

Test Intelligence mit Teamscale

Live am Beispiel

Fabian Streitl
Jonas Bogenberger





Fabian Streitl

- Team-Lead Test Intelligence
- Betreuung von **Bachelor- und Masterarbeiten**
- Seit 7 Jahren zuständig für **Neukundenprojekte**

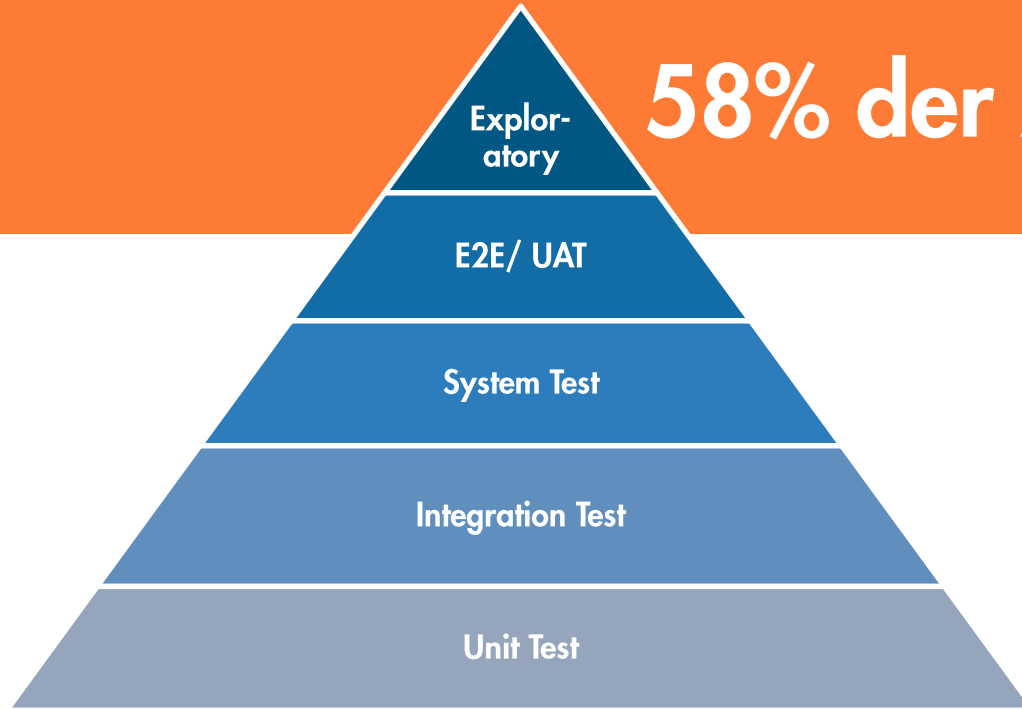
CQSE

 Teamscale

Wir testen zu viel

Wir testen zu wenig

58% der Änderungen wurden nicht getestet



Allianz 

Alle
Testportfolios

Manuelle &
Automatisierte
Tests

Messungs-
zeitraum
2,5 Monate



Blog Post



Aufzeichnung

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 cor
1000	Integrate ConQAT and Clone Detection to allow for f
1013	Rebuild CloneDetective Pipeline as ConQAT process
1014	Integrate cdct, clonedetective and bundles into singl
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

Unklar was getestet werden muss!

Nicht alle Änderungen
sind dokumentiert!

Jira Software

Denali Next

Backlog

QUICK FILTERS: Only My Issues Recently Updated

Denali Sprint 4 20 issues ACTIVE

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-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

Teamscale 6.1.3

Teamscale 6.1.3

Teamscale 6.1.3

Teamscale 6.1.3

Teamscale 6.0.9

Teamscale 6.1.3

Teamscale 6.1.3

Teamscale 6.1.3

Teamscale 6.2

Teamscale 6.0.9

Teamscale 6.1.3

Teamscale 6.2

Teamscale 6.1.3

Änderungen



Test-Gap-Analyse

Ausführung



Ungetestete
Änderungen

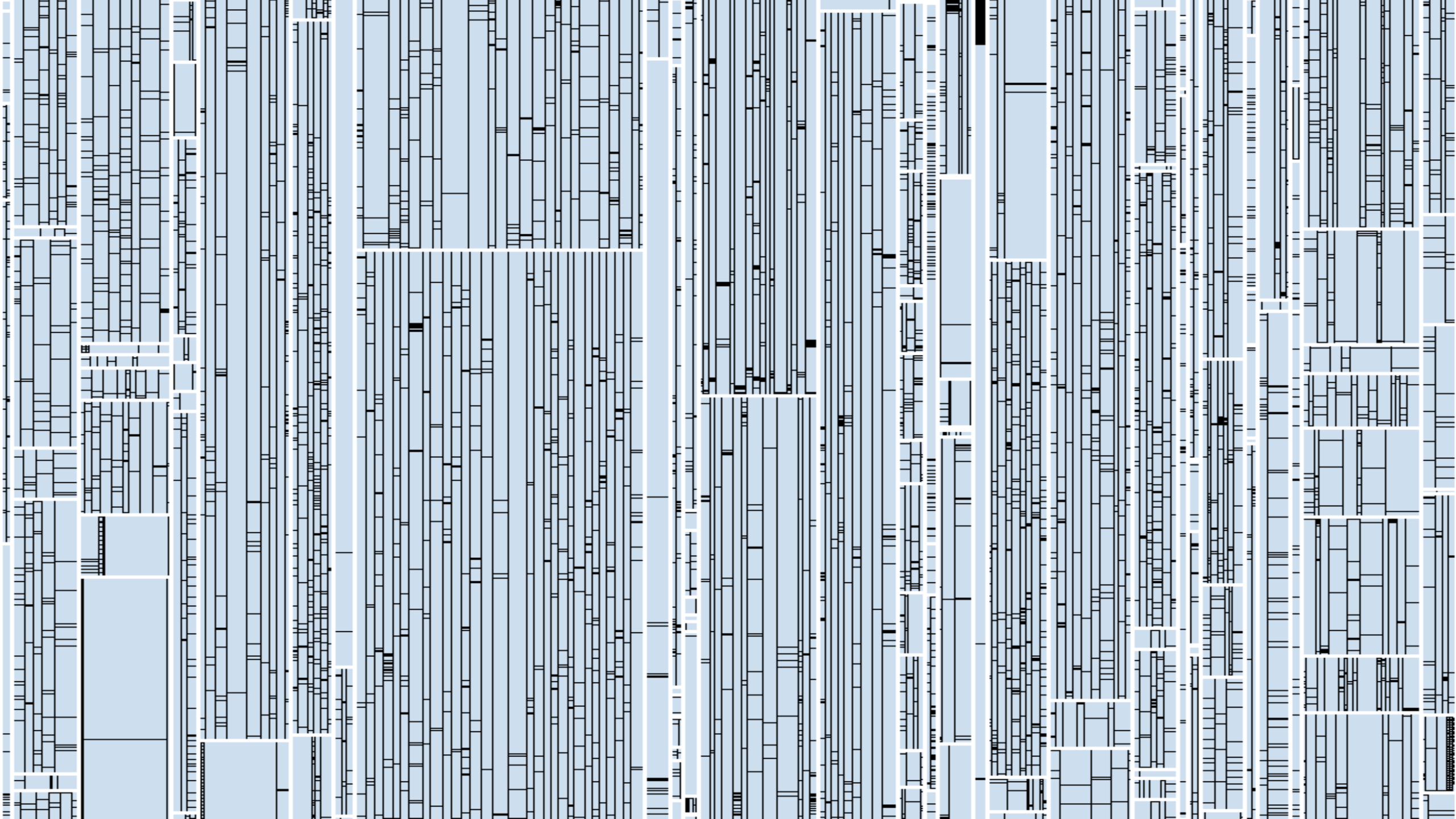
GUI.Dialogs

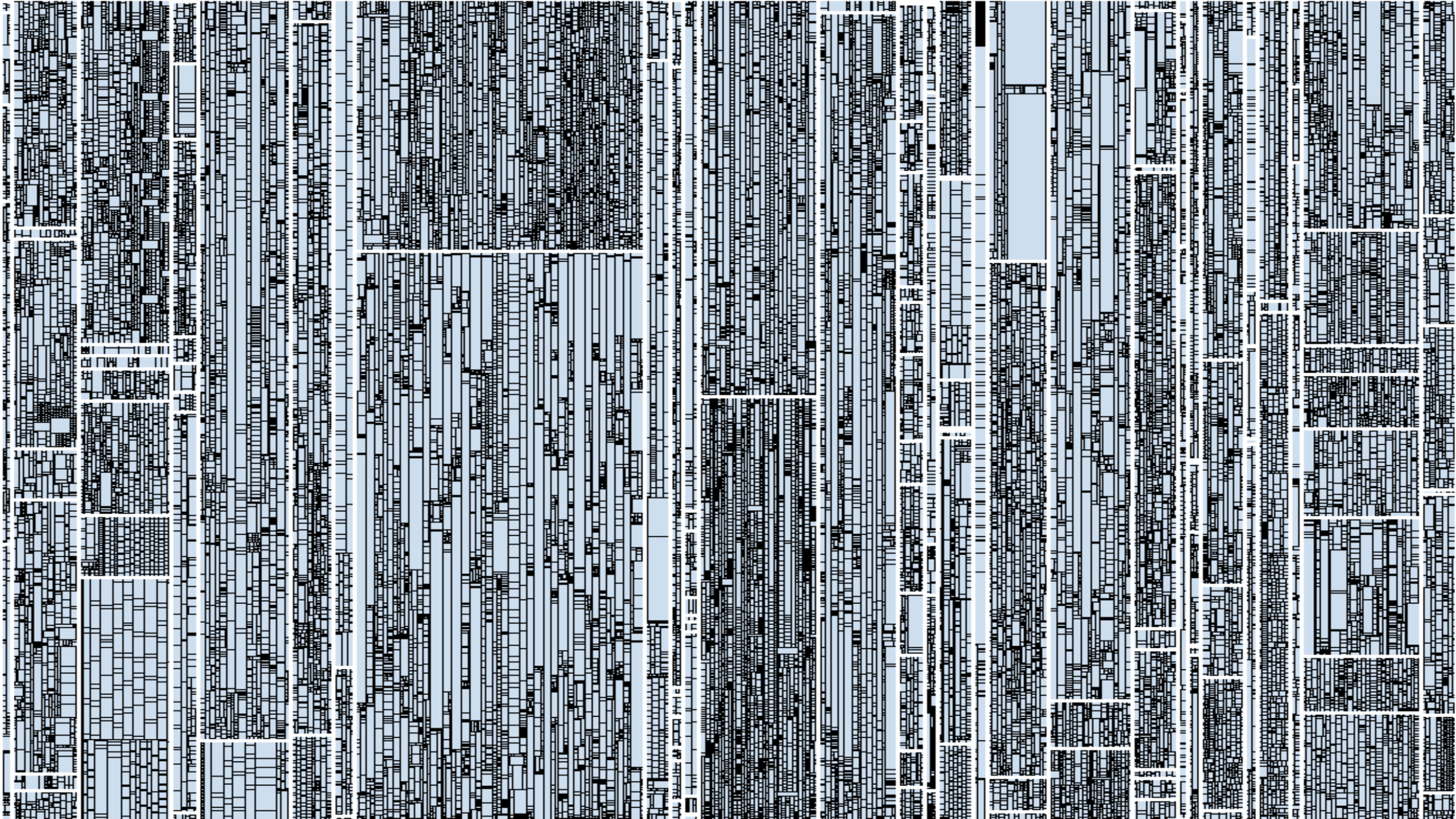
UI Controls

GUI.Base

Authentication

Data Validation



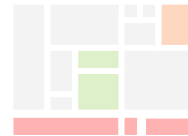


Änderungen



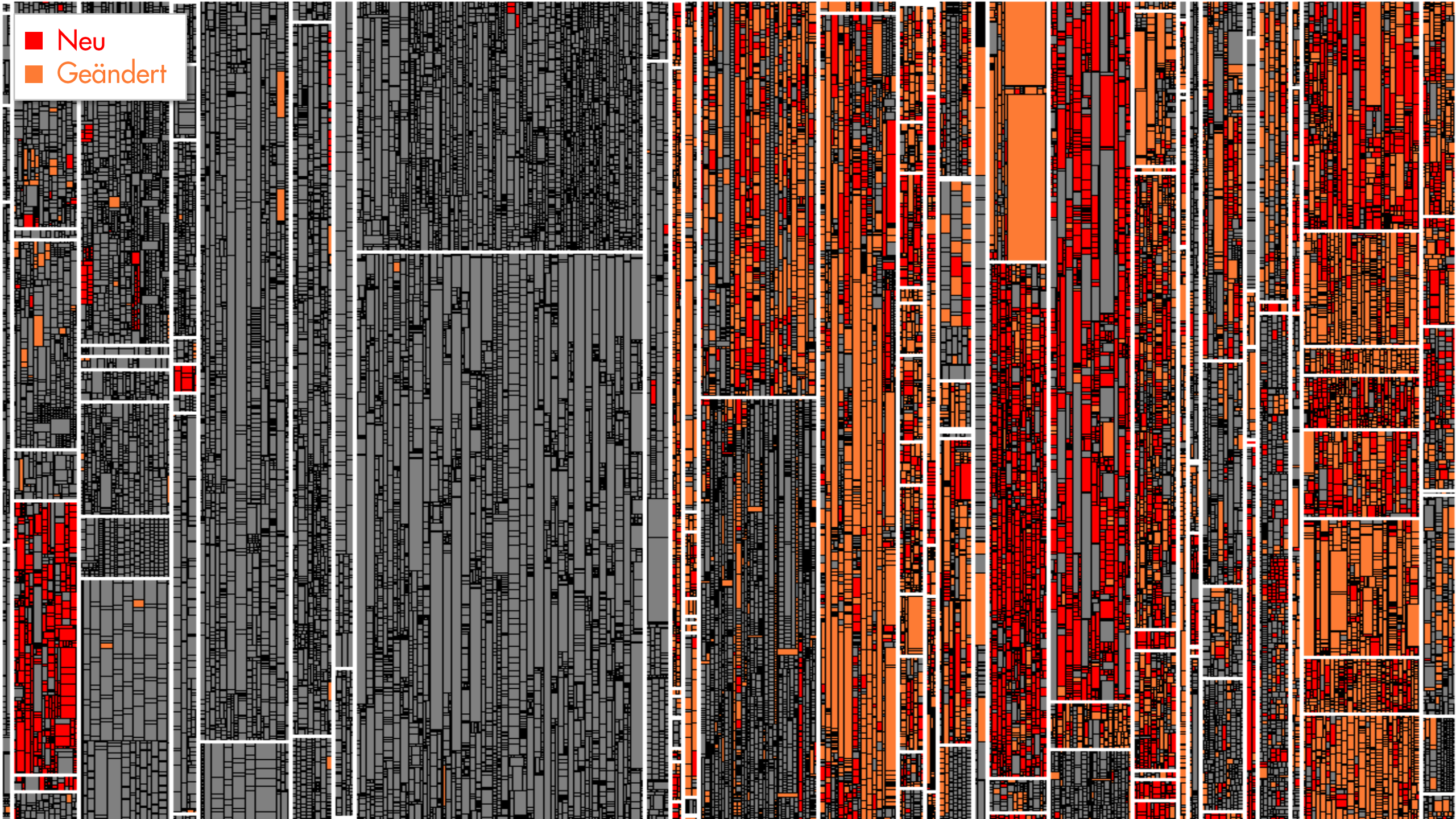
Test-Gap-Analyse

Ausführung

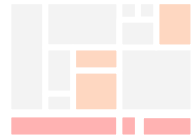


Ungetestete
Änderungen

■ Neu
■ Geändert

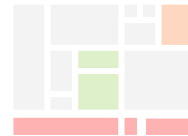


Änderungen



Test-Gap-Analyse

Ausführung

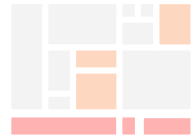


Ungetestete
Änderungen

■ Ausgeführt im Test

Manuelle &
automatisierte Tests

Änderungen



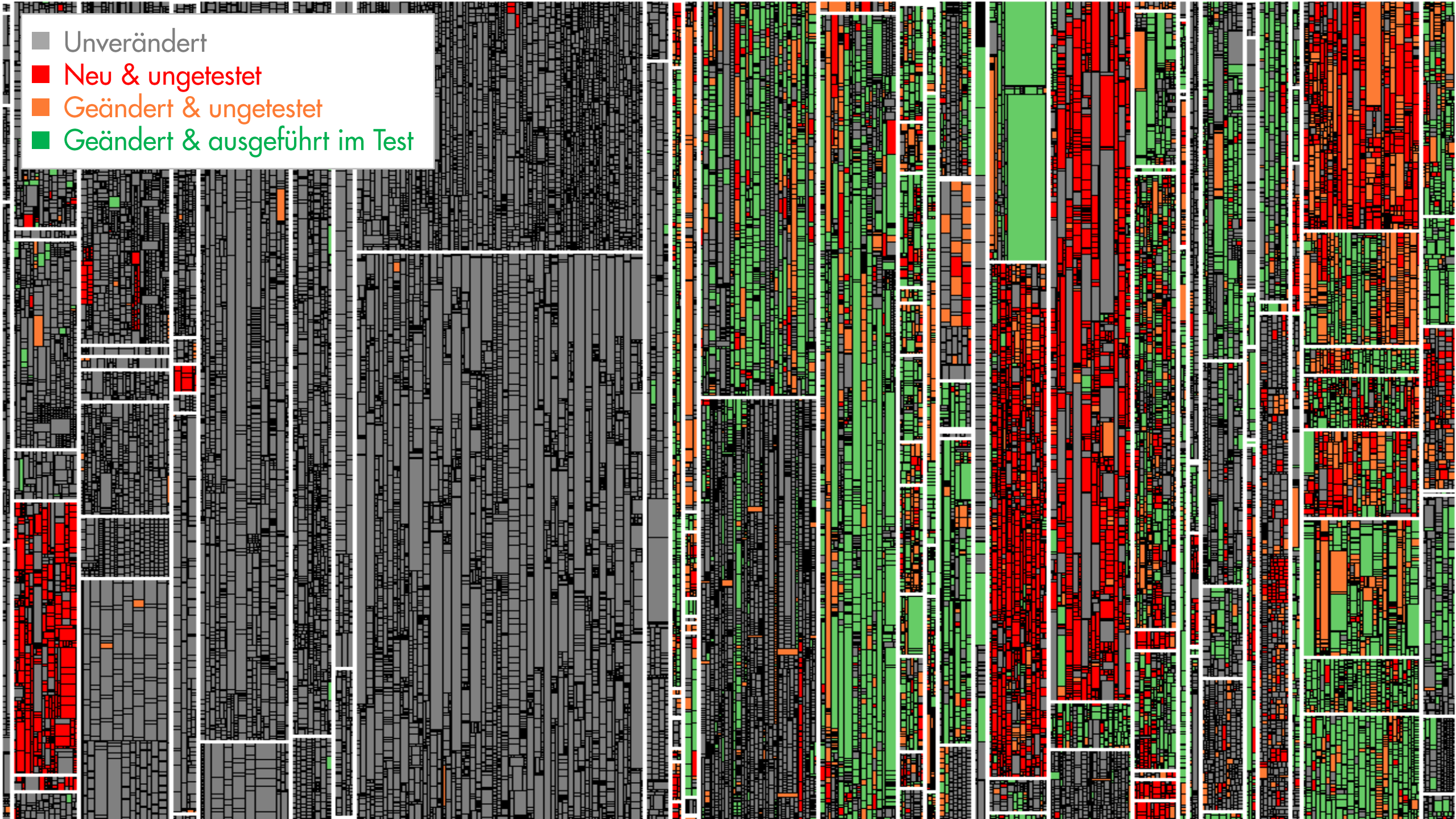
Test-Gap-Analyse

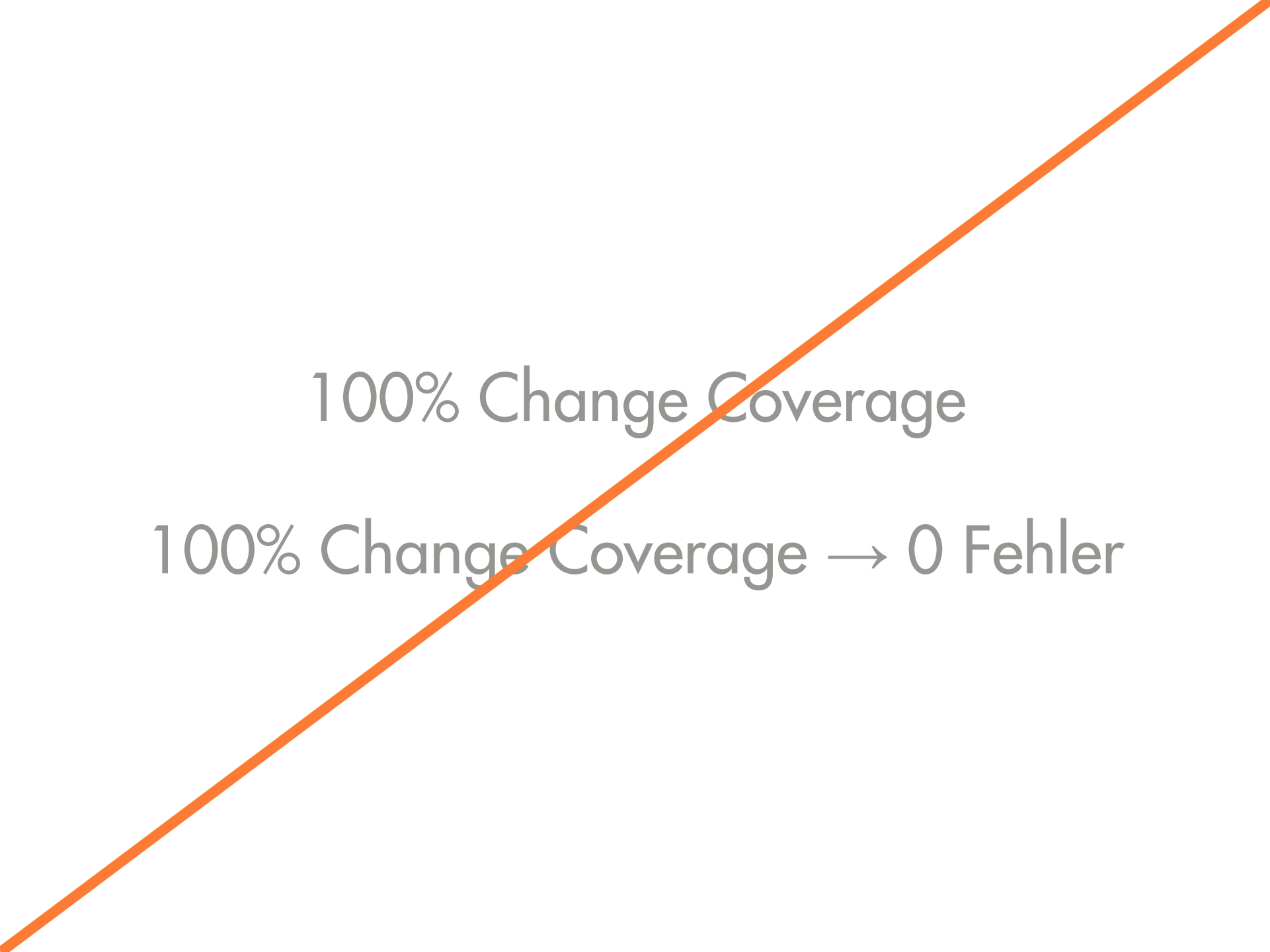
Ausführung



Ungetestete
Änderungen

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

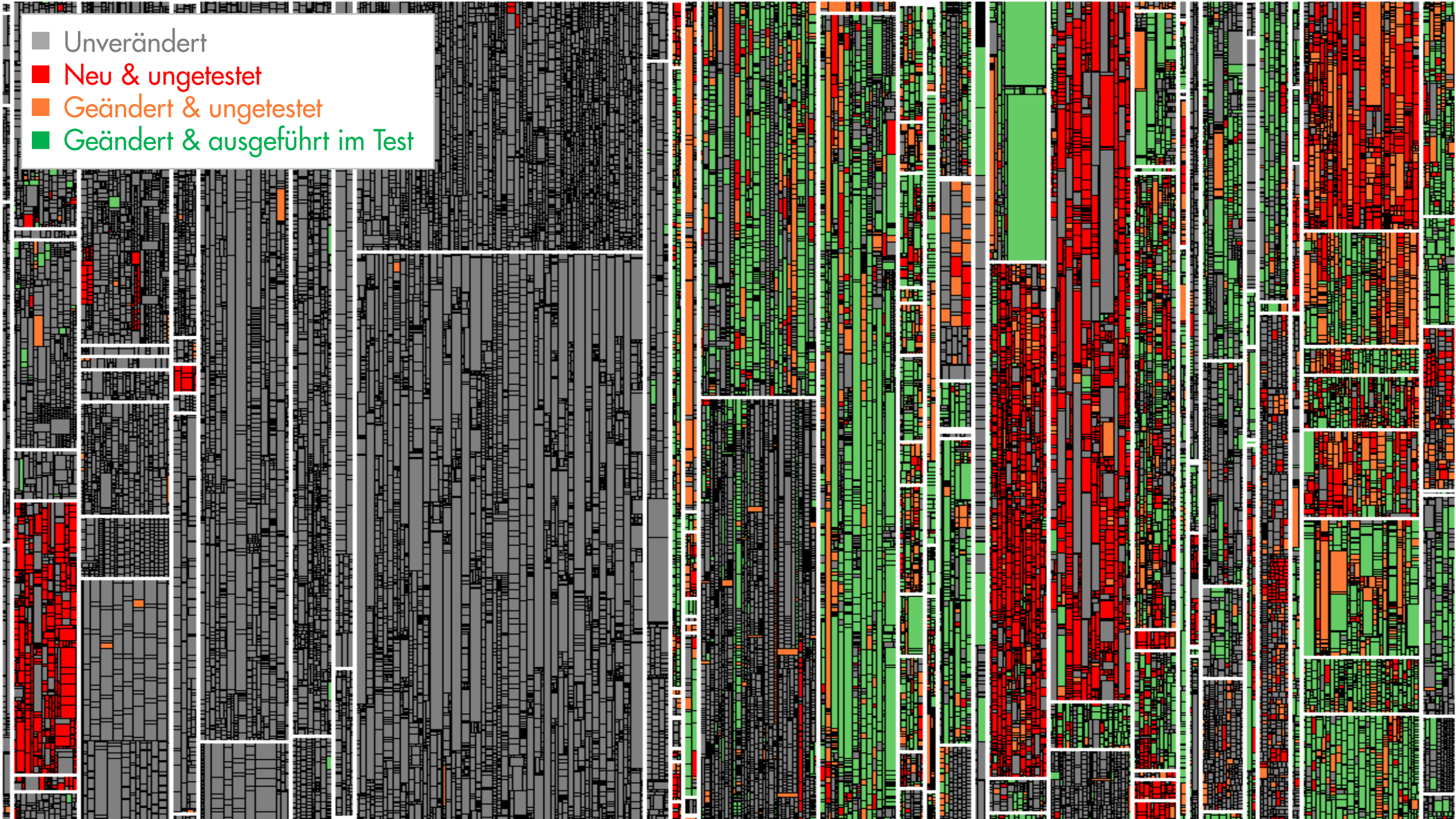




100% Change Coverage

100% Change Coverage → 0 Fehler

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



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

Issue # ▾	Subject	Test Gap		
TS-14421	Get rid of TestGapSynchronizer block	Done		0%
TS-14733	Remove Dataflow blocks	Done		22%

Done

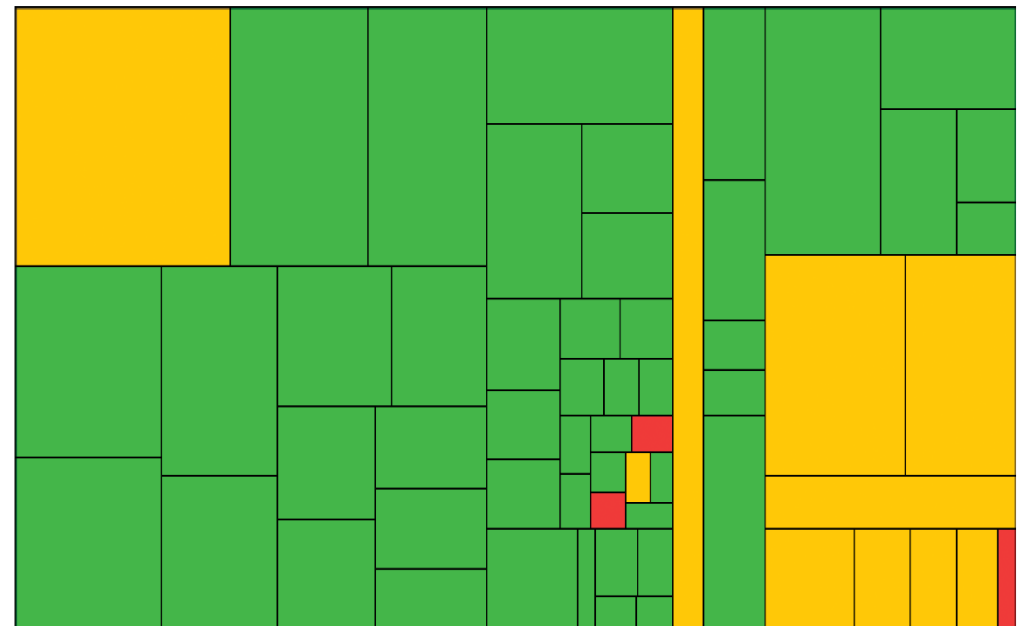
Issue TS-14733 - Remove Dataflow blocks

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

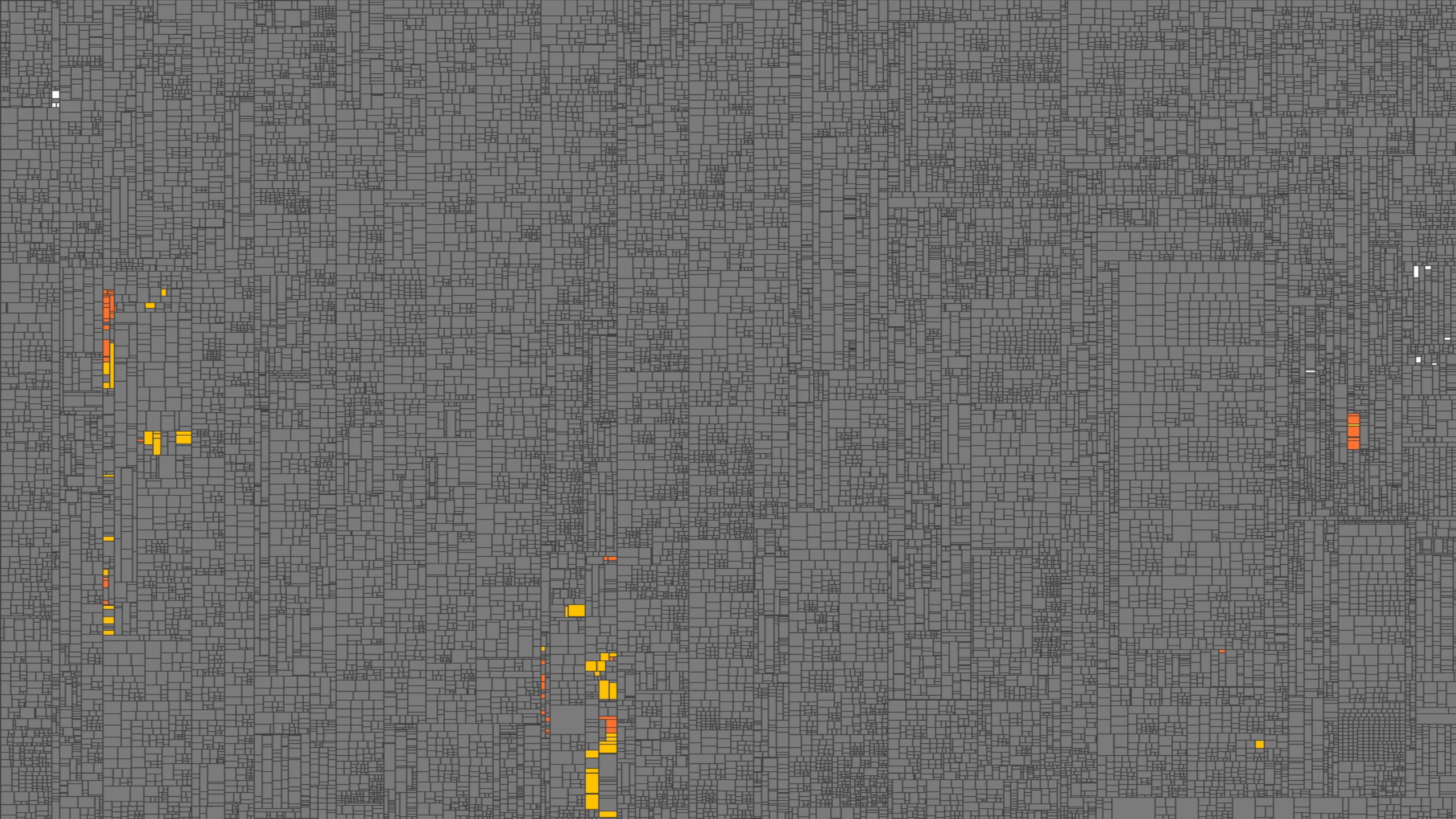
Assignee: 

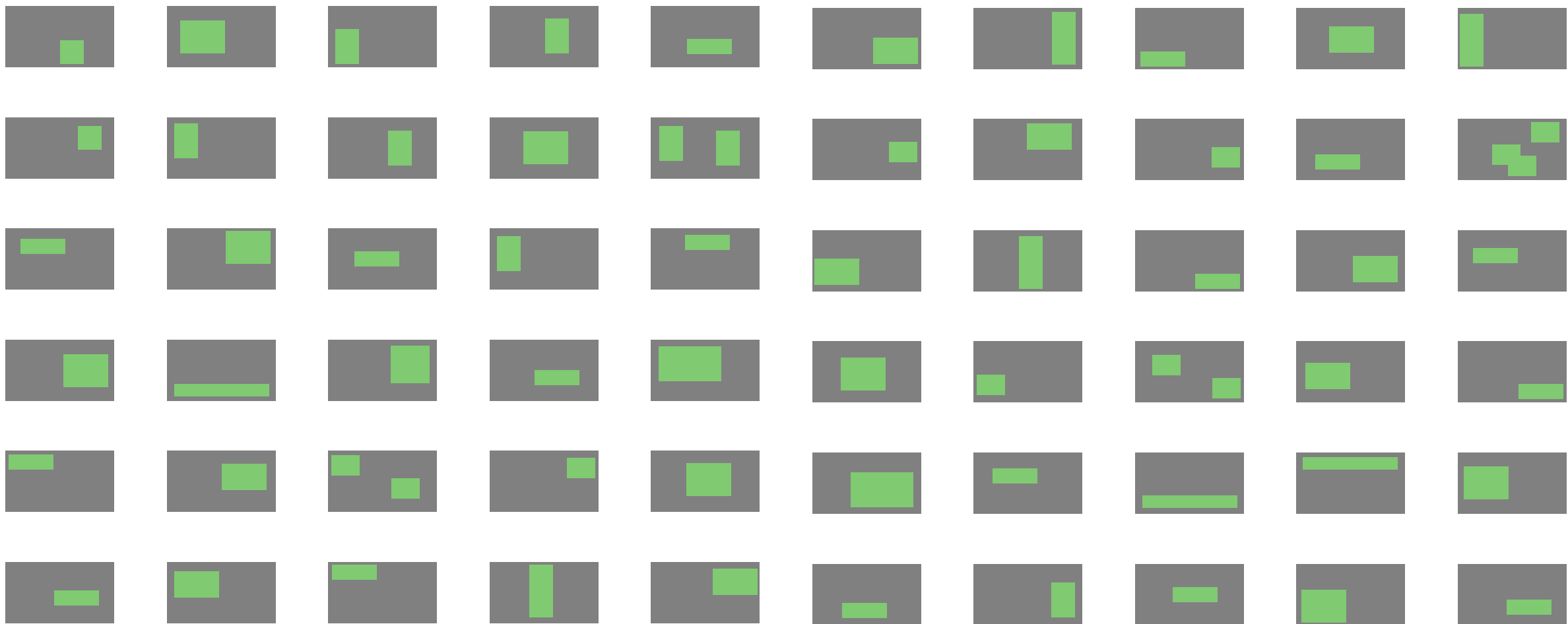
Project	Type	Priority	Resolution	Fix Version
TS	Maintenance	Normal	Green	Teamscale 4.5
Component	Labels	Affected Version	Customer	Customer Issue
Backend	Performance			
Epic Name	Freshdesk URL	Merge Request		
		https://git.cqse.eu/cqse/teamscale/3621		

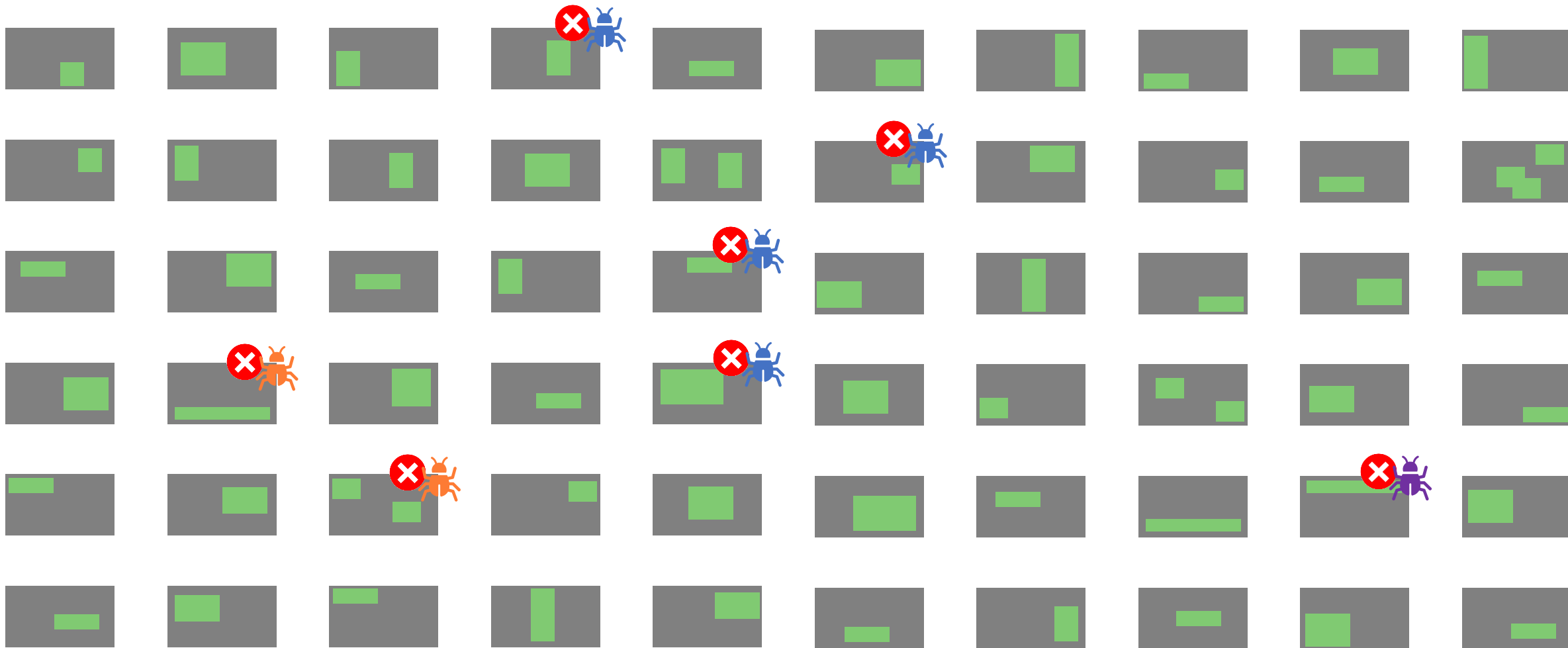
Aug 15 2018 12:37–Now | Test Gap: 22%



Wir testen zu viel



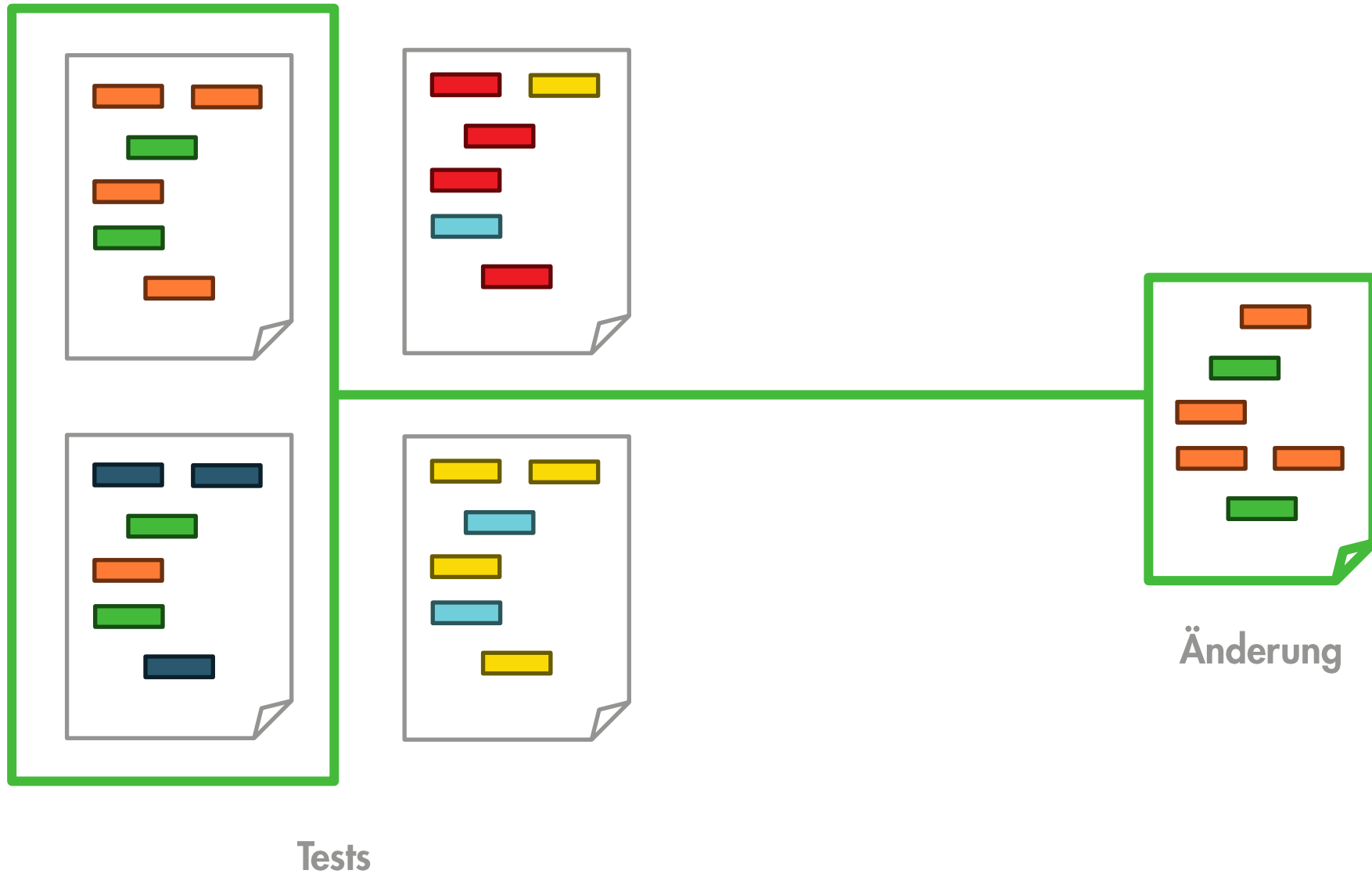




Testselektion



Similarity Scoring



Geänderter Code

```
43
42
41
40
39
38  /*
37  * Transfer amount between two accounts
36  *
35  * Accounts should be full objects. With that said, the objects are fetched to make sure.
34  *
33  * AccountTransaction can be a partial object but must contain the transaction amount.
32  */
31  public void transfer(Account fromAccount, Account toAccount, AccountTransaction accountTransaction) {
30
29      LOG.debug("Transfer Between Accounts:");
28
27      // From Transaction
26      fromAccount = this.getAccountById(fromAccount.getId());
25      AccountTransaction fromAt = new AccountTransaction();
24      fromAt.setAmount(accountTransaction.getAmount());
23      fromAt.setTransactionDate(accountTransaction.getTransactionDate());
22      fromAt.setDescription("Transfer to Account (" + toAccount.getAccountNumber() + ")");
21      fromAt.setTransactionType(transactionTypeRepository.findByCode(Constants.ACCT_TRAN_TYPE_XFER_CODE));
20      debitTransaction(fromAccount, fromAt);
19
18      // To Transaction
17      toAccount = this.getAccountById(toAccount.getId());
16      AccountTransaction toAt = new AccountTransaction();
15      toAt.setAmount(accountTransaction.getAmount());
14      toAt.setTransactionDate(accountTransaction.getTransactionDate());
13      toAt.setDescription("Transfer from Account (" + fromAccount.getAccountNumber() + ")");
12      toAt.setTransactionType(transactionTypeRepository.findByCode(Constants.ACCT_TRAN_TYPE_XFER_CODE));
11      creditTransaction(toAccount, toAt);
10
9      LOG.debug("Transfer Between Accounts: Accounts Updated.");
8  }
7
6
5
4
3
2
```

Digibank

Geänderter Code	Code Test
<pre>43 42 41 40 39 38 /* 37 * Transfer amount between two accounts 36 * 35 * Accounts should be full objects. With that said, the objects are f 34 * 33 * AccountTransaction can be a partial object but must contain the tr 32 */ 31 public void transfer(Account fromAccount, Account toAccount, AccountT 30 29 LOG.debug("Transfer Between Accounts:"); 28 27 // From Transaction 26 fromAccount = this.getAccountById(fromAccount.getId()); 25 AccountTransaction fromAt = new AccountTransaction(); 24 fromAt.setAmount(accountTransaction.getAmount()); 23 fromAt.setTransactionDate(accountTransaction.getTransactionDate()); 22 fromAt.setDescription("Transfer to Account (" + toAccount.getAccoun 21 fromAt.setTransactionType(transactionTypeRepository.findByCode(Cons 20 debitTransaction(fromAccount, fromAt); 19 18 // To Transaction 17 toAccount = this.getAccountById(toAccount.getId()); 16 AccountTransaction toAt = new AccountTransaction(); 15 toAt.setAmount(accountTransaction.getAmount()); 14 toAt.setTransactionDate(accountTransaction.getTransactionDate()); 13 toAt.setDescription("Transfer from Account (" + fromAccount.getAcco 12 toAt.setTransactionType(transactionTypeRepository.findByCode(Consta 11 creditTransaction(toAccount, toAt); 10 9 LOG.debug("Transfer Between Accounts: Accounts Updated."); 8 } 7 6 5 4 3 2</pre>	<pre>20 public class AccountServiceTest extends IntegrationTest { 19 18 @Test 17 public void transferBetweenSameAccountShouldNotBePossible() { 16 Account account = new Account("savings", AccountType.SAVING 15 AccountService service = new AccountService(); 14 AccountTransaction transaction = 13 MockAccountTransaction.createForAmount(100); 12 service.transfer(account, account, transaction); 11 10 assertThat(this.getErrors()).contains(9 new Error("Transfer between same account is not possible. 8 7 Account databaseAccount = this.findAccountById(account.getI 6 AccountTransactionList transactionList = this.getTransaction 5 assertThat(transactionList).isEmpty() 4 } 3 2 } 1 21</pre>

Geänderter Code

Cucumber Test

```
43
42
41
40
39
38  /*
37  * Transfer amount between two accounts
36  *
35  * Accounts should be full objects. With that said, the objects are f
34  *
33  * AccountTransaction can be a partial object but must contain the tr
32  */
31  public void transfer(Account fromAccount, Account toAccount, AccountT
30
29      LOG.debug("Transfer Between Accounts:");
28
27      // From Transaction
26      fromAccount = this.getAccountById(fromAccount.getId());
25      AccountTransaction fromAt = new AccountTransaction();
24      fromAt.setAmount(accountTransaction.getAmount());
23      fromAt.setTransactionDate(accountTransaction.getTransactionDate());
22      fromAt.setDescription("Transfer to Account (" + toAccount.getAccount
21      fromAt.setTransactionType(transactionTypeRepository.findByCode(Const
20      debitTransaction(fromAccount, fromAt);
19
18      // To Transaction
17      toAccount = this.getAccountById(toAccount.getId());
16      AccountTransaction toAt = new AccountTransaction();
15      toAt.setAmount(accountTransaction.getAmount());
14      toAt.setTransactionDate(accountTransaction.getTransactionDate());
13      toAt.setDescription("Transfer from Account (" + fromAccount.getAccount
12      toAt.setTransactionType(transactionTypeRepository.findByCode(Consta
11      creditTransaction(toAccount, toAt);
10
9      LOG.debug("Transfer Between Accounts: Accounts Updated.");
8  }
7
6
5
4
3
2
```

```
22  @ui @account @savings
21  Feature: Transfer Money (UI)
20  As a DigitalBank user
19  I want to transfer money between accounts
18  So I can change how much is in each account
17
16
15  @negative
14  Scenario: Transfer between the same account is not possible
13      Given Carleen is logged into the application with Carleen6231@gmail.com
12      And they attempt to open a new 'Savings Account'
11          When Carleen enters 'Tangerine Savings' into the Account Name field
10          And they select 'Individual' from the Ownership radio button
9          And they select 'Money Market' from the Account Type radio button
8          And they enter '2500' into the Money Market Initial Deposit field
7          And they click the Submit button
6      And they attempt to transfer money
5      When Carleen selects account number '1' as the from account
4      And they select account number '1' as the to account
3      And they enter '11' into the amount field
2      And they submit the form
1      Then Carleen verifies the transfer failed
23
```

Geänderter Code

Robot Test

```
43
42
41
40
39
38  /*
37   * Transfer amount between two accounts
36   *
35   * Accounts should be full objects. With that said, the objects are full
34   *
33   * AccountTransaction can be a partial object but must contain the transaction
32   */
31 public void transfer(Account fromAccount, Account toAccount, AccountTransaction
30
29     LOG.debug("Transfer Between Accounts:");
28
27     // From Transaction
26     fromAccount = this.getAccountById(fromAccount.getId());
25     AccountTransaction fromAt = new AccountTransaction();
24     fromAt.setAmount(accountTransaction.getAmount());
23     fromAt.setTransactionDate(accountTransaction.getTransactionDate());
22     fromAt.setDescription("Transfer to Account (" + toAccount.getAccountName()
21     fromAt.setTransactionType(transactionTypeRepository.findByCode(Constants
20     debitTransaction(fromAccount, fromAt);
19
18     // To Transaction
17     toAccount = this.getAccountById(toAccount.getId());
16     AccountTransaction toAt = new AccountTransaction();
15     toAt.setAmount(accountTransaction.getAmount());
14     toAt.setTransactionDate(accountTransaction.getTransactionDate());
13     toAt.setDescription("Transfer from Account (" + fromAccount.getAccountName()
12     toAt.setTransactionType(transactionTypeRepository.findByCode(Constants
11     creditTransaction(toAccount, toAt);
10
9     LOG.debug("Transfer Between Accounts: Accounts Updated.");
8
7
6
5
4
3
2
```

```
✓ 17  *** Settings ***
16  Resource      ../keywords/digibank_keywords.robot
15
✓ 14  *** Test Cases ***
✓ 13  Transfer between the same account is not possible
12      Log in Carleen6231@gmail.com
11      Open new account      Savings Account      Individual Money Market
10      Open transfer page
9      Select from account number      1
8      Select to account number      1
7      Enter amount      11
6      Submit transfer form
5      Transfer failed message should be displayed
4
3
2
1
18
```

Geänderter Code	Manueller Test														
<pre>43 42 41 40 39 38 /* 37 * Transfer amount between two accounts 36 * 35 * Accounts should be full objects. With that said, the objects are f 34 * 33 * AccountTransaction can be a partial object but must contain the tra 32 */ 31 public void transfer(Account fromAccount, Account toAccount, AccountT 30 29 LOG.debug("Transfer Between Accounts:"); 28 27 // From Transaction 26 fromAccount = this.getAccountById(fromAccount.getId()); 25 AccountTransaction fromAt = new AccountTransaction(); 24 fromAt.setAmount(accountTransaction.getAmount()); 23 fromAt.setTransactionDate(accountTransaction.getTransactionDate()); 22 fromAt.setDescription("Transfer to Account (" + toAccount.getAccount 21 fromAt.setTransactionType(transactionTypeRepository.findByCode(Const 20 debitTransaction(fromAccount, fromAt); 19 18 // To Transaction 17 toAccount = this.getAccountById(toAccount.getId()); 16 AccountTransaction toAt = new AccountTransaction(); 15 toAt.setAmount(accountTransaction.getAmount()); 14 toAt.setTransactionDate(accountTransaction.getTransactionDate()); 13 toAt.setDescription("Transfer from Account (" + fromAccount.getAcco 12 toAt.setTransactionType(transactionTypeRepository.findByCode(Consta 11 creditTransaction(toAccount, toAt); 10 9 LOG.debug("Transfer Between Accounts: Accounts Updated."); 8 } 7 6 5 4 3 2</pre>	<table><tr><th>Action</th><th>Check</th></tr><tr><td>Log in as Carleen6231@gmail.com</td><td></td></tr><tr><td>Open a new account: Type Savings Account, Individual In the Money Market Start deposit: 2500</td><td>Account was created as specified.</td></tr><tr><td>Open the transfer page.</td><td></td></tr><tr><td>Select the account from step 2 as both from and to account.</td><td></td></tr><tr><td>Enter amount: 11</td><td></td></tr><tr><td>Submit the form</td><td>Transfer should fail with a message that transfers between the same account are prohibited</td></tr></table>	Action	Check	Log in as Carleen6231@gmail.com		Open a new account: Type Savings Account, Individual In the Money Market Start deposit: 2500	Account was created as specified.	Open the transfer page.		Select the account from step 2 as both from and to account.		Enter amount: 11		Submit the form	Transfer should fail with a message that transfers between the same account are prohibited
Action	Check														
Log in as Carleen6231@gmail.com															
Open a new account: Type Savings Account, Individual In the Money Market Start deposit: 2500	Account was created as specified.														
Open the transfer page.															
Select the account from step 2 as both from and to account.															
Enter amount: 11															
Submit the form	Transfer should fail with a message that transfers between the same account are prohibited														

Evaluating Information Retrieval for the use in Regression Test Selection

Case Study

Author: Majd Akleh
Supervisors: **Prof. Dr. Ben Hermann**
TU Dortmund
Raphael Nömmner
CQSE GmbH
Date: September 2023



Master Thesis

Optimization and Evaluation of an Information Retrieval Based Test Selection Approach

Majd Akleh

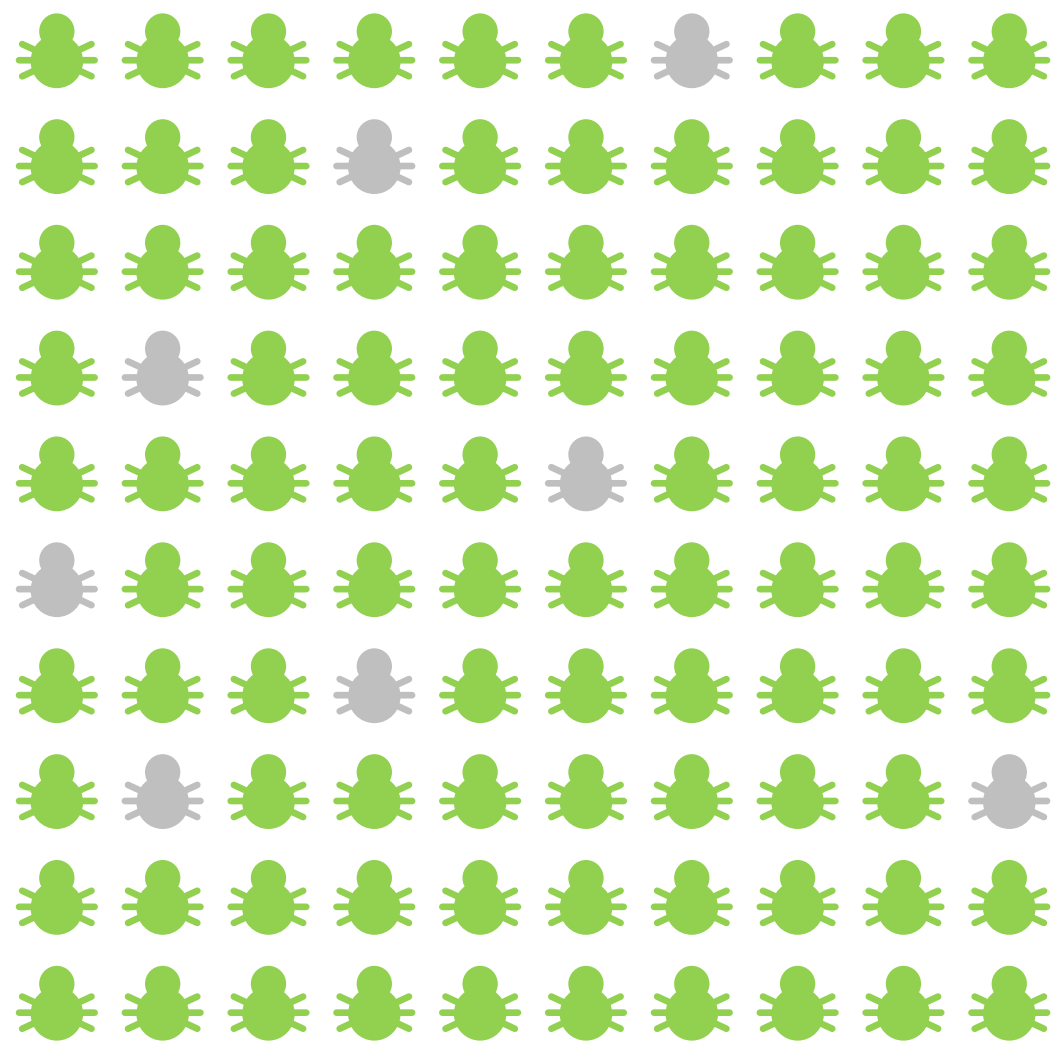
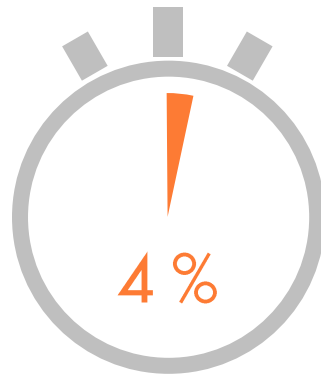
June 3, 2024

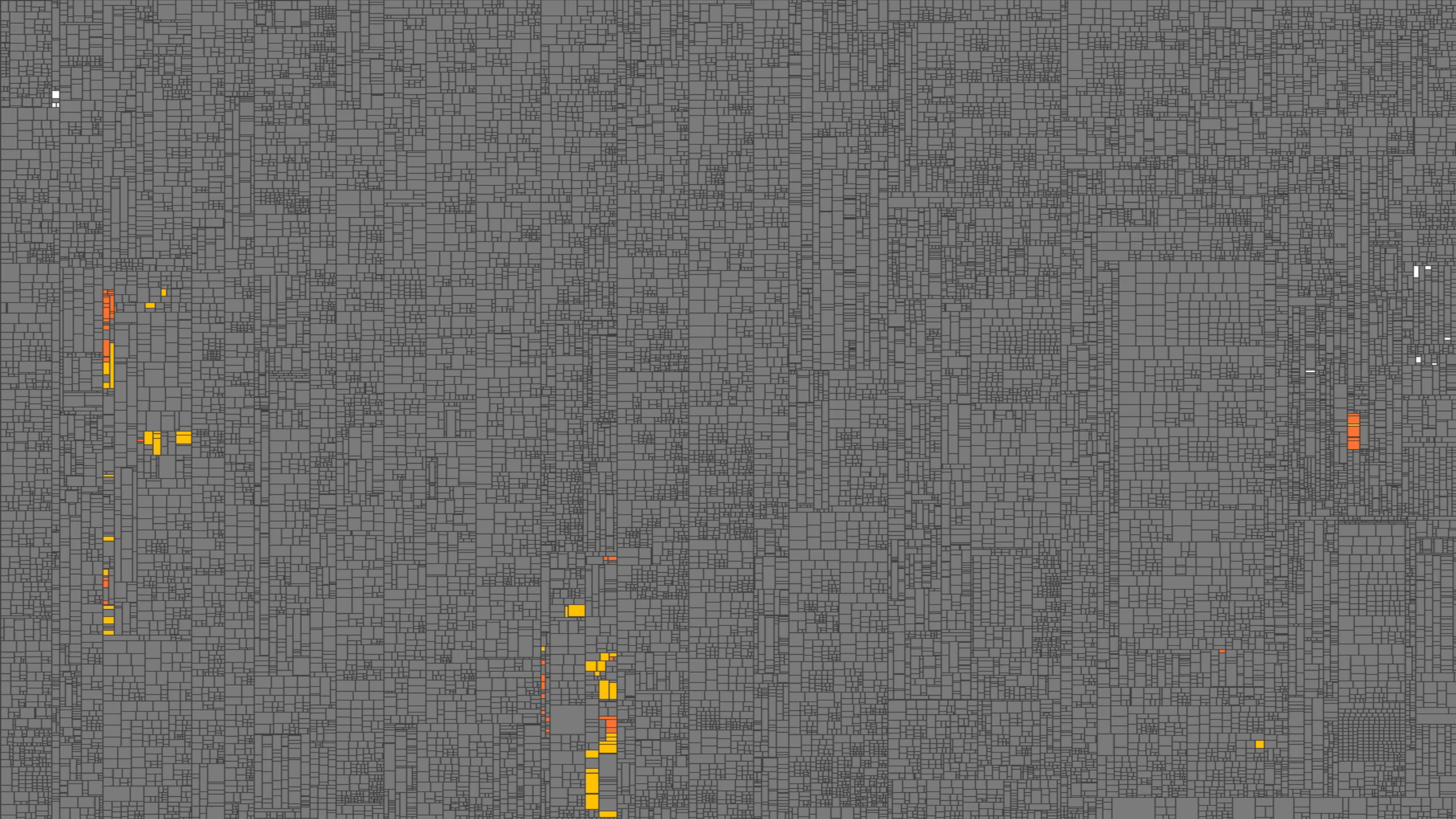
Reviewer:
JProf. Dr.-Ing. Ben Hermann
Dr. Elmar Jürgens



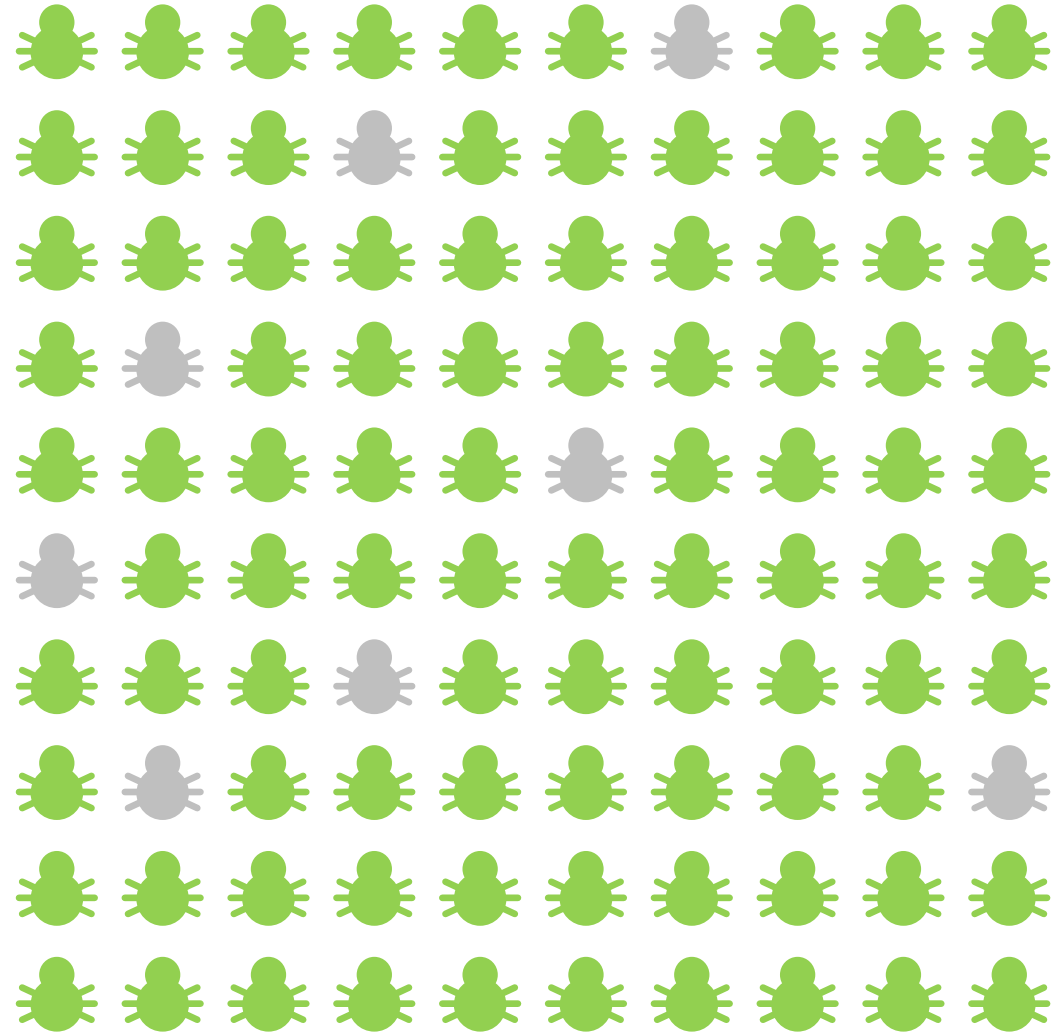
Technische Universität Dortmund
Fakultät für Informatik
Lehrstuhl V - Programmiersysteme
Fachgruppe Softwaretechnik sicherer Systeme
<https://sse.cs.tu-dortmund.de>

Similarity Scoring





Test-Impact-Analyse



Demo

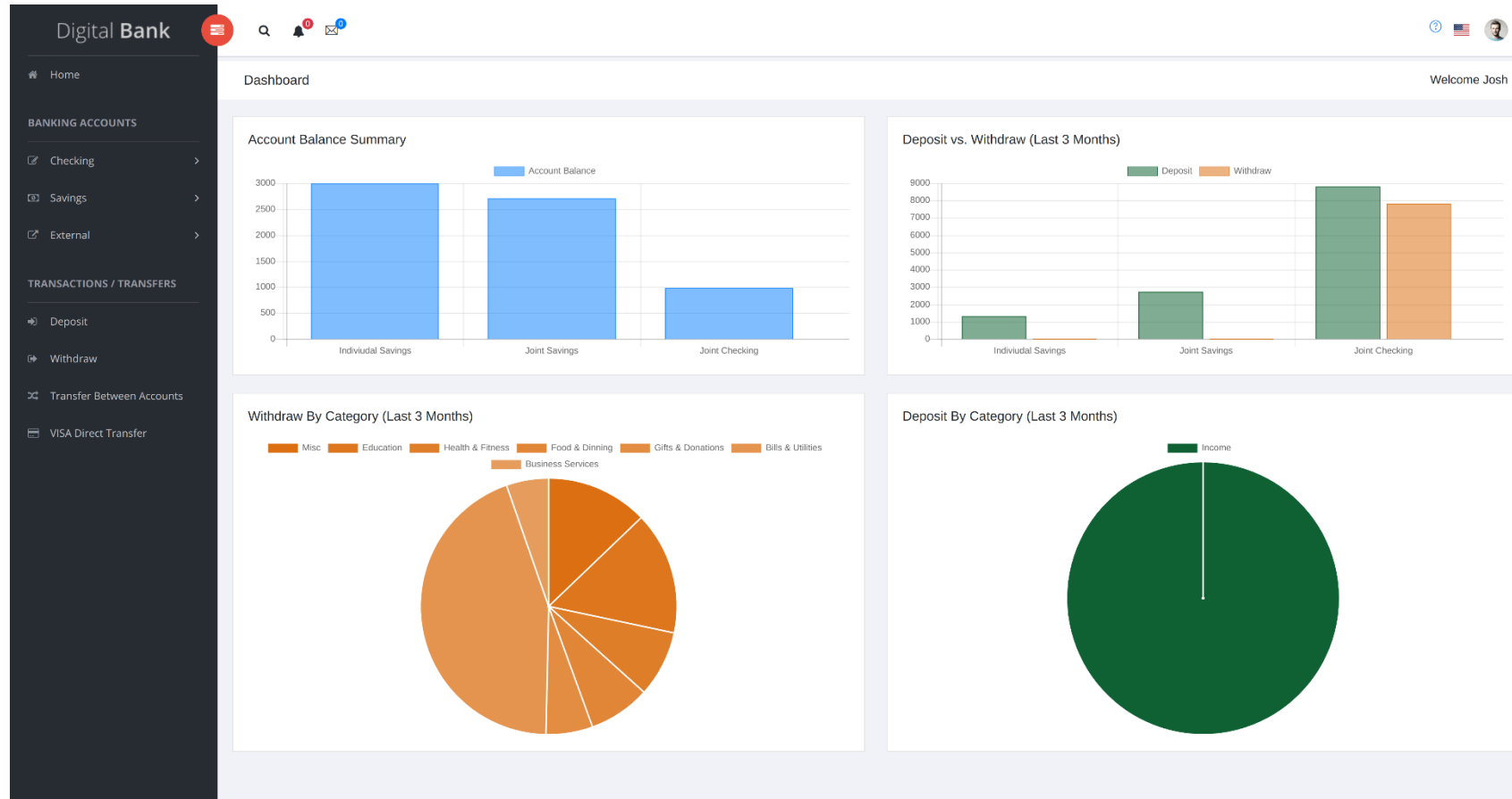


Jonas Bogenberger

- Teil von Fabis Team
- Vorher Mitglied im Development Team von Teamscale



Digital Bank: Open Source Online Banking Anwendung (Java)



ABAP

Ada

C#

C/C++

Cobol

Delphi

ESQL

Fortran

Go

Gosu

Groovy

HANA SQLScript / View

IEC 61131-3 ST

Java

JavaScript / TypeScript

Kotlin

Matlab

Objective-C

Open CL

OScript

PHP

PL/SQL

Python

Simulink / StateFlow

Swift

Transact-SQL

Visual Basic .NET

XML

Xtend

Wir testen **zu wenig**

Test-Gap-Analyse zeigt risikoreiche ungetestete Codeänderungen auf.

Wir testen **zu viel**

Testselektion hilft nur die wirklich relevanten Tests auszuführen.

Alle wollen »Shift Left« ...

Aber unsere Tests sind einfach zu langsam!

Mittwoch, 08. Oktober 2025

10:30 bis 12:00 Uhr

online und kostenlos



Jetzt anmelden: tmscl.me/ts2510-swqd



Jonas Bogenberger



Fabian Streitl



Besuchen Sie uns am **Stand!**



Vortragsfolien

