.07.16 10:56
CR#10199: Mail notifications do now support starTLS	26.07.16 10:52
CR#9533: working on developer feedback	26.07.16 09:50
CR#9838: Amend last commit	26.07.16 09:38
CR#9838: minor refactoring	26.07.16 09:05
CR#9838: Fix NPE	26.07.16 09:01

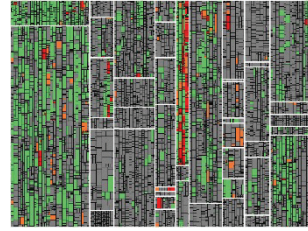




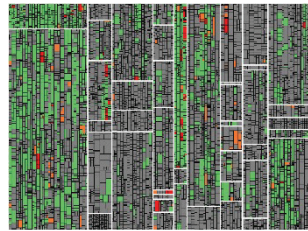
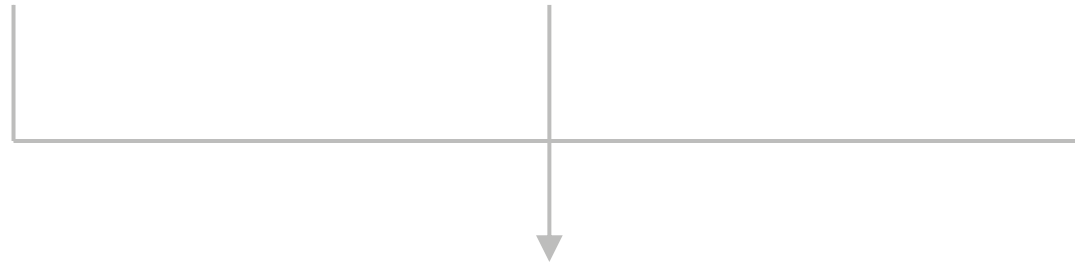
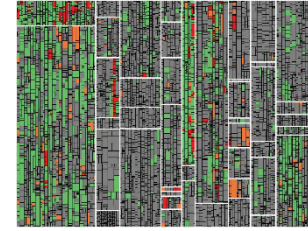
Komponententest



Integrationstest



Systemtest

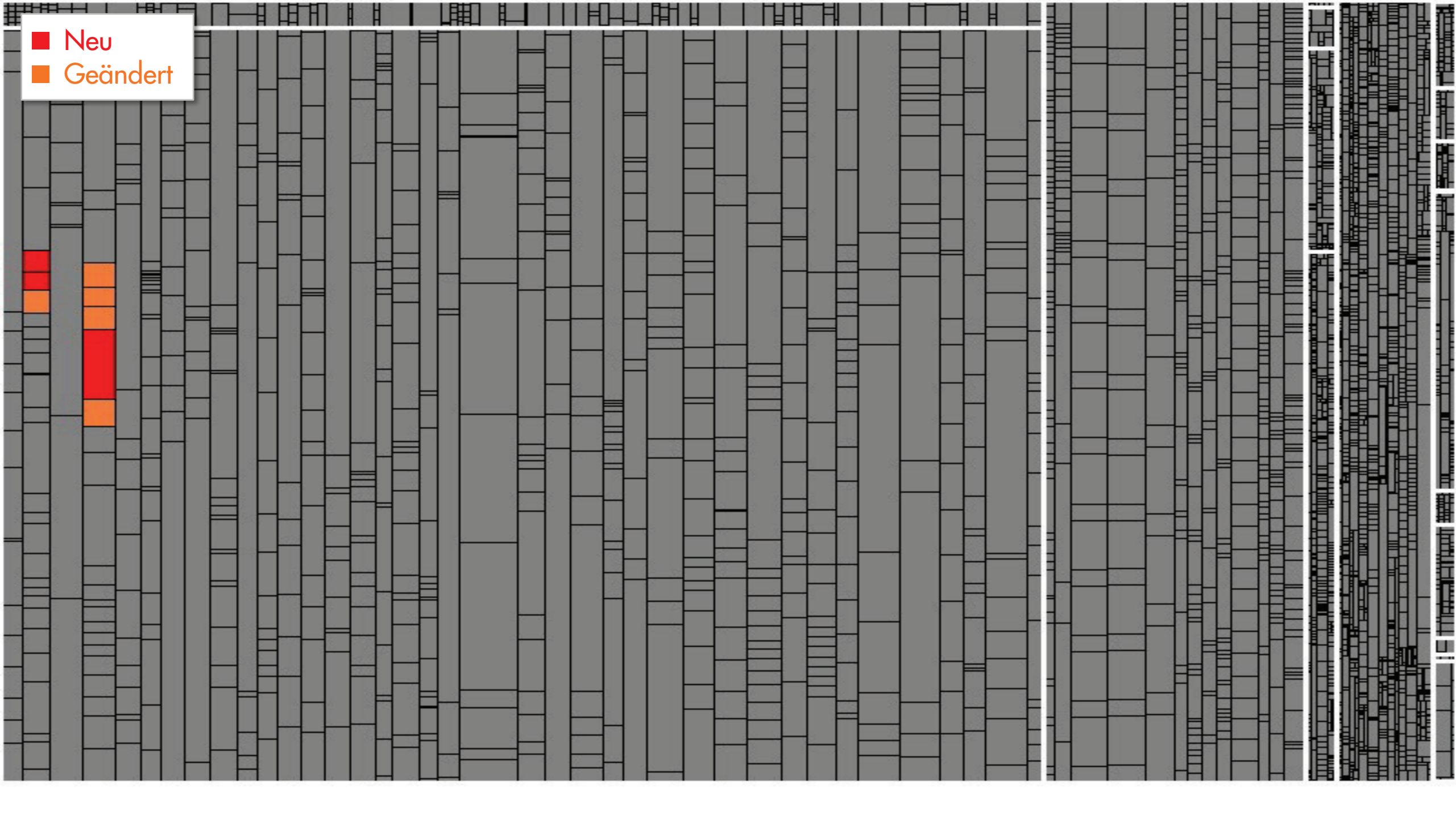


Aggregation

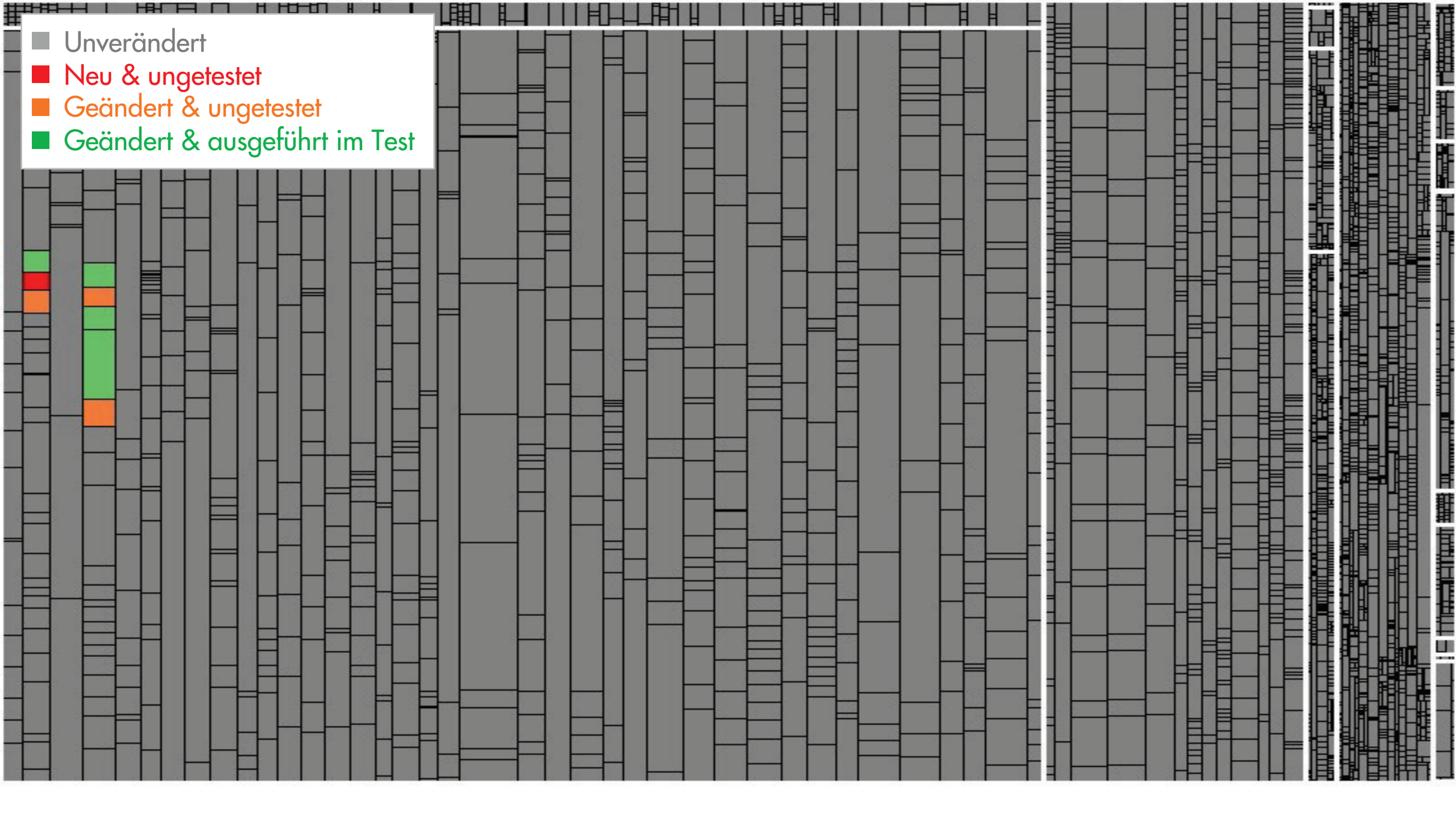
# Hotfix-Test

- On-Demand, wenig Zeit
- Getestet werden nur Änderungen des Hotfix

■ Neu  
■ Geändert

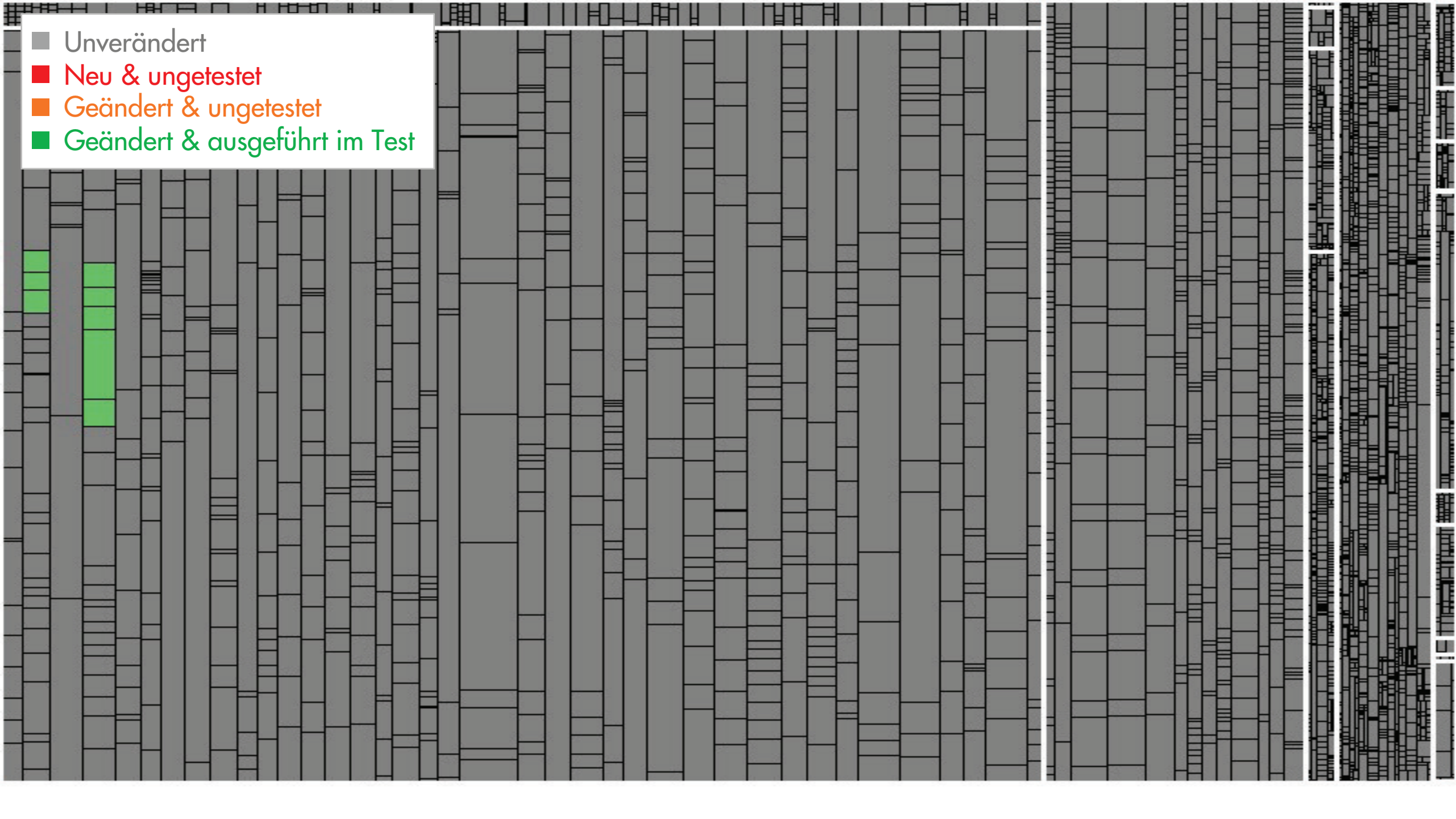


- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test

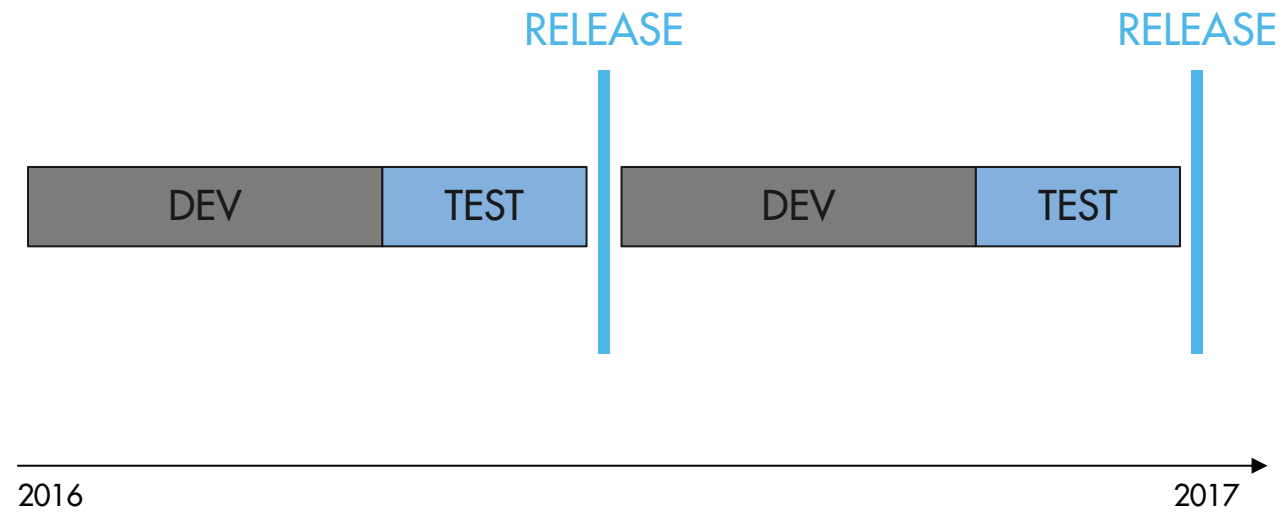




- Unverändert
- Neu & ungetestet
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# Release-Test

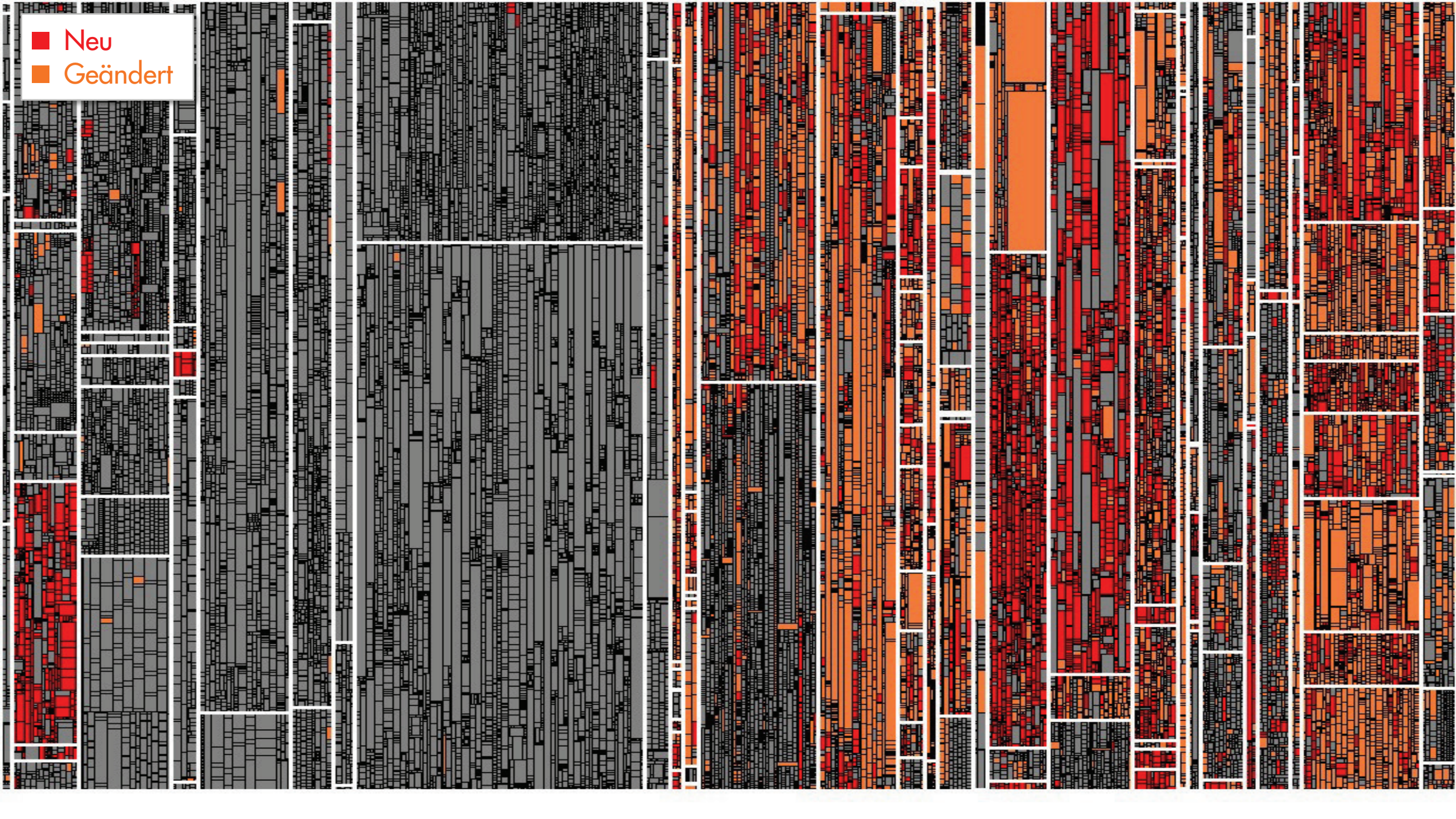


# Dedizierter Release-Test

- Test-Factory
- 5 Tester in Indien
- Zeitraum 2 Wochen
- 143 Test-Sessions
- 6 Versionen des Systems

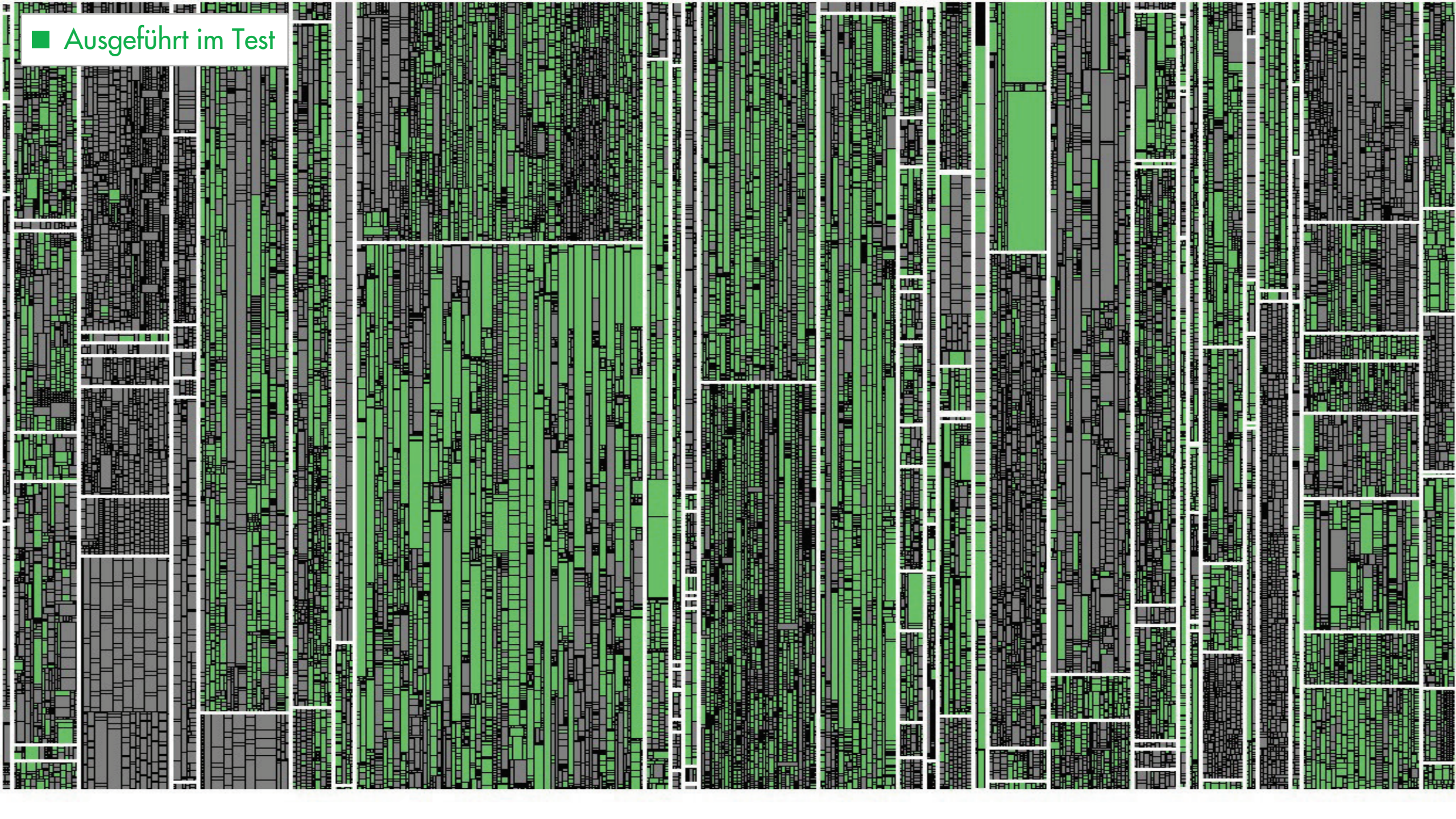


■ Neu  
■ Geändert



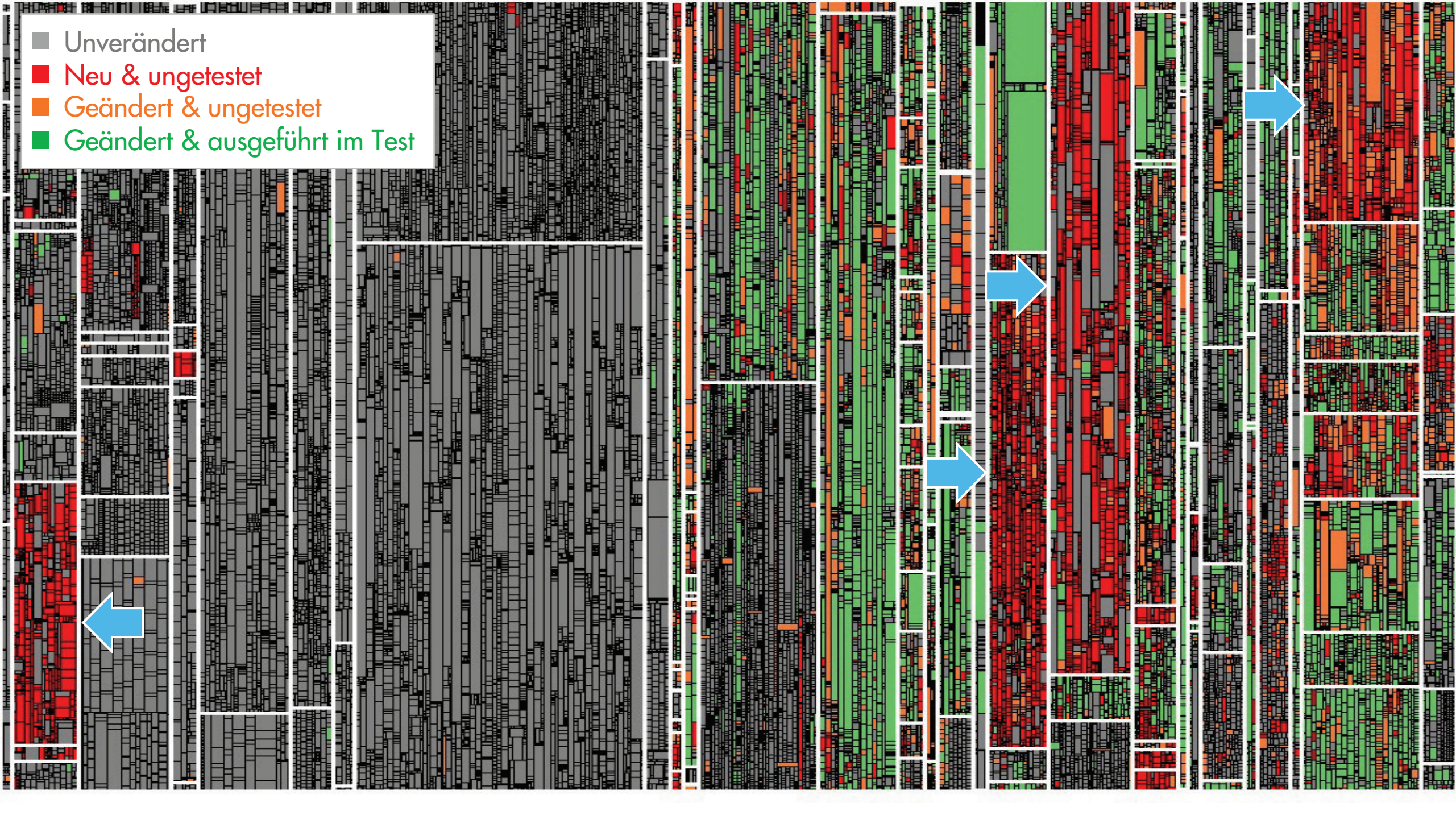


■ Ausgeführt im Test





- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test



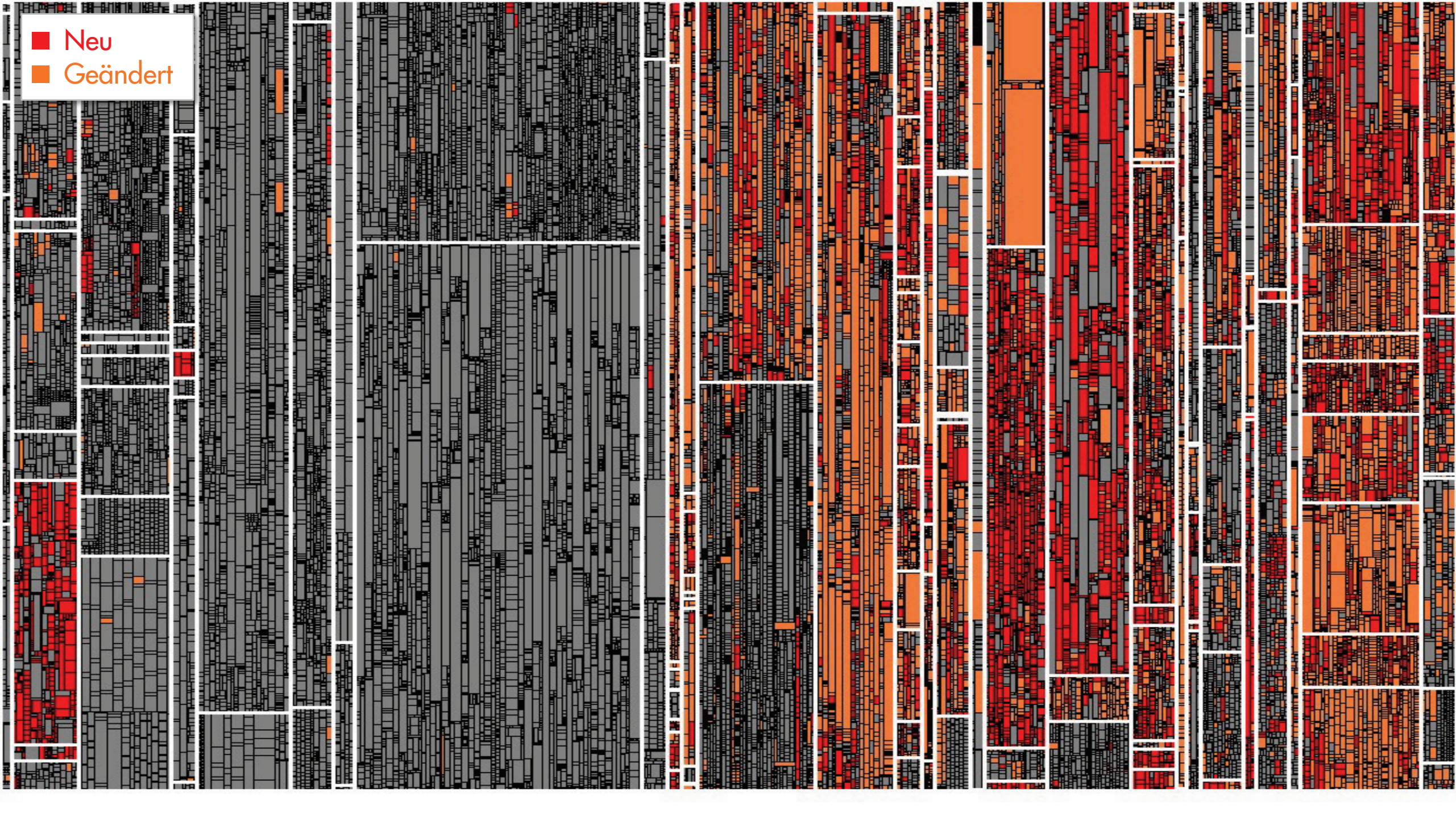


# Explorativer Test («Trampeltest«)

- 23 Tester
  - Requirements Engineers
  - Fachbereich
  - Endanwender
- Zeitraum 2 Wochen
- 307 Test-Sessions
- 8 Versionen des Systems



■ Neu  
■ Geändert

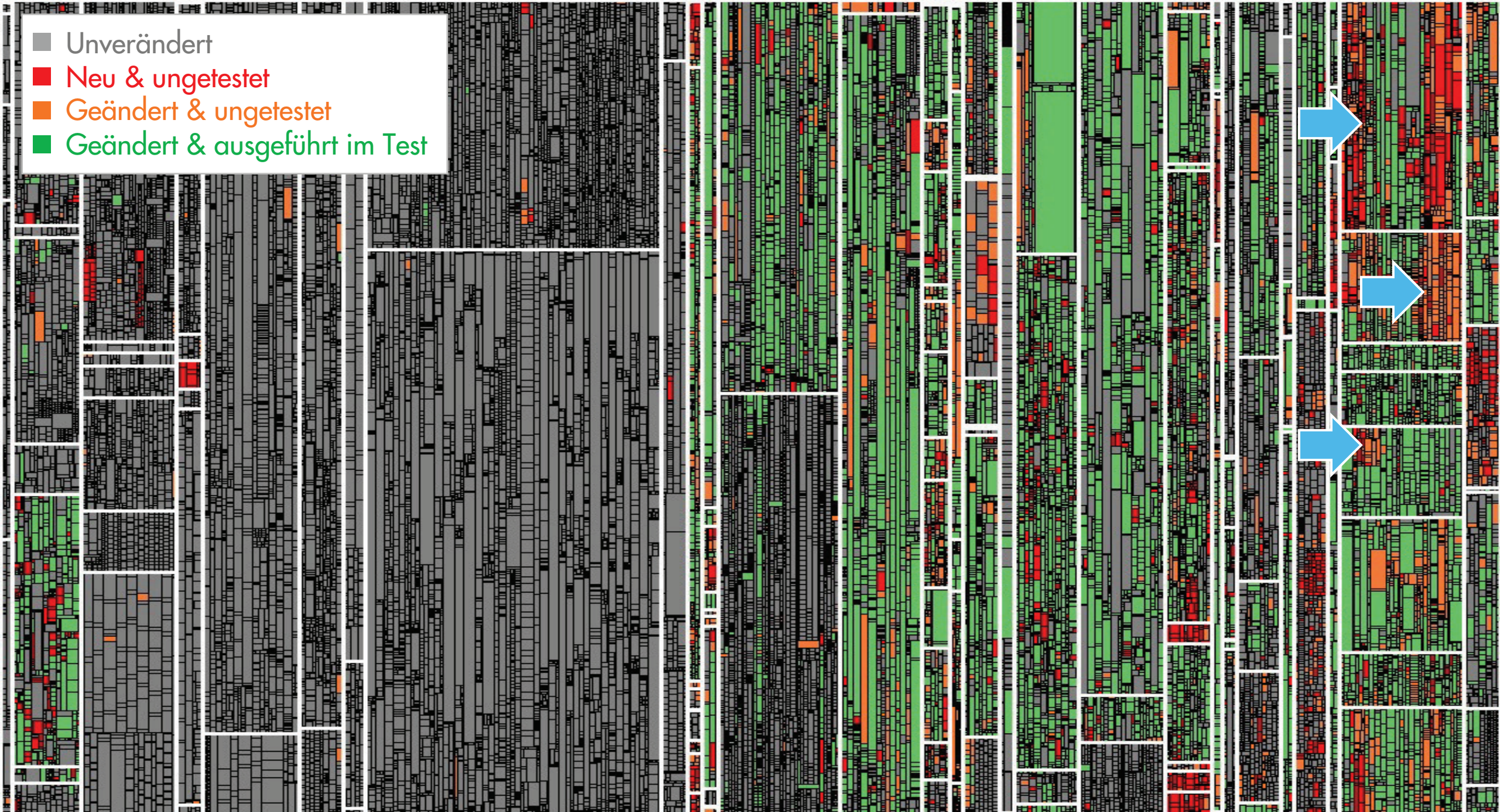






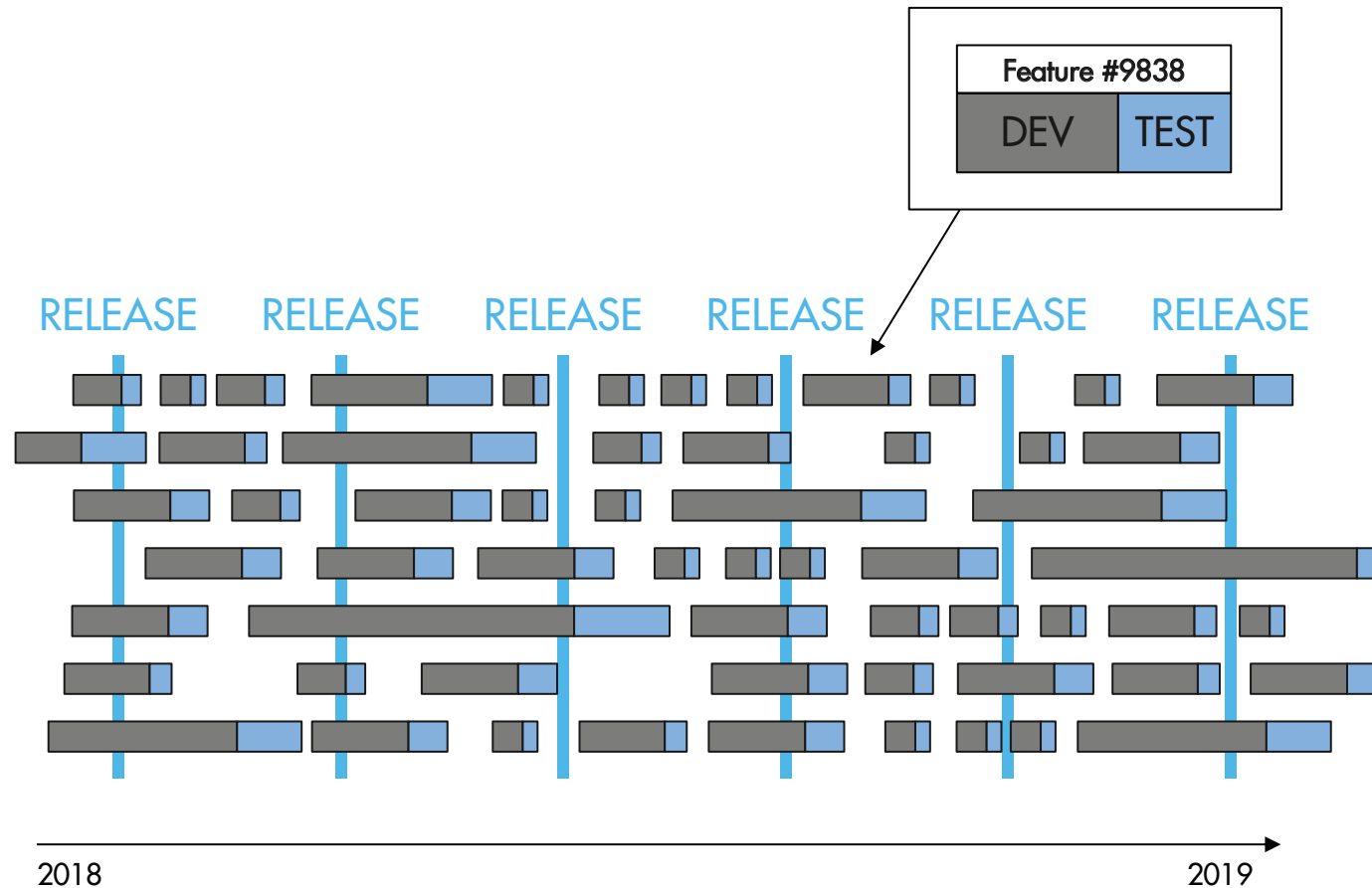


- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test























# Entwicklungsbegleitender Test







Issue # <span>▼</span>	Subject	Done		Test Gap
<a href="#">🔗 TS-10549</a>	Undo/Redo for web-based architecture editor	Done		0% 
<a href="#">🔗 TS-10784</a>	Fix long method finding in TaintAnalysisRunner	Done		0% 
<a href="#">🔗 TS-10923</a>	Implement metric 'Nesting Depth' for Simulink	Done		29% 
<a href="#">🔗 TS-11364</a>	External findings are not registered during first upload	Done		14% 
<a href="#">🔗 TS-11942</a>	Manual test coverage upload during development	Done		43% 
<a href="#">🔗 TS-12050</a>	Tool for transferring findings blacklists and tasks	Done		50% 
<a href="#">🔗 TS-12262</a>	Cannot set or alter alias without reanalysis	Done		0% 
<a href="#">🔗 TS-13151</a>	Fetch parent relationship of TFS work items	Done		0% 

Issue # ▾	Subject		Test Gap
<a href="#">TS-14421</a>	Get rid of TestGapSynchronizer block	Done 	0% 
<a href="#">TS-14733</a>	Remove Dataflow blocks	Done 	22% 

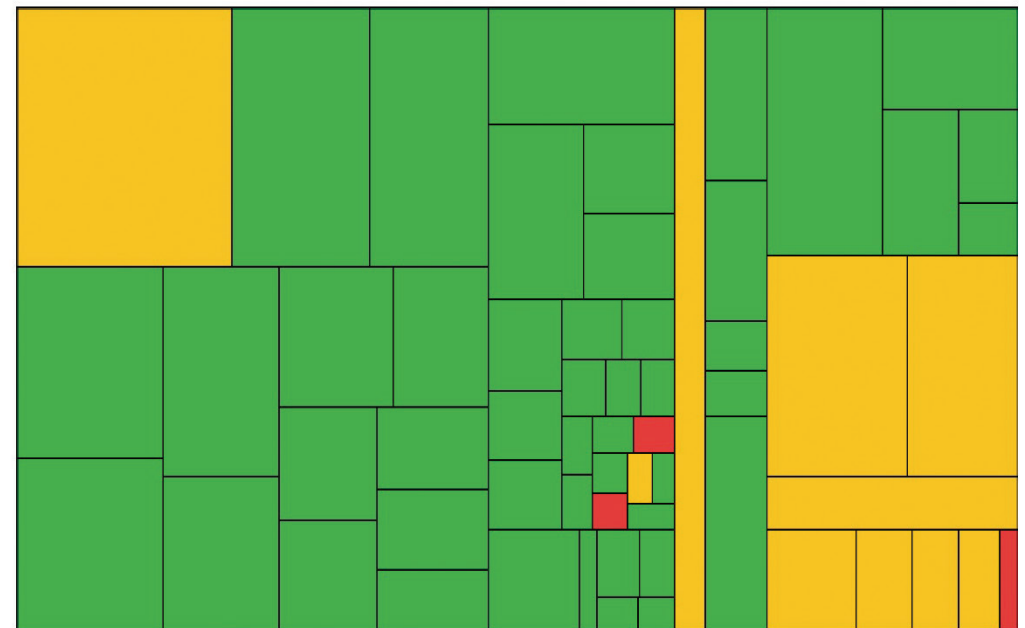
**Done Issue TS-14733 - Remove Dataflow blocks**

Creator:  (on Apr 06 2018 19:44) Last update: Aug 24 2018 09:32

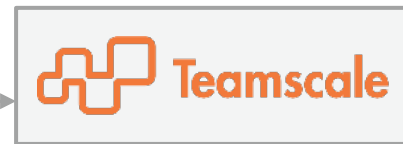
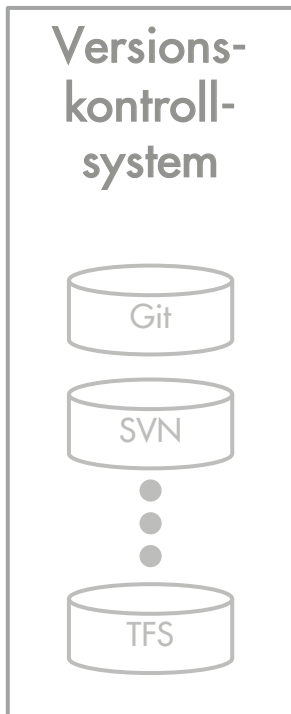
Assignee: 

Project	Type	Priority	Resolution	Fix Version
TS	Maintenance	Normal	Green	Teamscale 4.5
Component	Labels	Affected Version	Customer	Customer Issue
Backend	Performance			
Epic Name	Freshdesk URL	Merge Request		
		<a href="https://git.cqse.eu/cqse/teamscale/3621">https://git.cqse.eu/cqse/teamscale/3621</a>		

Aug 15 2018 12:37–Now | Test Gap: 22%



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CR#9838: minor refactoring	26.07.16 09:05
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Ticket Coverage

```

public static synchronized void log(String methodIdentifier) {
    if (s_mode == LoggingMode.TESTING) {
        s_testingLog.add(methodIdentifier);
    } else if (s_mode == LoggingMode.FRAMING) {
        s_framingLog.add(methodIdentifier);
    } else {
        throw new IllegalStateException();
    }
}

public static synchronized Set<String> getFramingLog() {
    return s_framingLog;
}

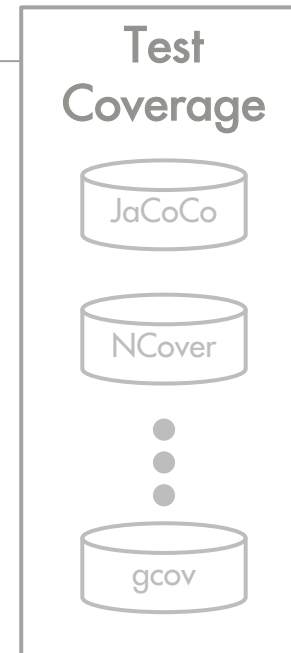
public static synchronized Set<String> getTestingLog() {
    return s_testingLog;
}

public static synchronized void reset() {
    s_testingLog.clear();
    s_framingLog.clear();
}

setMode(LoggingMode.FRAMING);

public static synchronized void setMode(LoggingMode newMode) {
    s_mode = newMode;
}

```



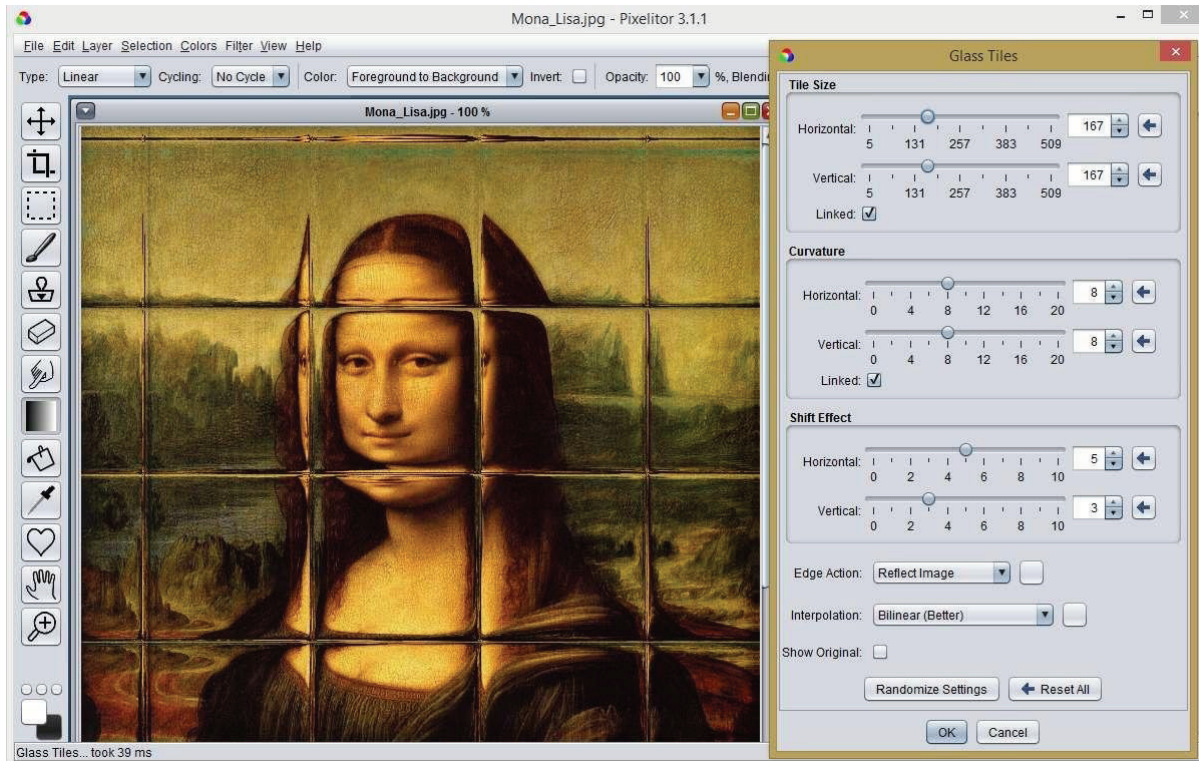


# Demo



[www.teamscale.com](http://www.teamscale.com)

# Pixelitor: Open Source Zeichenprogramm (Java)



ABAP

Ada

C#

C/C++

Cobol

Delphi

Fortran

Groovy

Gosu

IEC 61131-3 ST

Java

JavaScript

Kotlin

Matlab

Open CL

OScript

PHP

PL/SQL

Python

Rust

Simulink/StateFlow

SQLScript

Swift

TypeScript

Visual Basic .NET

Xtend



The screenshot shows a web browser window with the Eventbrite website. The URL is [www.eventbrite.de/e/pilotierung-test-gap-analyse-mit-teamscale](https://www.eventbrite.de/e/pilotierung-test-gap-analyse-mit-teamscale). The event title is "Pilotierung - Test-Gap-Analyse mit Teamscale" by CQSE GmbH. The date is May 5, 2021, from 10:30 to 11:15 CEST. The event is free of charge. The description mentions a workshop on Test-Gap-Analyse from April 21st and lists several questions to be discussed, such as evaluating Teamscale and the support provided by CQSE.

eventbrite Nach Events suchen Events Durchsuchen Event Erstellen Hilfe Anmelden

MAI 05

**Pilotierung**  
Teamscale  
**Test-Gap-Analyse**

Pilotierung - Test-Gap-Analyse mit Teamscale  
von CQSE GmbH [Folgen](#)

Kostenlos

[Registrieren](#)

Diese Veranstaltung knüpft an den Workshop zur Test-Gap-Analyse vom 21. April an und informiert über die Möglichkeiten einer Pilotierung.

**Zu diesem Event**

Die meisten Fehler treten bei langlebiger Software dort auf, wo viel geändert wird. Wer richtig will, muss sicherstellen, dass keine wichtigen Änderungen ungetestet bleiben. Die Test-Gap-Analyse hilft uns ungetestete Änderungen zu finden.

Mit Ihnen zusammen klärt heute *Fabian Streitl* folgende Fragen:

- Wie kann ich Teamscale evaluieren? Was kostet das?
- Wieviel Arbeit ist das für mich/mein Team?
- Wie unterstützt mich die CQSE? Wen kann ich bei Problemen fragen?

Datum Und Uhrzeit  
Mi., 5. Mai 2021  
10:30 - 11:15 CEST  
[Zum Kalender hinzufügen](#)

Veranstaltungsort  
Online-Event

## Infos zur TGA Pilotierung

5. Mai 2021  
10 – 11:15 Uhr

Anmeldung und Infos auf:  
[cqse.eu/tga-pilot](https://cqse.eu/tga-pilot)

» Können wir den Nutzen  
quantifizieren? «



# Wieviele Änderungen sind ungetestet?

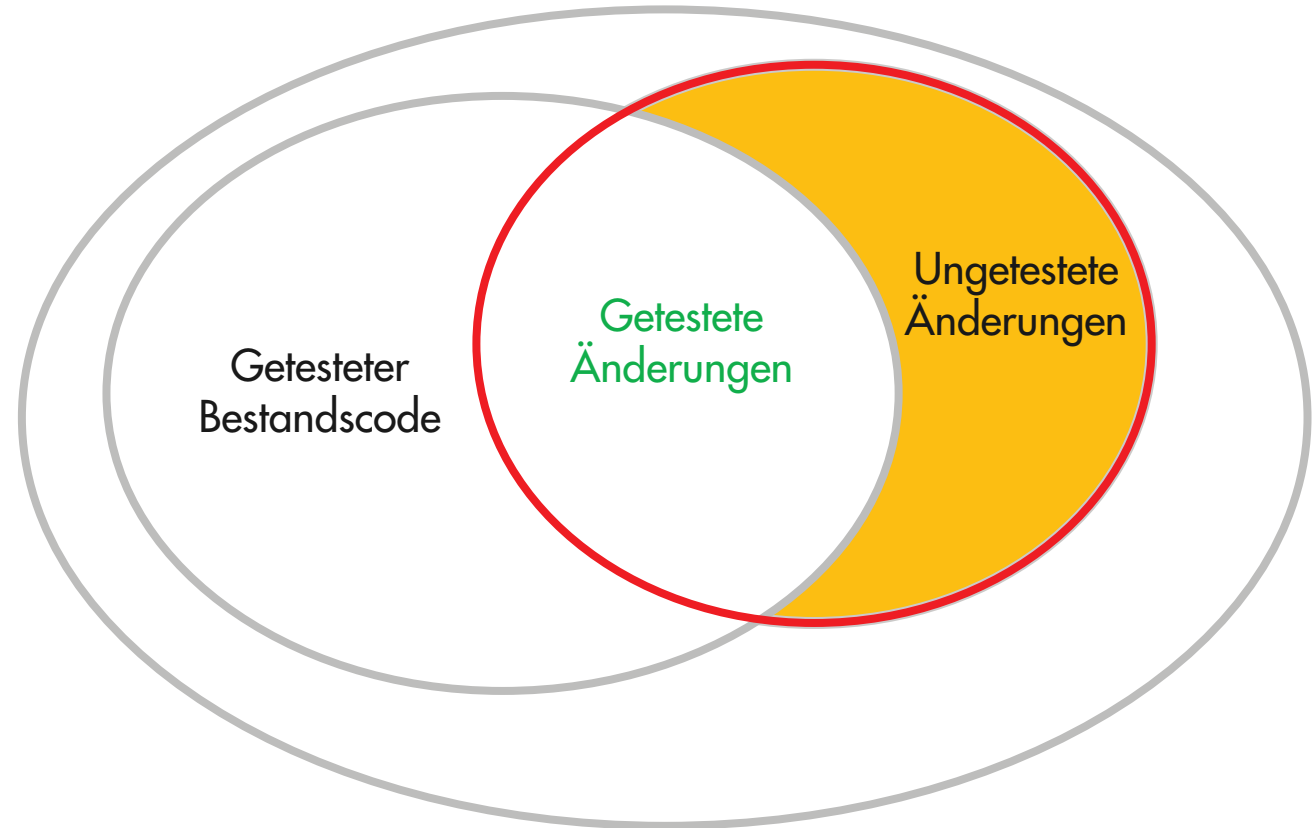
Studie: C# System @ Munich Re

Release A:

15% Code neu/geändert,  
**>50% ungetestet**

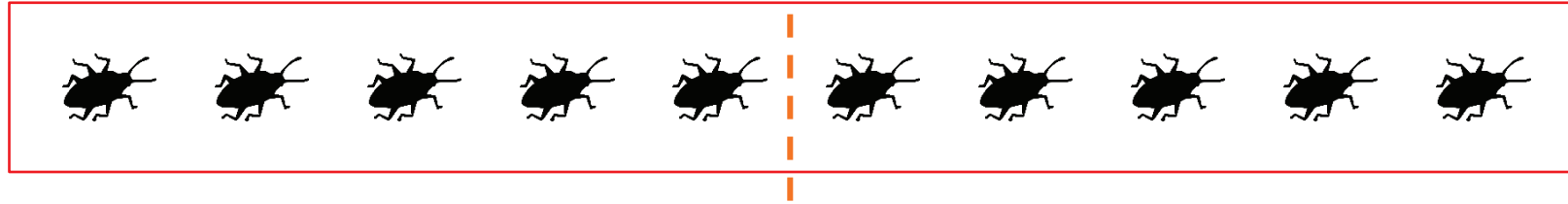
Release B:

15% Code neu/geändert,  
**>60% ungetestet**



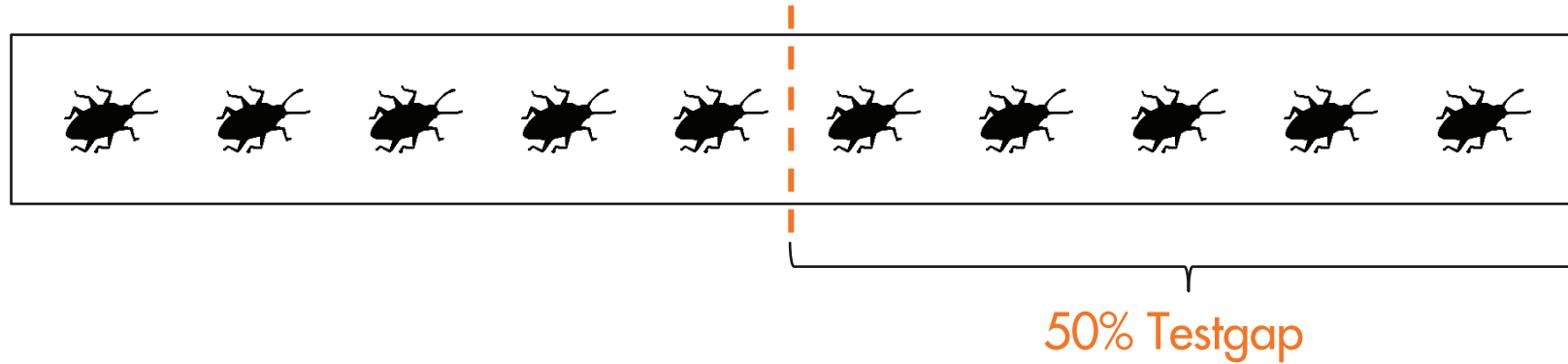
**Feldfehlerwahrscheinlichkeit 5x höher für ungetestete Änderungen!**

$$\% \text{Restfehler} = \% \text{Getestet} * \text{Testineffektivitat} + \% \text{Testgap}$$

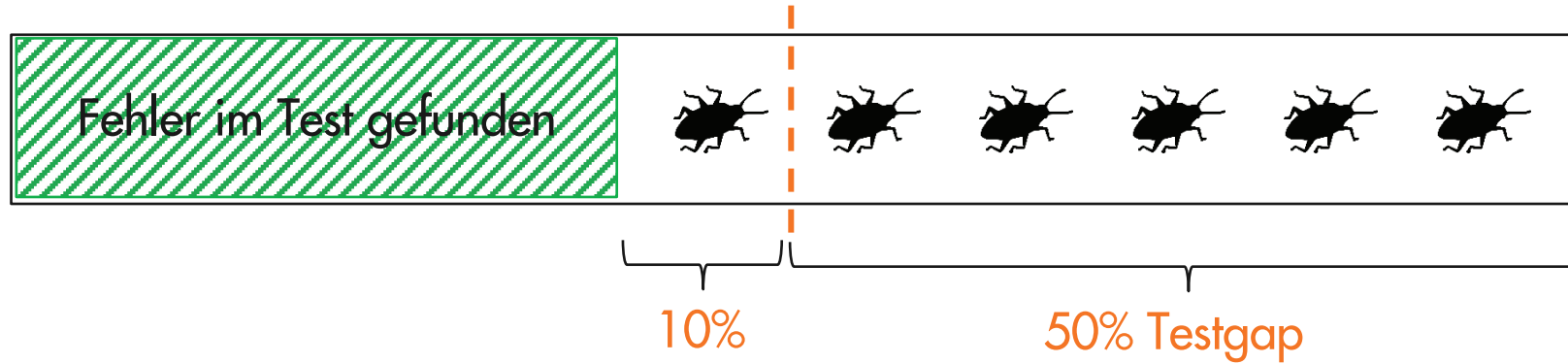




$$\% \text{Restfehler} = \% \text{Getestet} * \text{Testineffektivitat} + 50\%$$

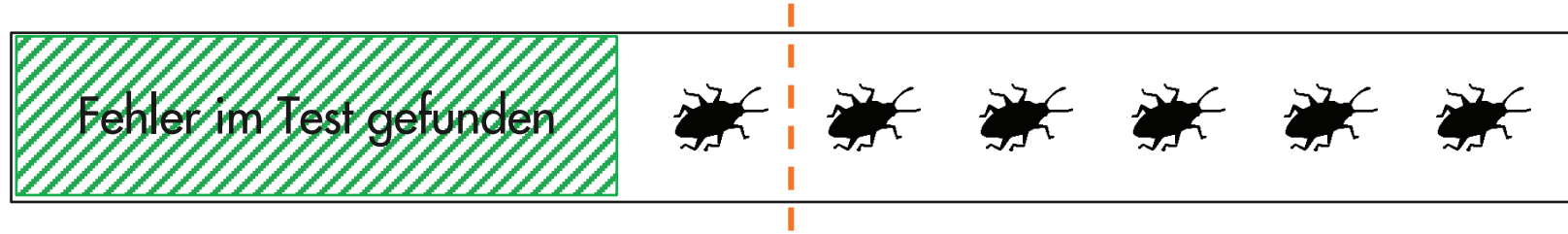


$$\% \text{Restfehler} = 10\% + 50\%$$

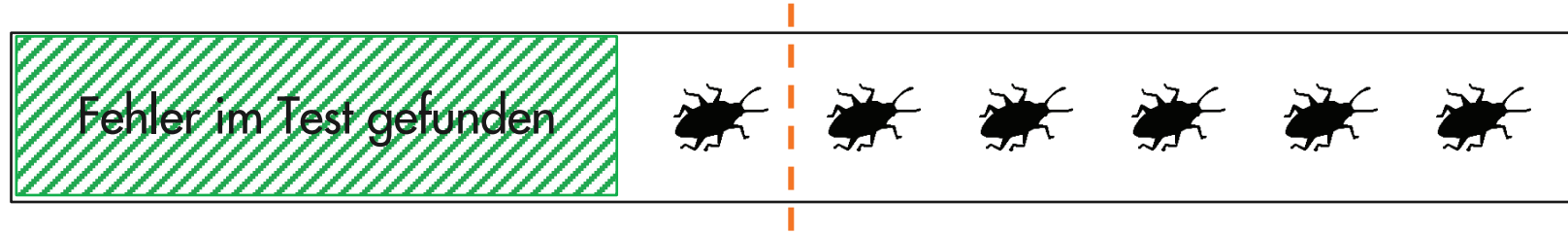




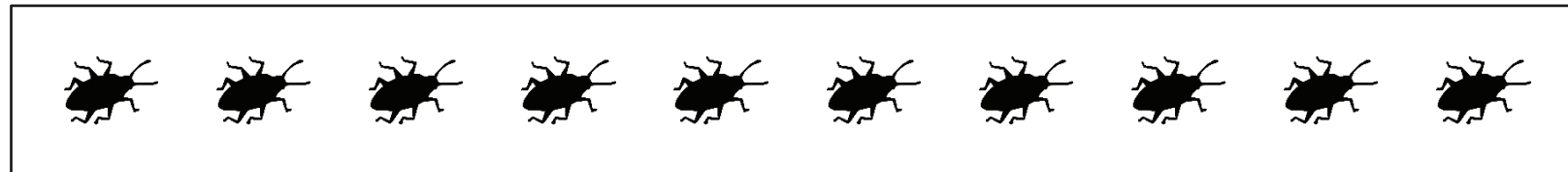
%Restfehler = 60%



$\% \text{Restfehler} = 60\%$

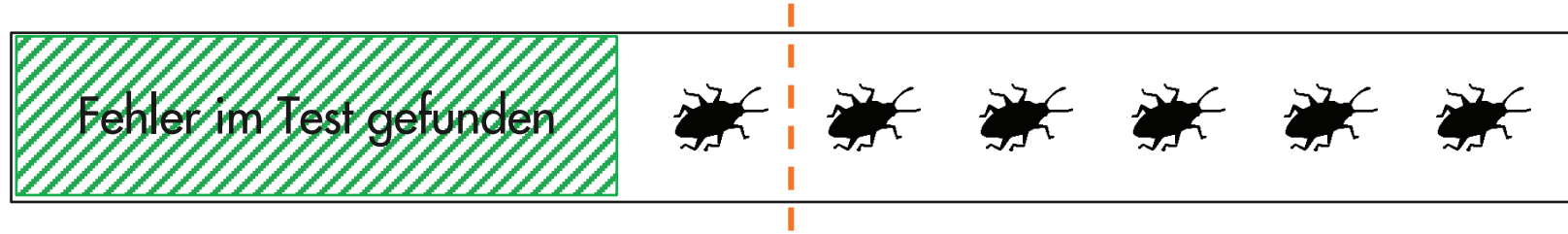


$\% \text{Restfehler} = \% \text{Getestet} * \text{Testineffektivität} + \% \text{Testgap}$





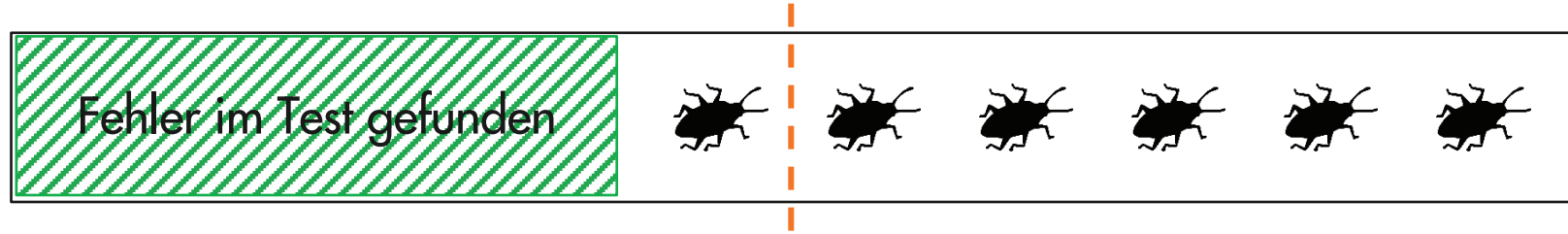
$$\% \text{Restfehler} = 60\%$$



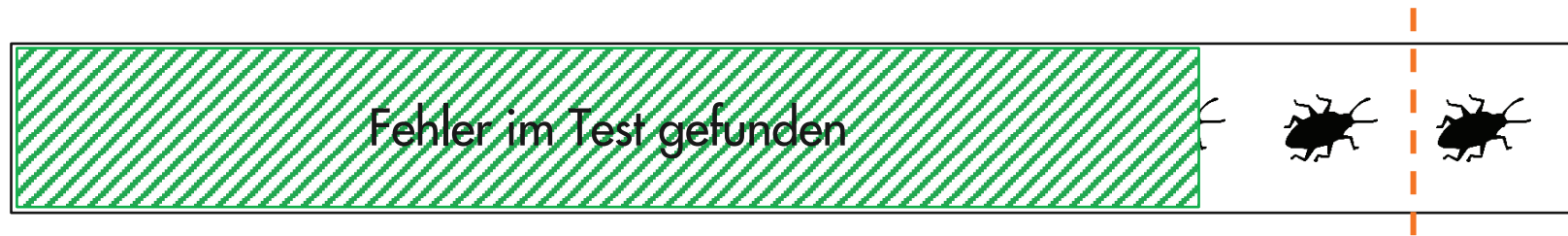
$$\% \text{Restfehler} = 90\% * 20\% + 10\%$$



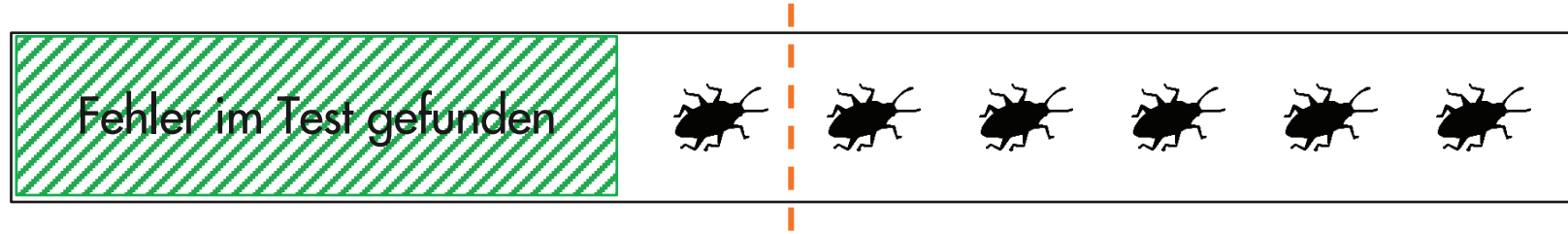
$\% \text{Restfehler} = 60\%$



$\% \text{Restfehler} = 18\% + 10\%$



$\% \text{Restfehler} = 60\%$



$\% \text{Restfehler} = 28\%$





Reduzierte Feldfehler = **50%**

Test-Gap-Analyse reduziert Feldfehler in den Applikationen der Munich Re um  
1/2

The screenshot shows a web browser window with the URL [www.eventbrite.de/e/pilotierung-test-gap-analyse-mit-teamscale](http://www.eventbrite.de/e/pilotierung-test-gap-analyse-mit-teamscale). The event title is "Pilotierung - Test-Gap-Analyse mit Teamscale" by CQSE GmbH. The date is May 5, 2021, from 10:30 to 11:15 CEST. The event is free of charge. The description mentions a workshop on Test-Gap-Analyse from April 21st and lists several questions to be discussed, such as evaluating Teamscale and the support provided by CQSE.

eventbrite Nach Events suchen Events Durchsuchen Event Erstellen Hilfe Anmelden

MAI 05

**Pilotierung - Test-Gap-Analyse mit Teamscale**

von CQSE GmbH [Folgen](#)

Kostenlos

[↑](#) [♥](#) [Registrieren](#)

Diese Veranstaltung knüpft an den Workshop zur Test-Gap-Analyse vom 21. April an und informiert über die Möglichkeiten einer Pilotierung.

**Zu diesem Event**

Die meisten Fehler treten bei langlebiger Software dort auf, wo viel geändert wird. Wer richtig will, muss sicherstellen, dass keine wichtigen Änderungen ungetestet bleiben. Die Test-Gap-Analyse hilft uns ungetestete Änderungen zu finden.

Mit Ihnen zusammen klärt heute *Fabian Streitl* folgende Fragen:

- Wie kann ich Teamscale evaluieren? Was kostet das?
- Wieviel Arbeit ist das für mich/mein Team?
- Wie unterstützt mich die CQSE? Wen kann ich bei Problemen fragen?

Datum Und Uhrzeit  
Mi., 5. Mai 2021  
10:30 - 11:15 CEST  
[Zum Kalender hinzufügen](#)

Veranstaltungsort  
Online-Event

## Infos zur TGA Pilotierung

5. Mai 2021  
10 – 11:15 Uhr

Anmeldung und Infos auf:  
[cqse.eu/tga-pilot](http://cqse.eu/tga-pilot)

The screenshot shows a web browser window with the URL [www.eventbrite.de/e/workshop-test-gap-analysis-tickets](https://www.eventbrite.de/e/workshop-test-gap-analysis-tickets). The page features a header with the Eventbrite logo and navigation links. The main content area includes a large image of a code diff with a white text box that reads "Test Gap Analysis" and "Reveal Untested Changes in Source Code". Below this is the Teamscale logo. To the right, the event details are displayed: "SEP 15", "Workshop - Test Gap Analysis" by CQSE GmbH, and a "Follow" button. A green "Register" button is prominently placed. Below the main image, there is a section titled "Workshop - Test Gap Analysis" with an "About this Event" sub-section. The text describes the workshop's focus on identifying untested changes in long-lived software. The event details section on the right specifies the date and time as Wednesday, September 15, 2021, from 5:00 PM to 6:30 PM CEST, and notes that it is an online event.

eventbrite Search for events Browse Events Create Event Help Sign In

SEP 15

Workshop - Test Gap Analysis

by CQSE GmbH Follow

Free

Register

Workshop - Test Gap Analysis

About this Event

Most errors in long-lived software occur in code areas that change a lot. To do things right, you have to make sure that no important changes goes live untested. Test Gap Analysis helps us to find untested changes.

After an introduction to Test Gap Analysis (TGA), we present the experience that we have gained in recent years using TGA with customers and in our own development and answer the following questions: How can the quality of hotfix tests be assured? How can I determine during the iteration how thoroughly selected critical change requests or tickets have been tested? How does the test coverage of different test levels (unit test, integration test, acceptance test, user trampling test, etc.) compare to one another and which changes were

Date And Time

Wed, September 15, 2021  
5:00 PM - 6:30 PM CEST  
[Add to Calendar](#)

Location

Online Event

## Englische Ausgabe des Workshops

15. September 2021

17 – 18:30 Uhr

Anmeldung und Infos auf:

[cqse.eu/en/tga-workshop](https://cqse.eu/en/tga-workshop)

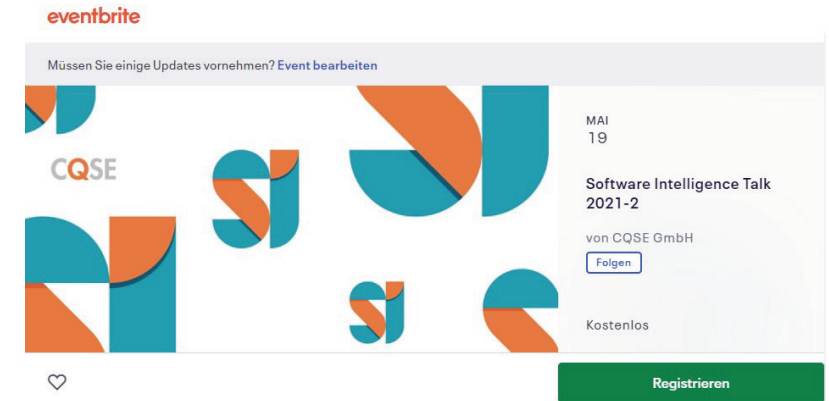


# Virtueller Workshop

19. Mai 21, 10:30 – 12:00 Uhr

Anmeldung:

<http://cqse.eu/si-talks/2gtb>



## Zu den Sprechern

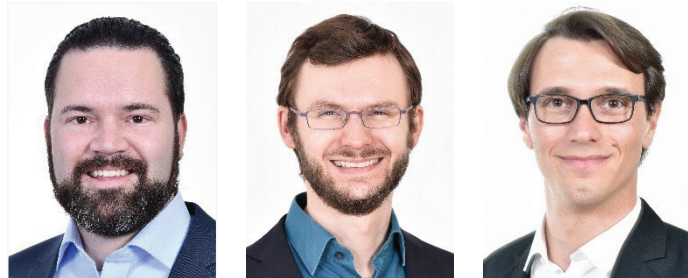
**Jeannette Wernicke** Jeannette Wernicke ist Innovation Managerin im Innovation Lab der Bayerische Versorgungskammer. Sie beschäftigt sich dort damit neue Technologien und Trends auf ihre Anwendbarkeit in der BVK zu untersuchen. Davor war sie als Software-Entwicklerin und -Architektin mit Schwerpunkt Software-Qualität tätig.

**Raphael Nömmel** hat seinen Master an der Technischen Universität München mit einem Fokus auf Software-Engineering und Software-Qualität abgeschlossen. Er hat seine Masterarbeit zu Test-Suite-Minimierung und Pareto-Testing erstellt und promoviert bei der CQSE in diesem Themenbereich.

**Fabian Streitl** hat als Leiter des CQSE Piloten-Teams die Test-Analysen bei vielen Kunden erfolgreich eingeführt.

**Dr. Elmar Jürgens** hat die CQSE mitgegründet und beschäftigt sich sein ganzes Berufsleben mit Qualitätsanalysen von Software.

# Kontakt



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