

Immer kürzere Testphasen?

Mit Ticket Coverage verhindern, dass wichtige Änderungen ungetestet bleiben

Dr. Elmar Juergens
Dr. Dennis Pagano

CQSE



Praxis

Software-**Audits**

Kontinuierliche **Qualitäts-**
und **Testkontrolle**

 **Teamscale**

CQSE GmbH



Forschung

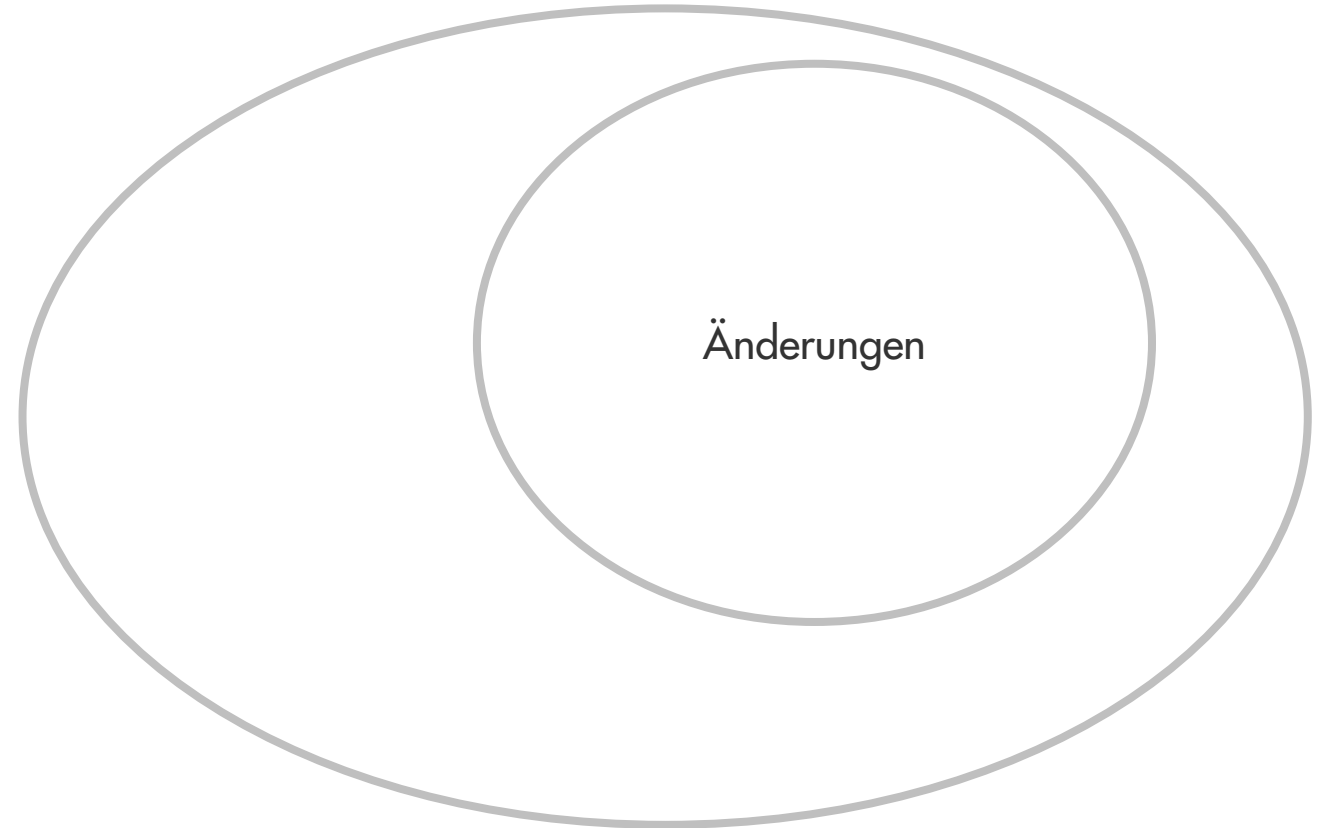
13+ **Promotionen** in
Software Engineering

Eigene **Forschung**

Enger Kontakt zu
Universitäten

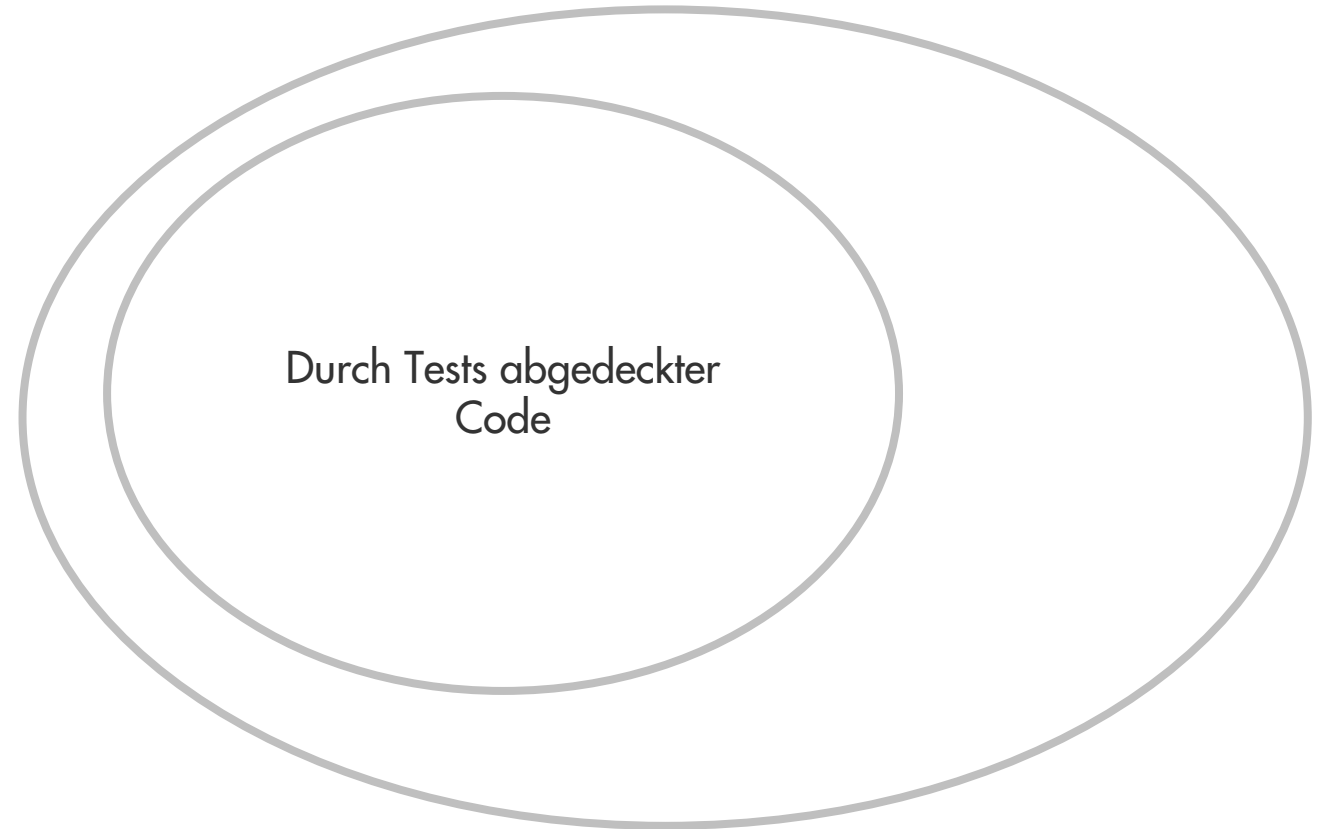
Wieviele Änderungen sind ungetestet?

Studie: C# System @ Munich Re



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Studie: C# System @ Munich Re



Wieviele Änderungen sind ungetestet?

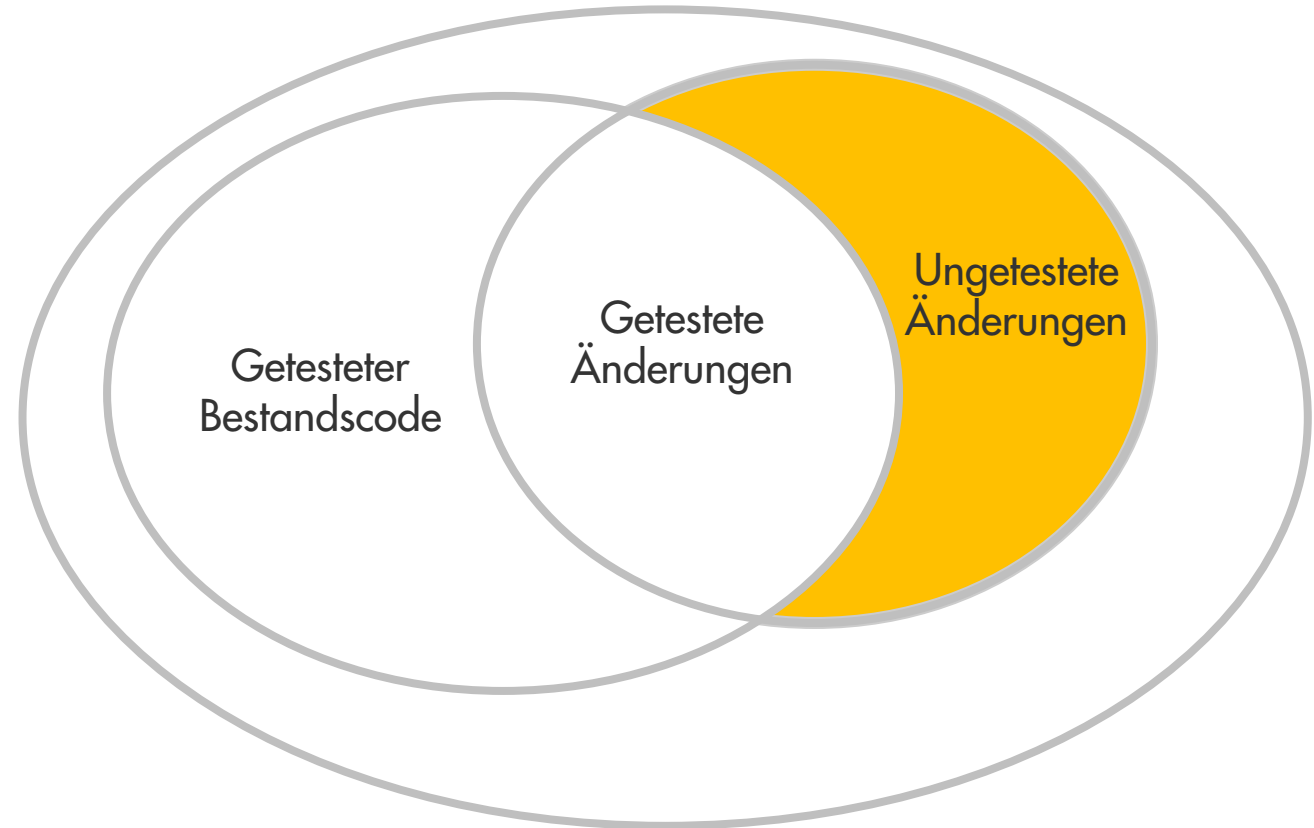
Studie: C# System @ Munich Re

Release A:

15% Code neu/geändert,
>50% ungetestet

Release B:

15% Code neu/geändert,
>60% ungetestet



Feldfehlerwahrscheinlichkeit 5x höher für ungetestete Änderungen!

Änderungen



Test-Gap-Analyse

Ausführung



Ungetestete
Änderungen

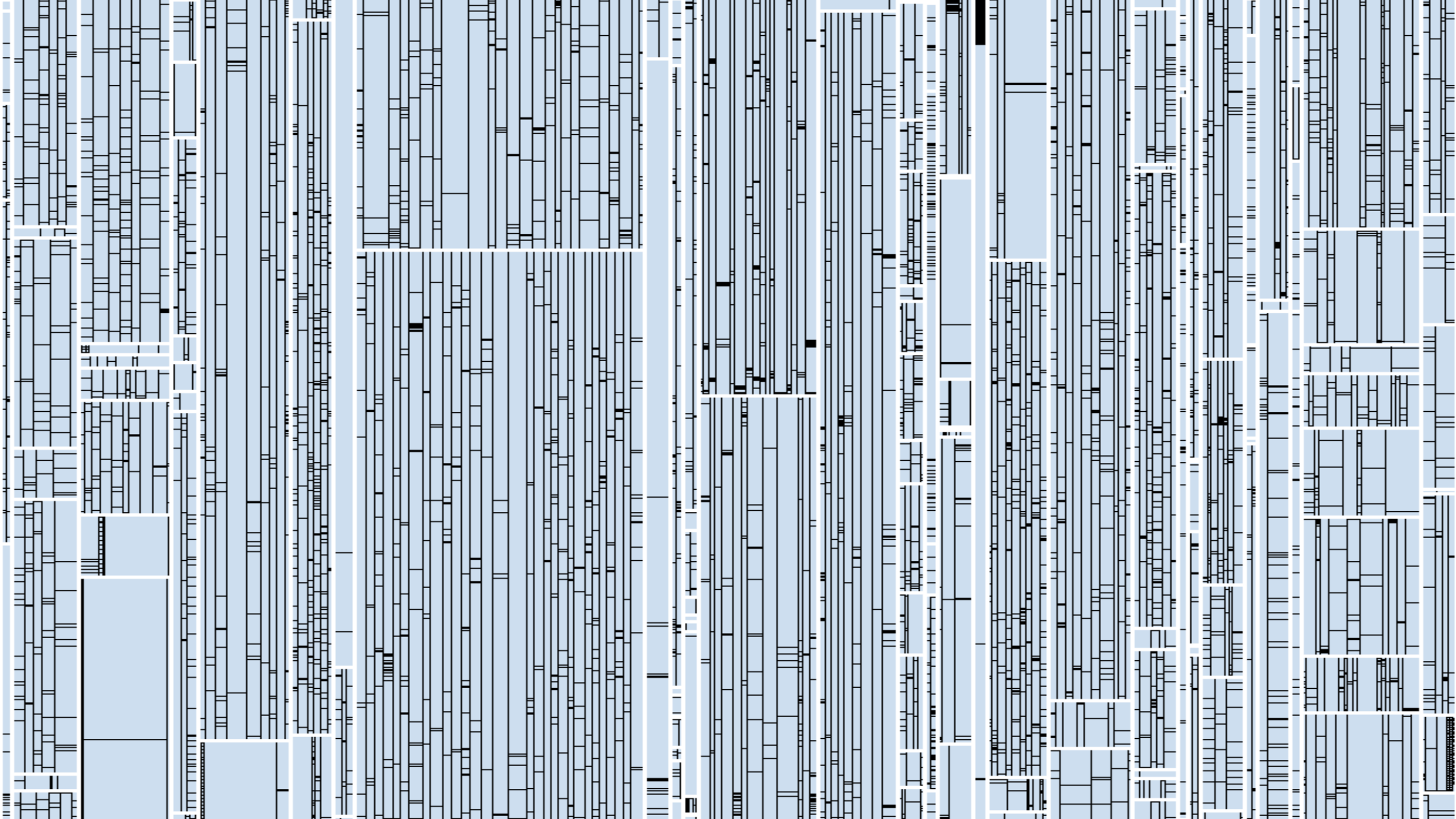
GUI.Dialogs

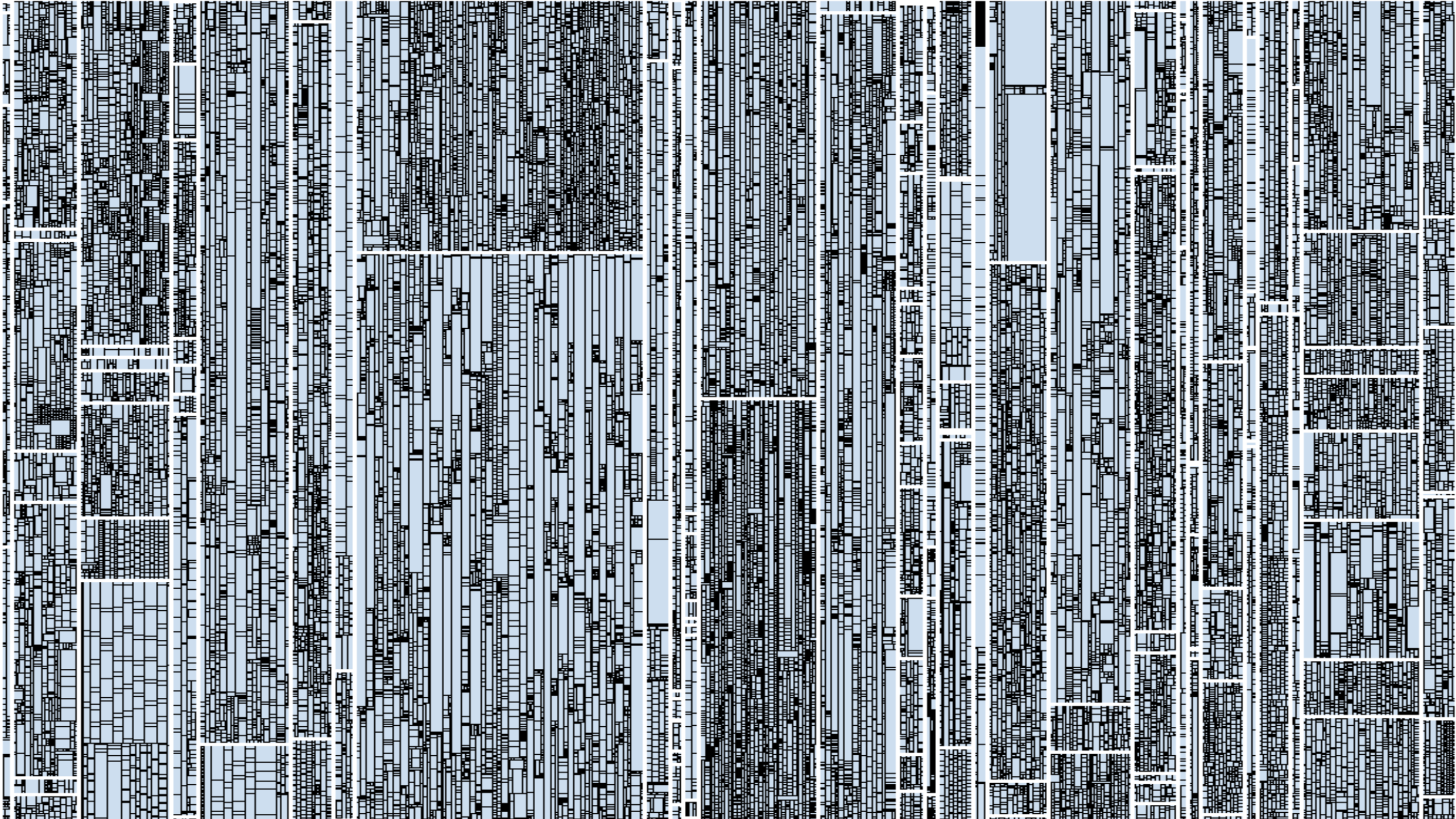
Authentication

UI Controls

GUI.Base

Data
Validation



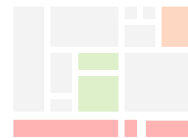


Änderungen



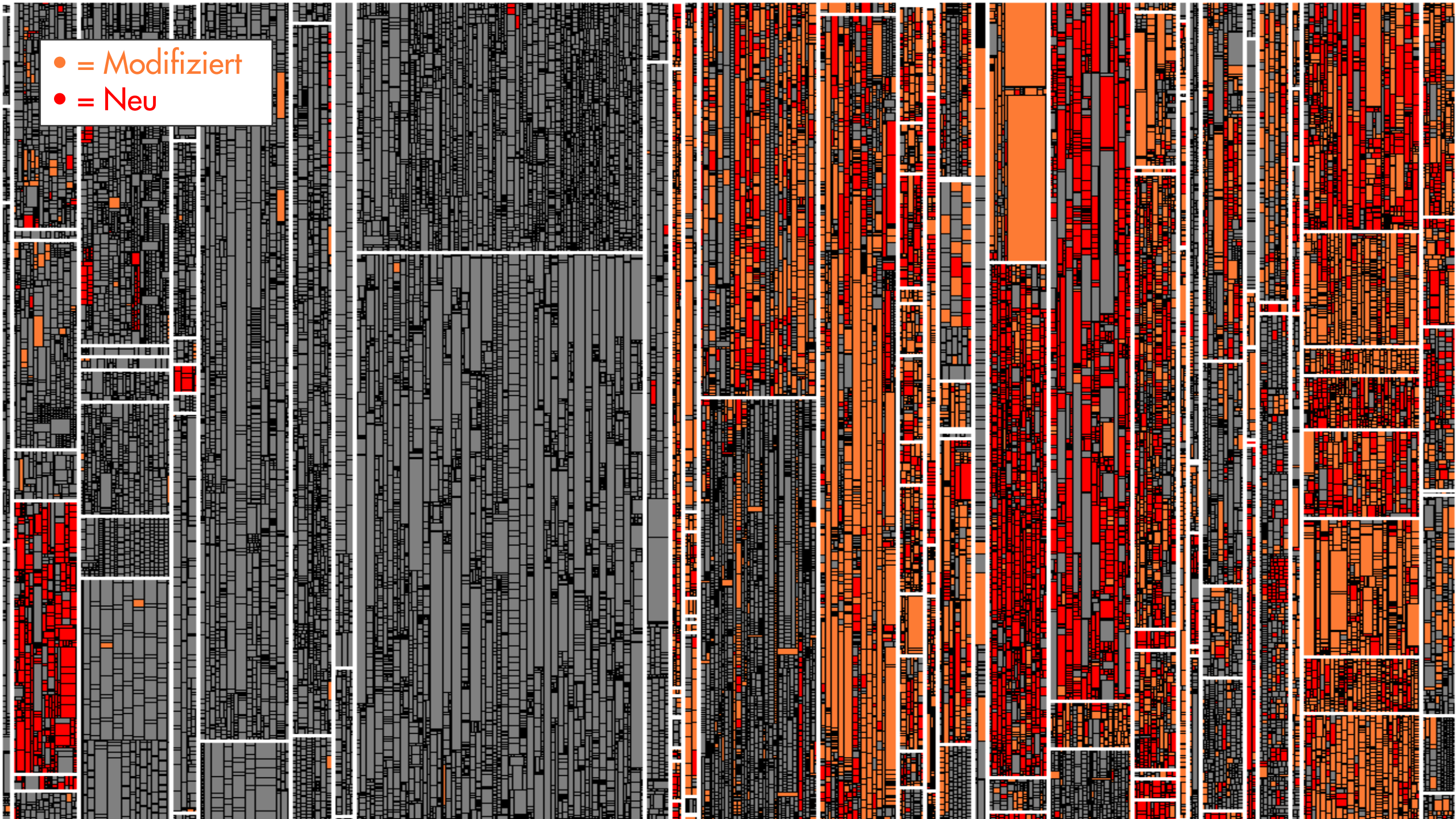
Test-Gap-Analyse

Ausführung

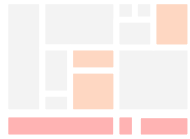


Ungetestete
Änderungen

- = Modifiziert
- = Neu

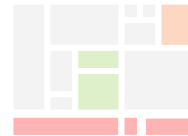


Änderungen



Test-Gap-Analyse

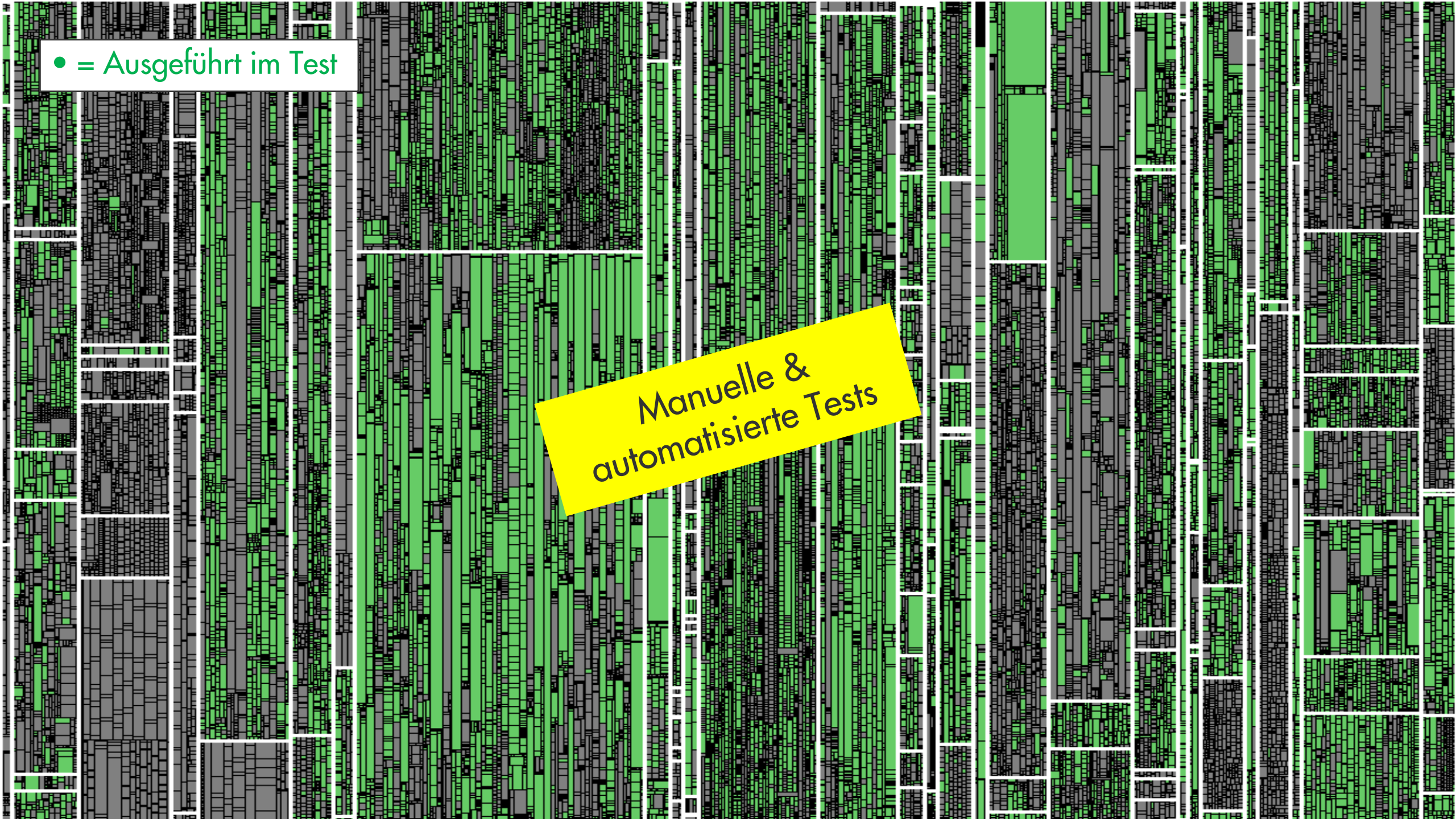
Ausführung



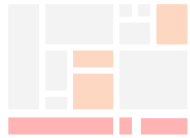
Ungetestete
Änderungen

• = Ausgeführt im Test

Manuelle &
automatisierte Tests



Änderungen



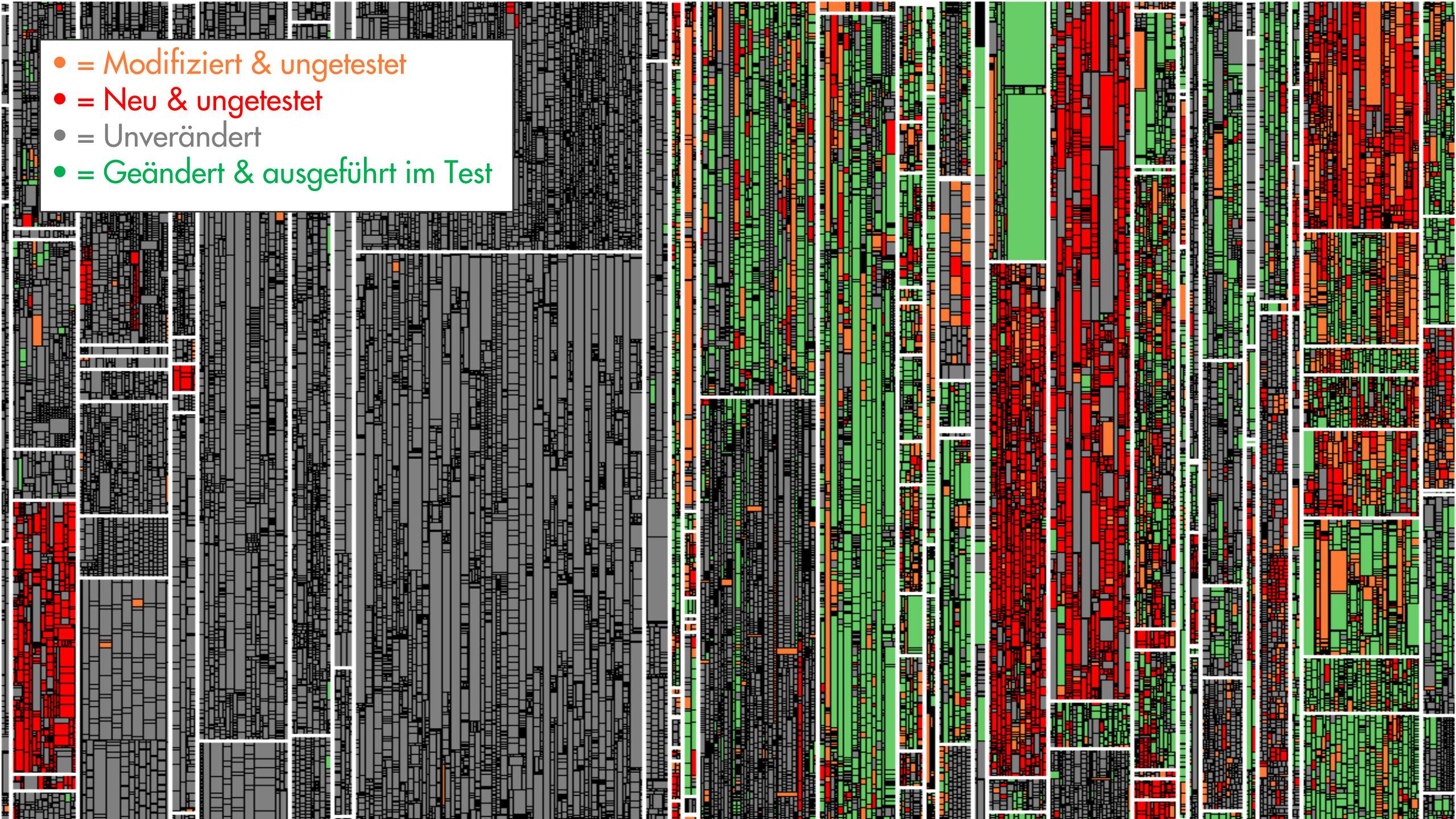
Test-Gap-Analyse

Ausführung



Ungetestete
Änderungen

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



Änderungen



Test-Gap-Analyse

Ausführung



Ungetestete
Änderungen



Testfälle



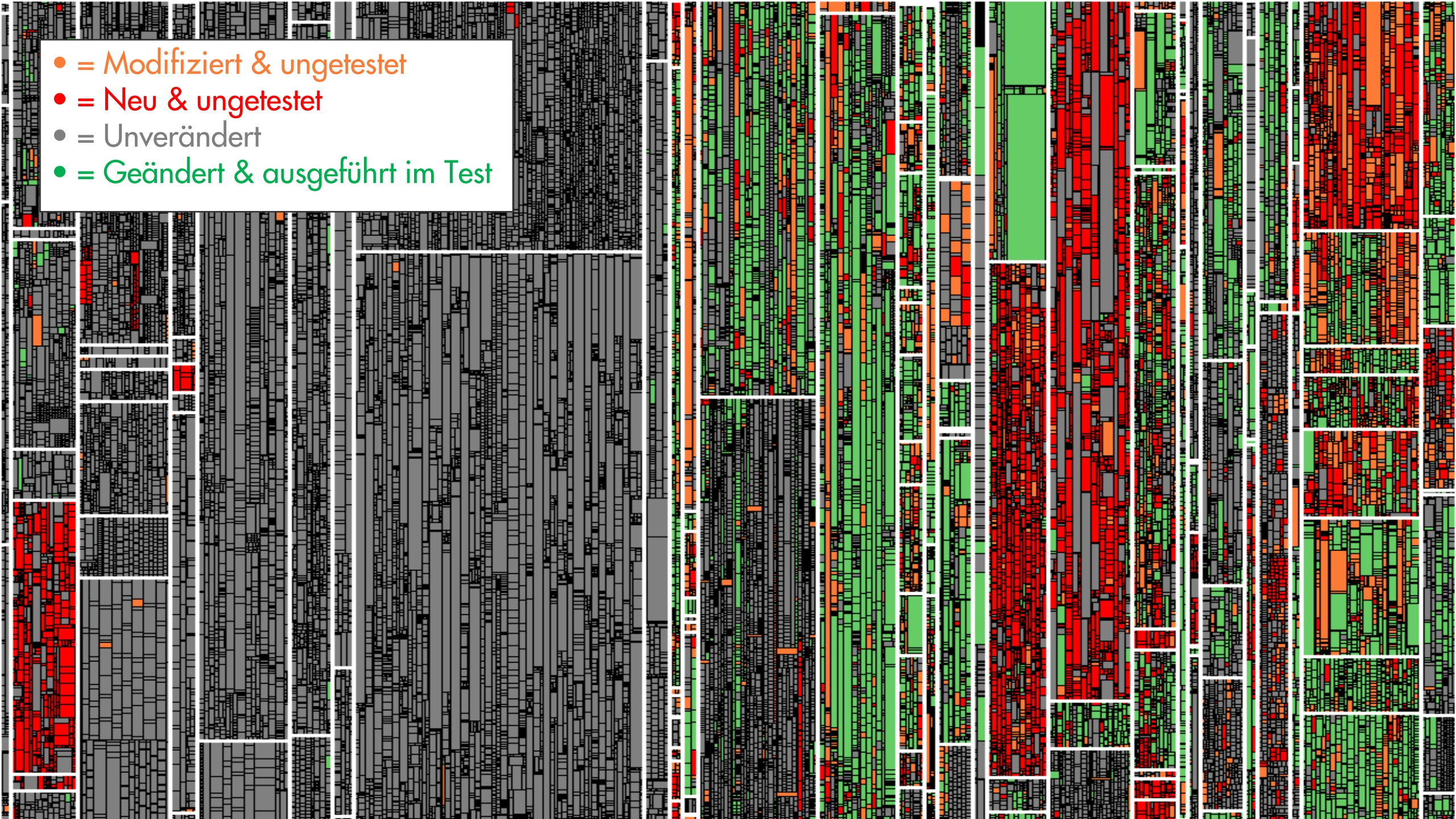
Entwickler, Tester, Testmanager



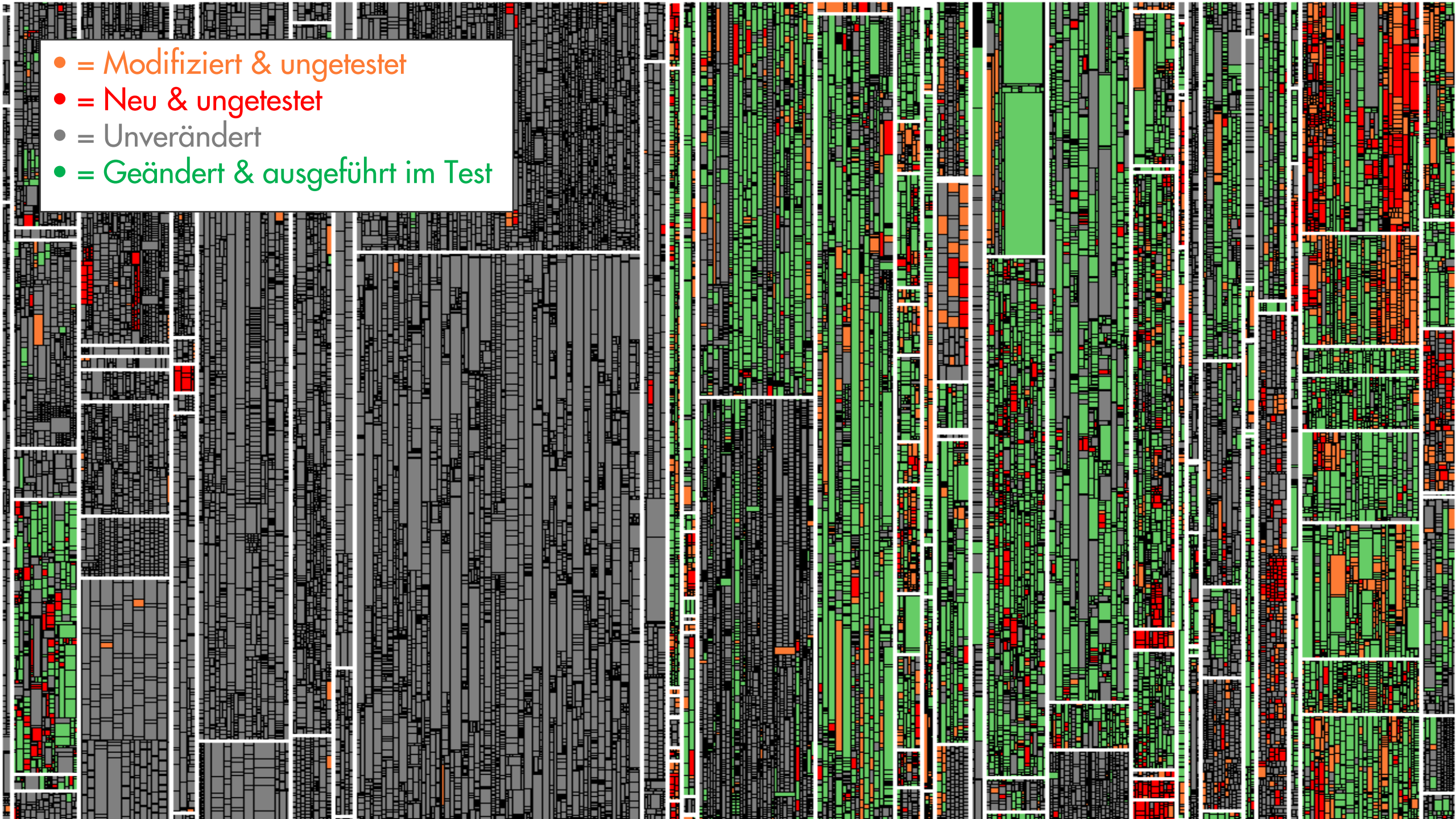
100% Change Coverage

100% Change Coverage → 0 Fehler

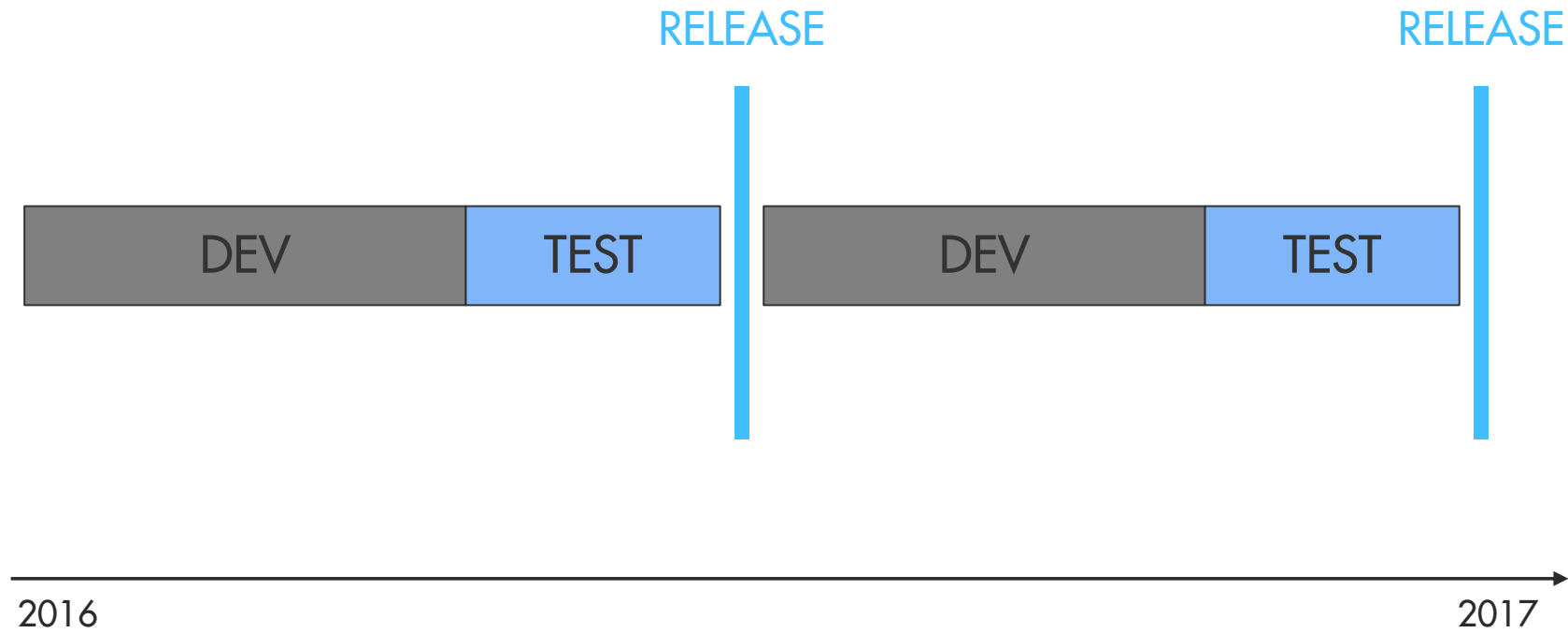
- = Modifiziert & ungetestet
- = Neu & ungetestet
- = Unverändert
- = Geändert & ausgeführt im Test



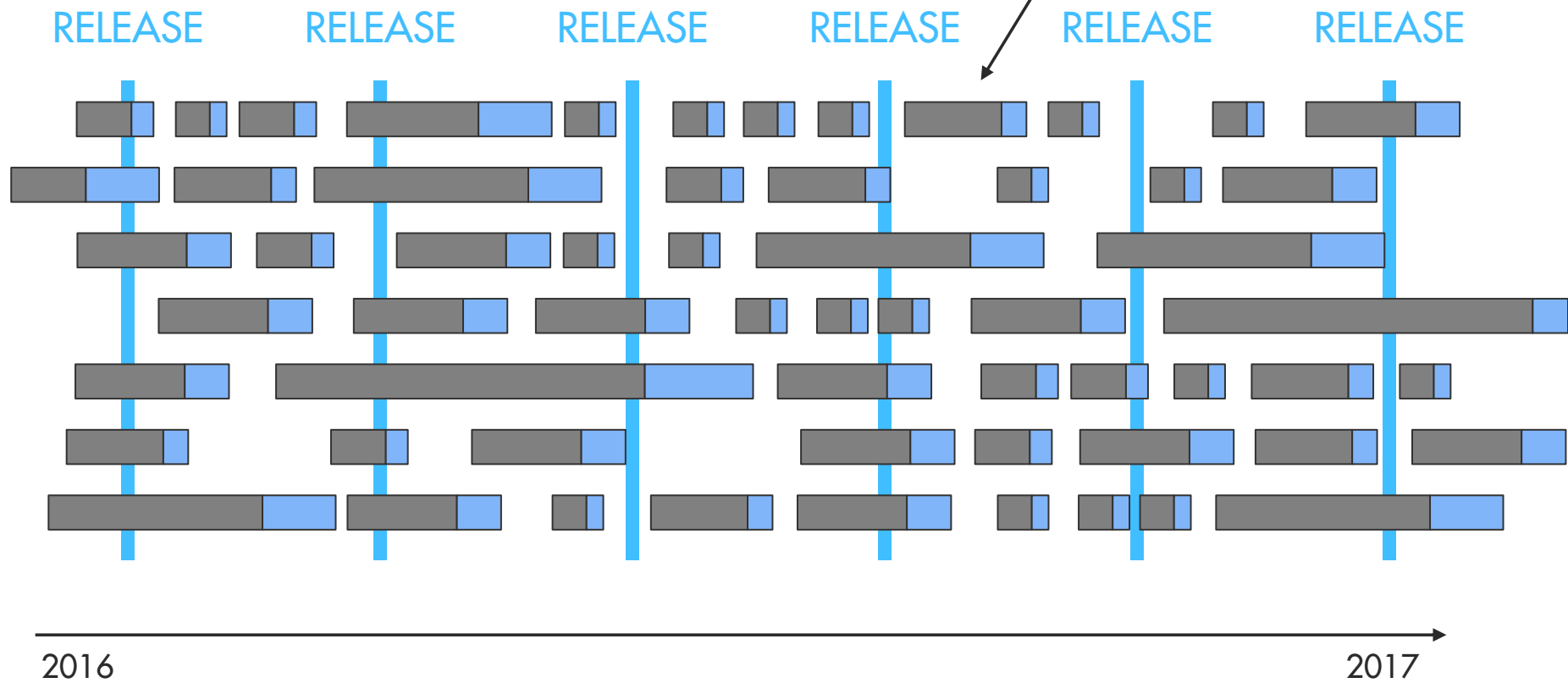
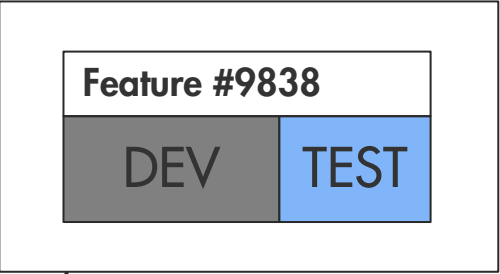
- = Modifiziert & ungetestet
- = Neu & ungetestet
- = Unverändert
- = Geändert & ausgeführt im Test

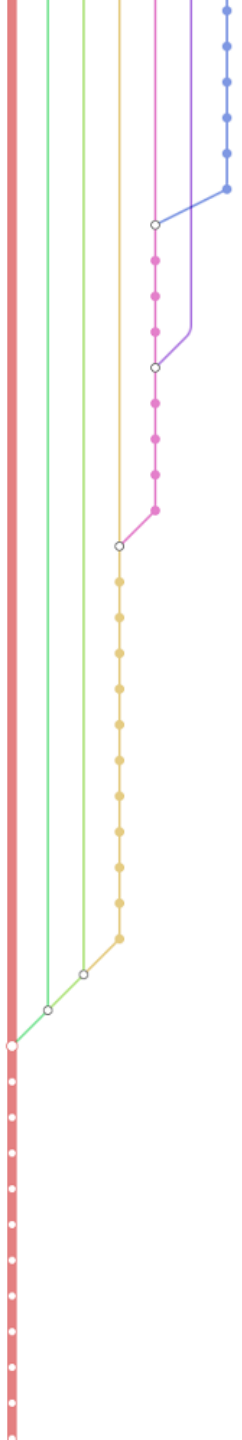


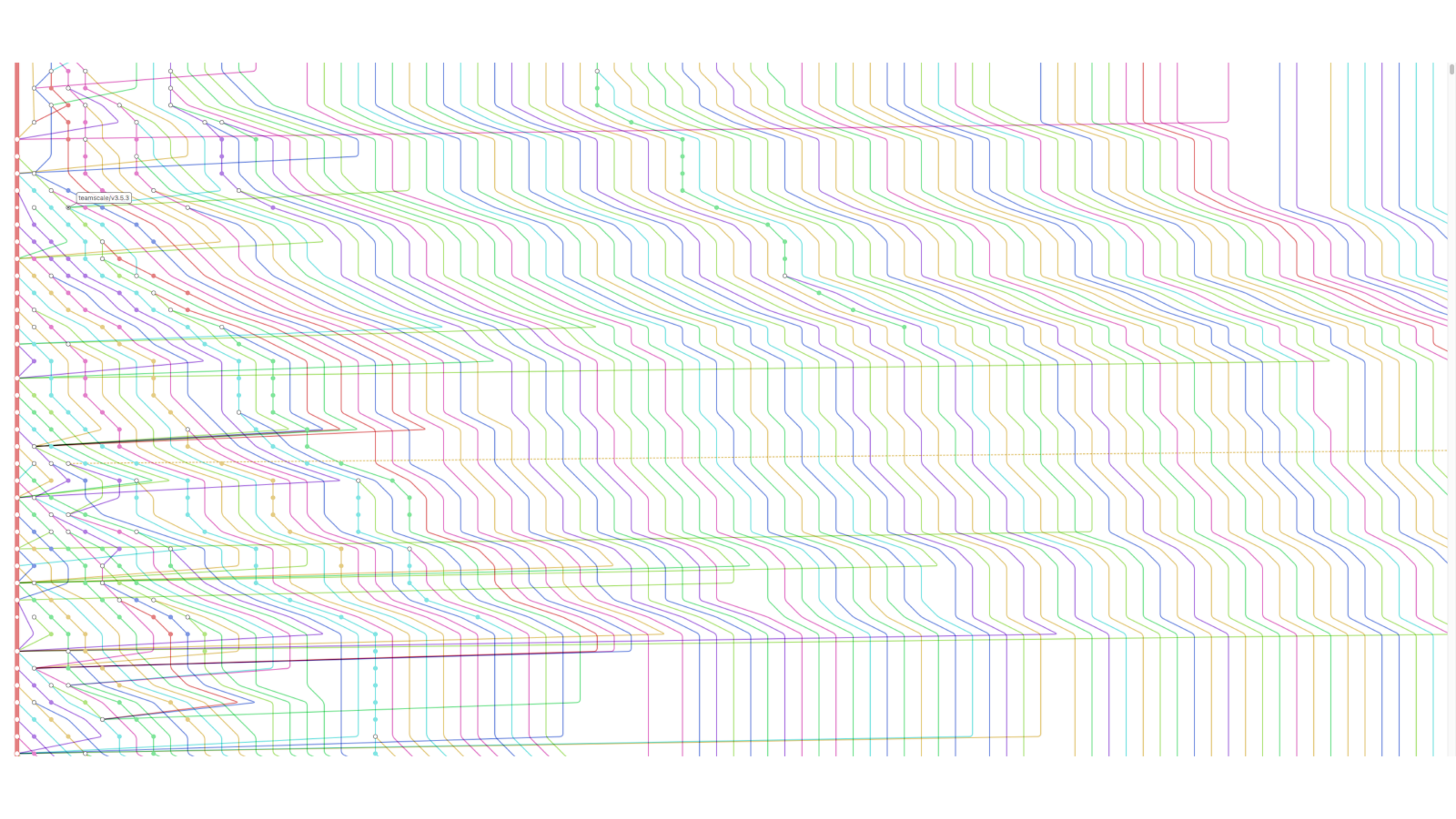
Test Focus: Release

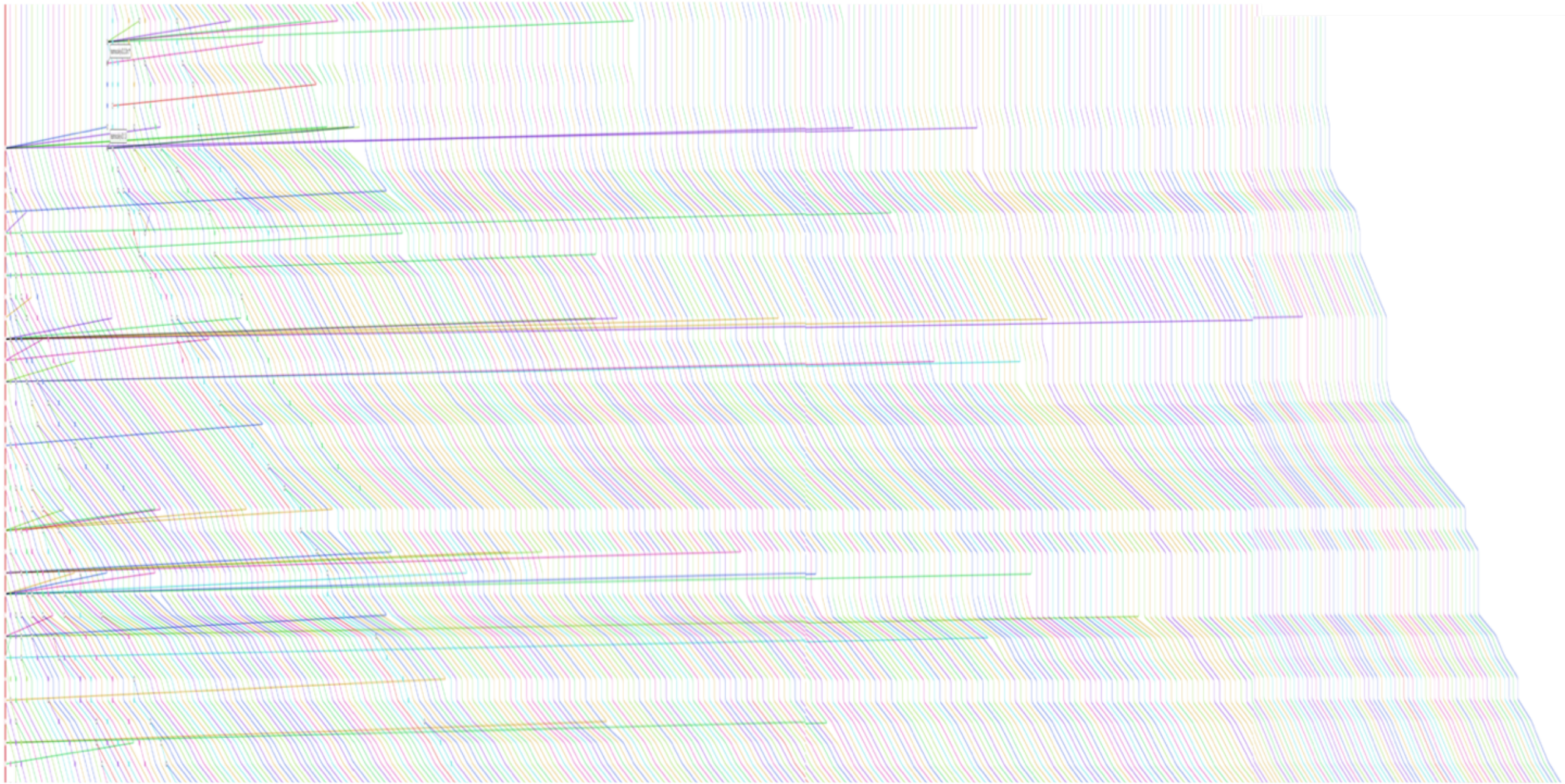


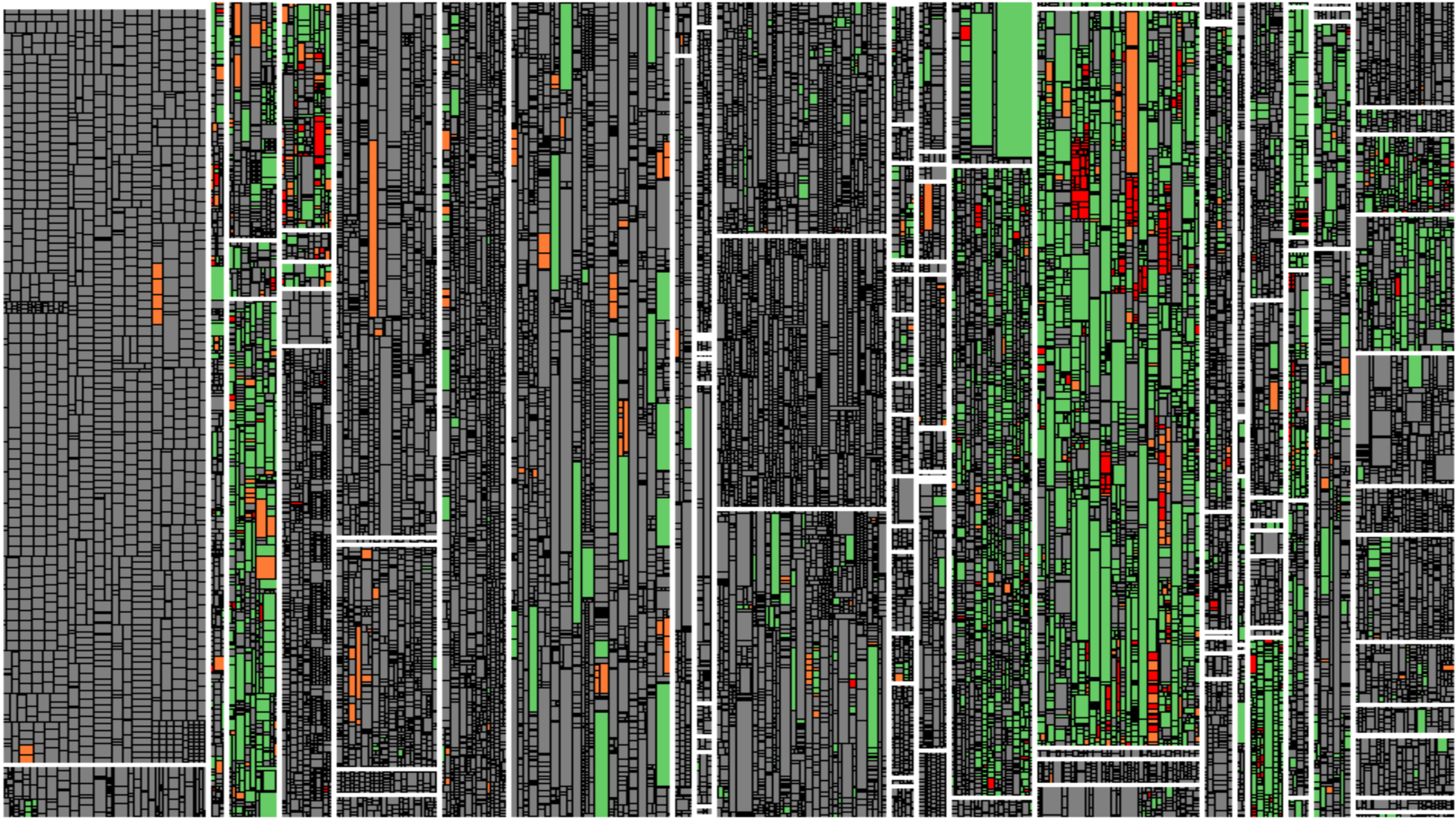
Test Focus: Ticket

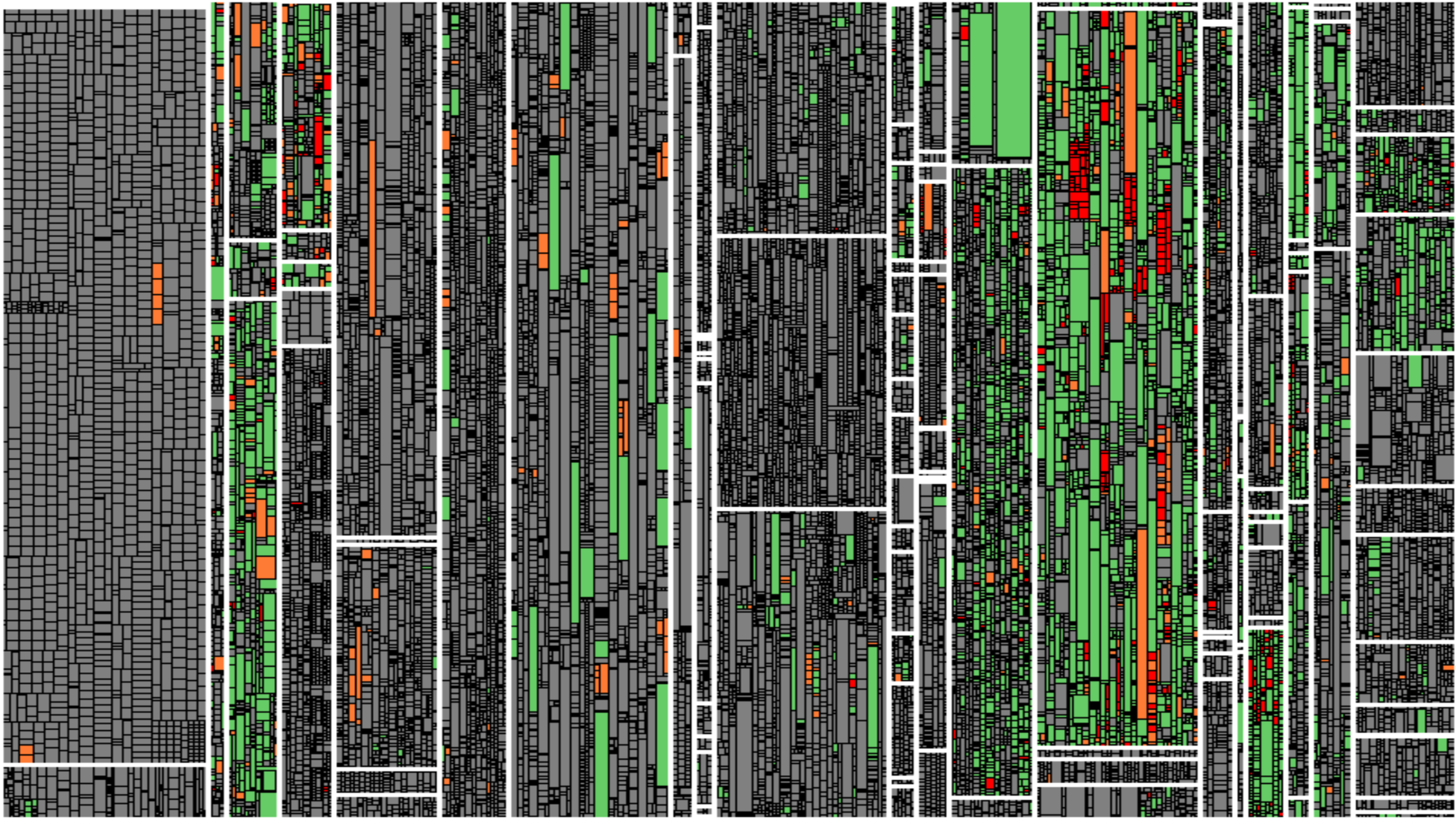


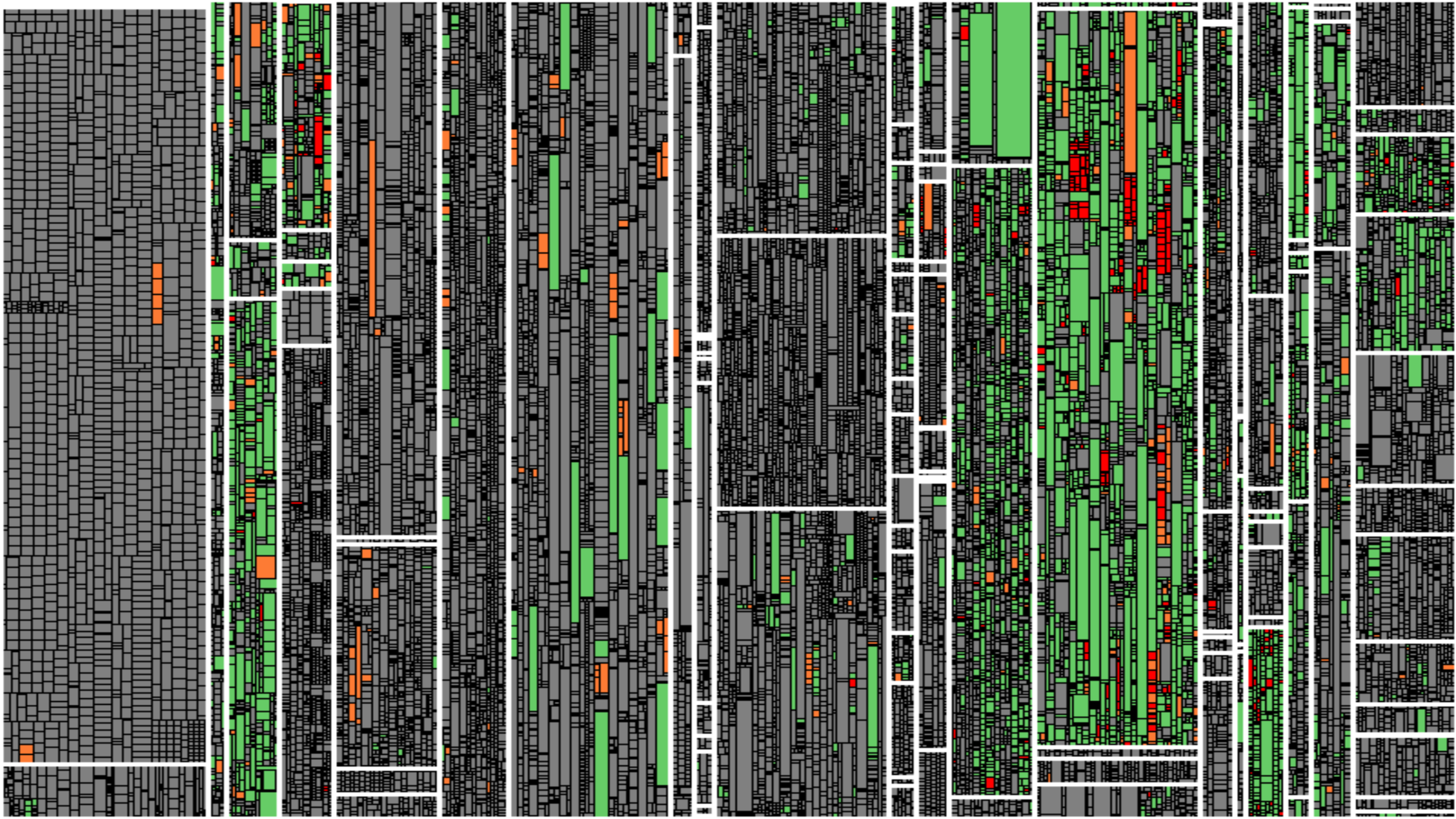


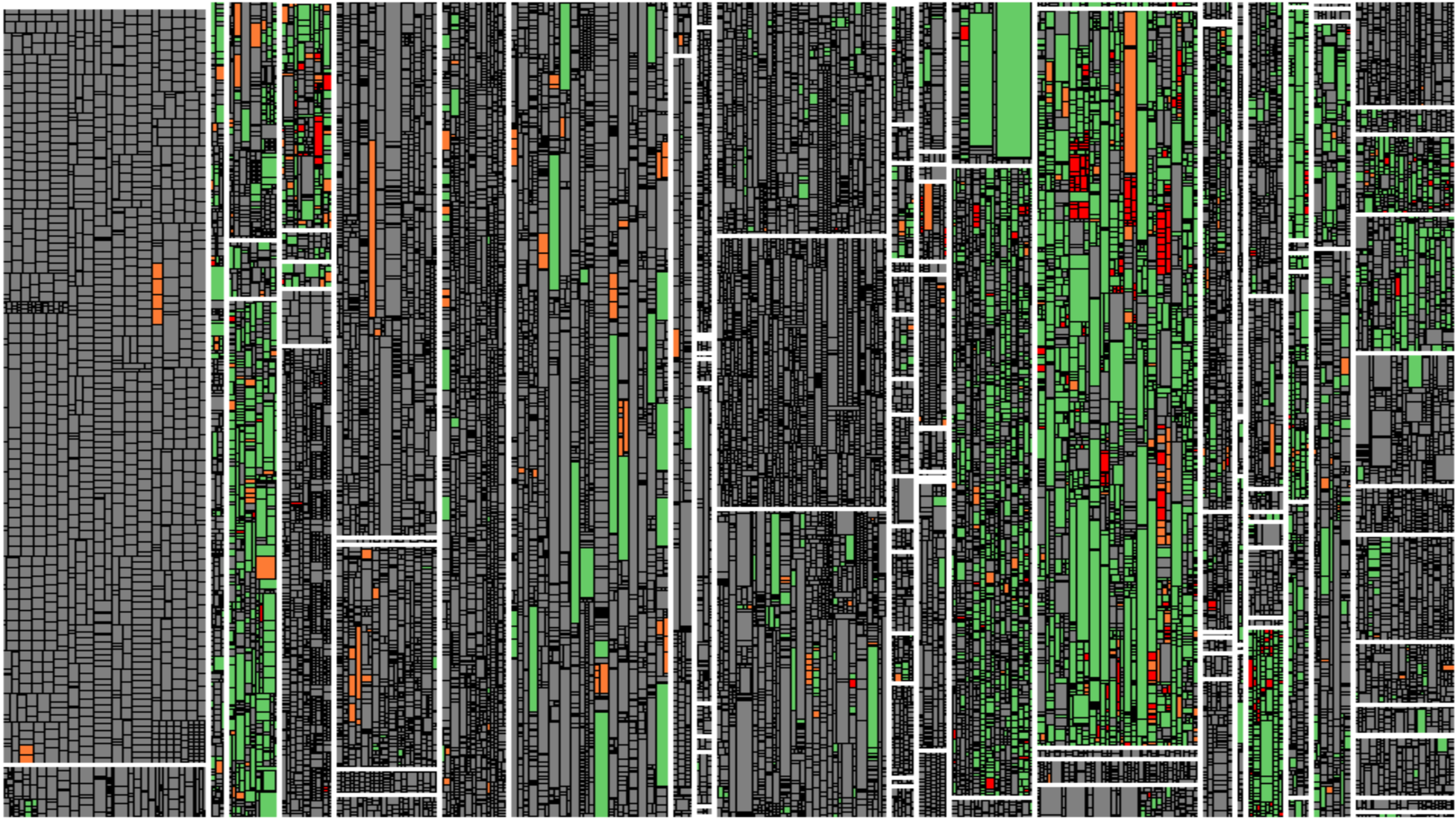


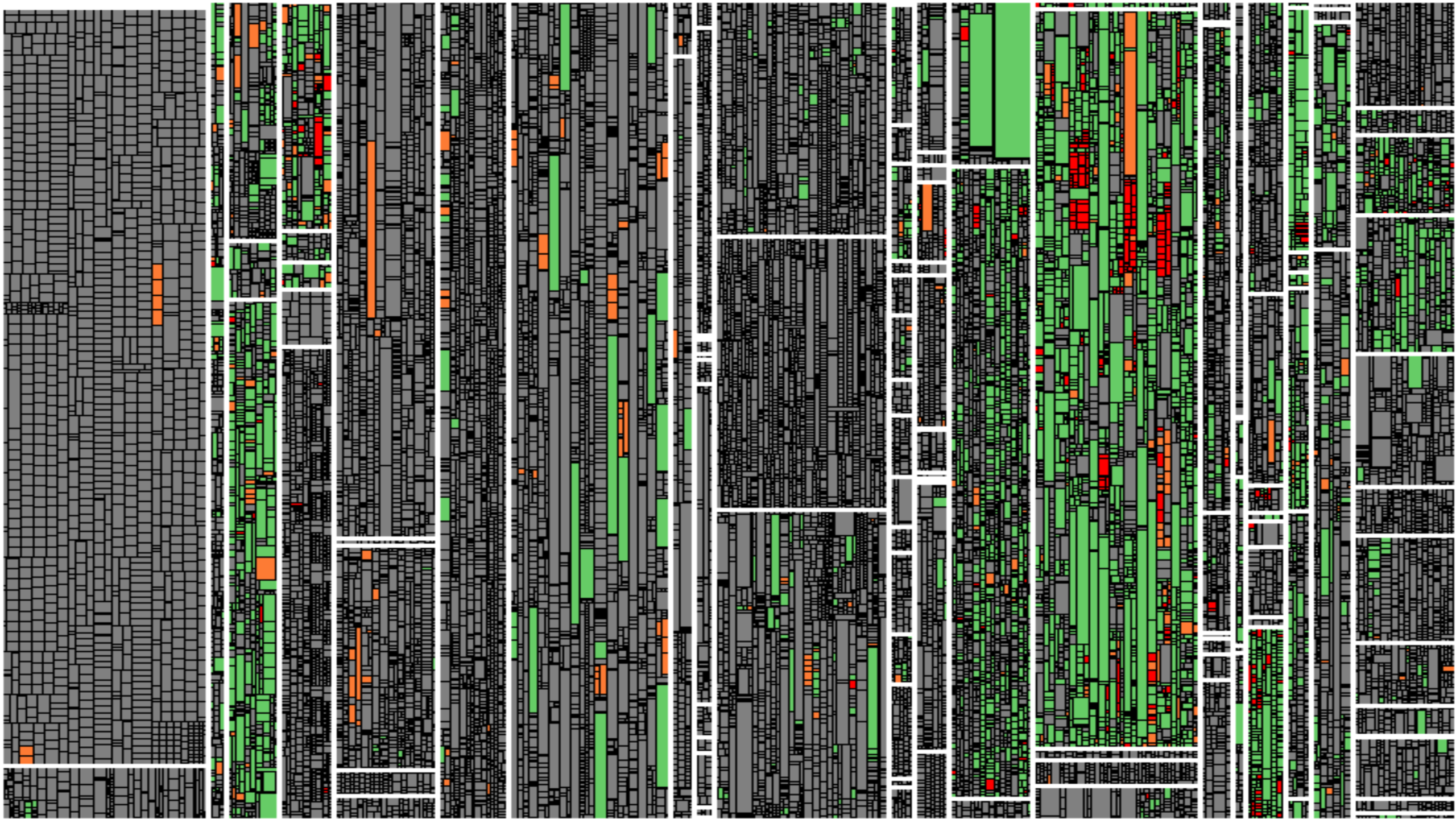


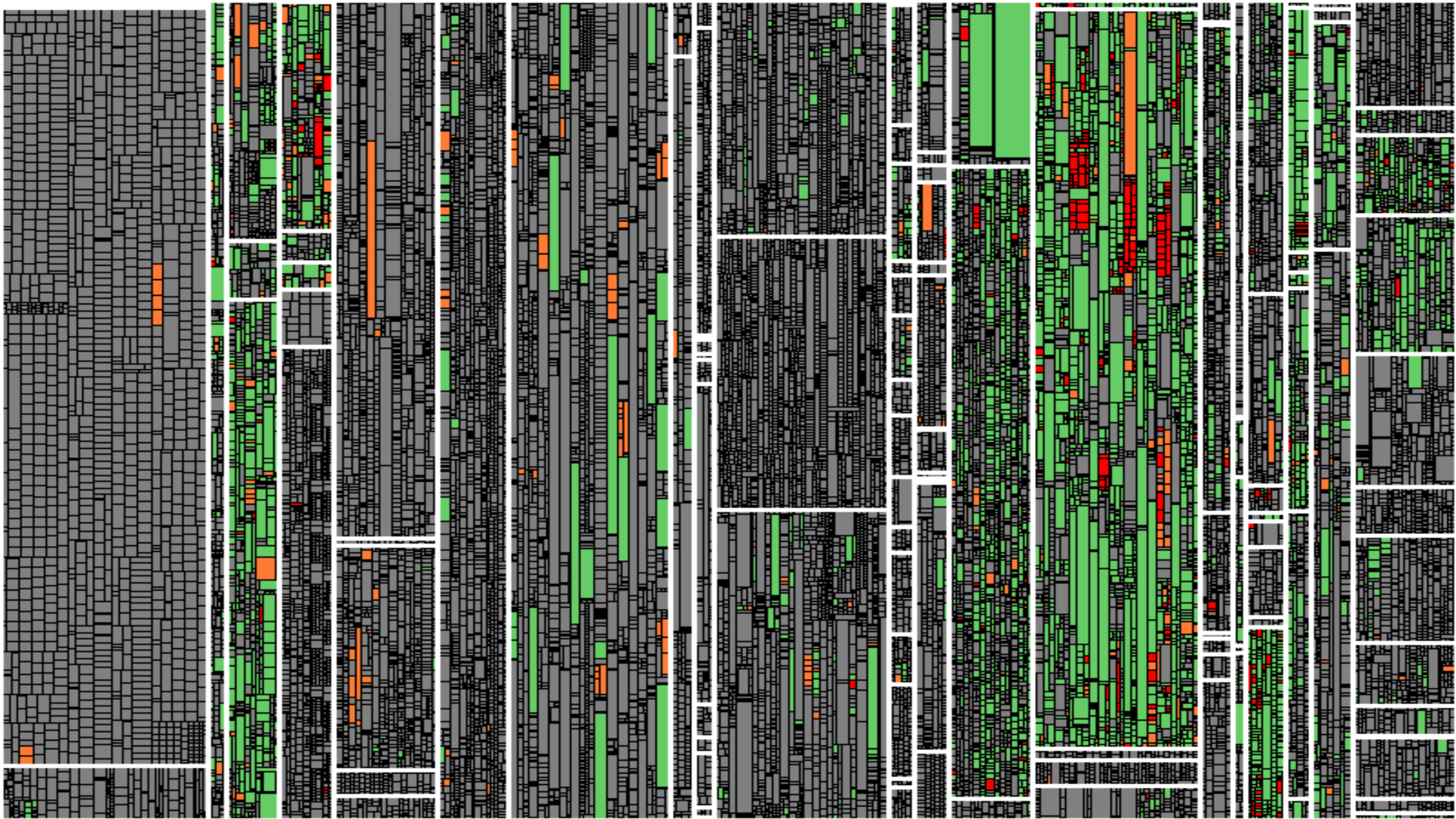


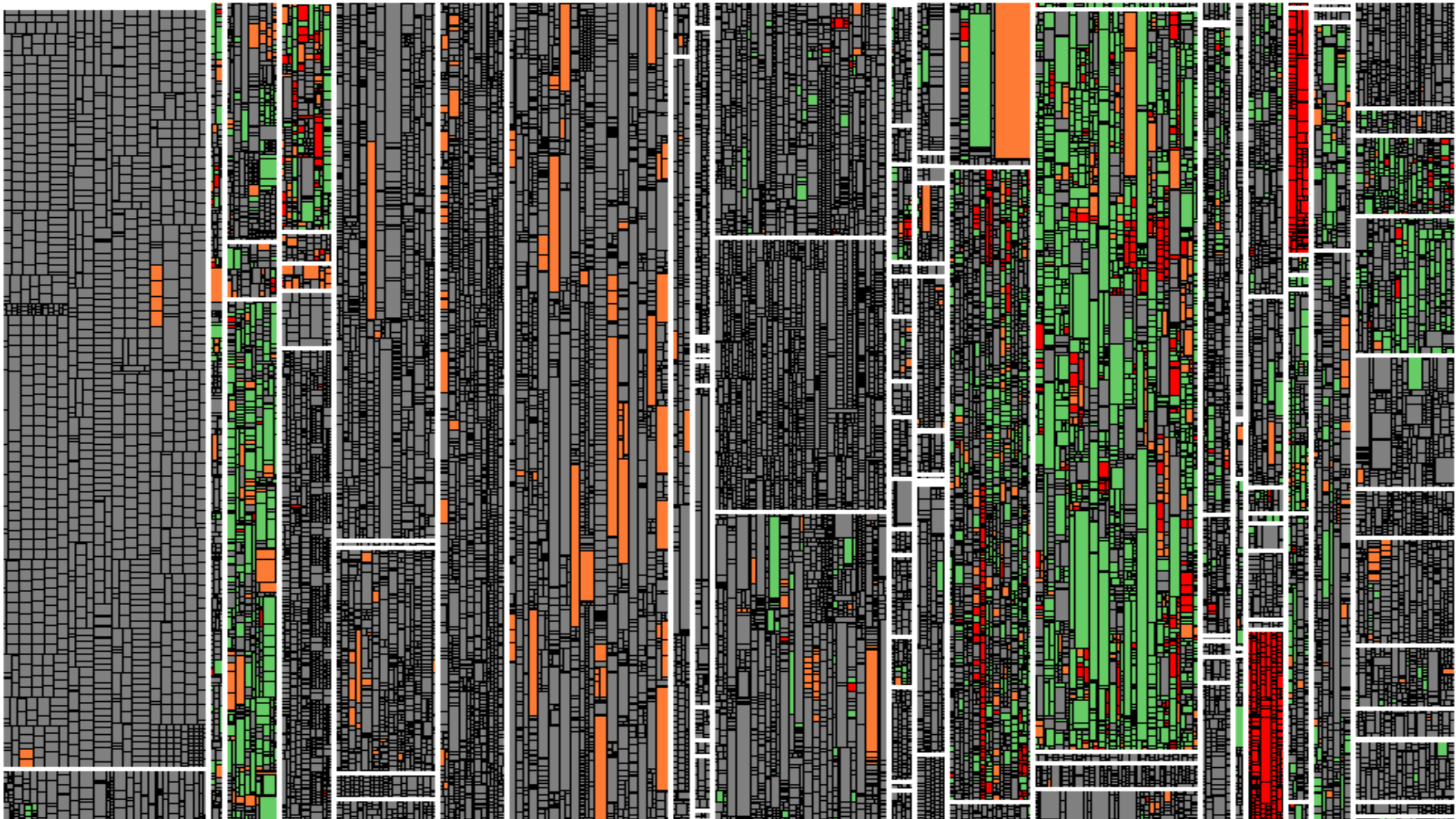

















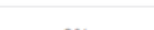
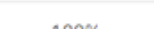

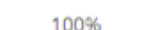
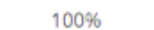







Ticket Coverage

Ticket	Im Issue Tracker verwaltete Unit of Work. Bug, Issue, Change Request, User Story, ...
Ticket Code	Code, der bei der Implementierung eines Tickets angefasst (geändert oder neu geschrieben) wurde.
Ticket Coverage	Anteil des Ticket Codes, der im Test zur Ausführung kam.

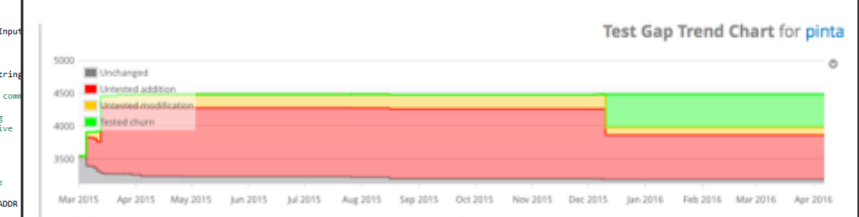
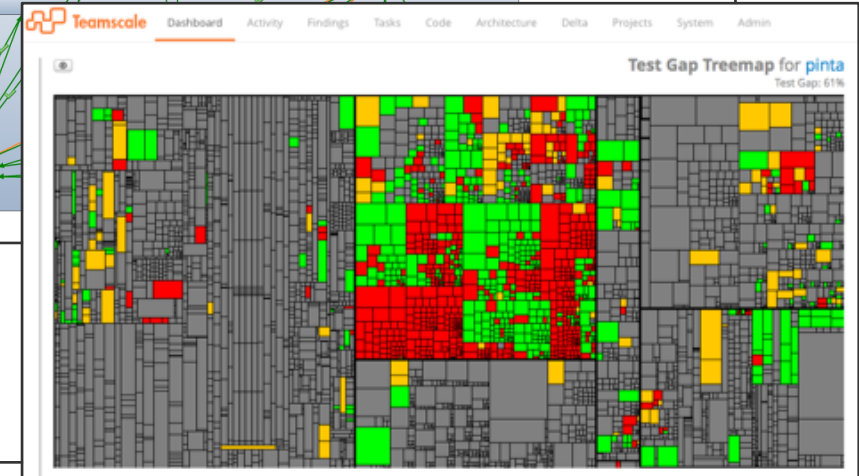
Issue #	Subject	Ticket Coverage
TS-13689	Undo/Redo for web-based architecture editor	70% 
TS-13701	Implement metric 'Nesting Depth' for Simulink	35% 
TS-13704	Fix long method finding in TaintAnalysisRunner	100% 
TS-13714	External findings are not registered during first upload	100% 
TS-13727	Manual test coverage upload during development	100% 
TS-13731	Tool for transferring Finding Blacklists and Tasks (w/ Findings) between instances	100% 
TS-13734	Cannot set/alter alias without reanalysis	100% 
TS-13735	Fetch parent relationship of TFS Work Items	100% 
TS-13742	Show data timestamp in project analysis warning	100% 
TS-13766	Get rid of ESLintFindingsSynchronizer and TSLintFindingsSynchronizer blocks	76% 
TS-13769	Show summary row in test perspective > issue view	0% 
TS-13772	Get rid of TestGapSynchronizer block	100% 
TS-13775	Remove Dataflow Blocks	67% 
TS-13778	Remove structuring block	100% 
TS-13779	Get rid of Bootstrap Wells	100% 



100% Ticket Coverage → 0 Fehler

Studienobjekt: Teamscale

- 750 kLOC Code (Java, JavaScript)
- 11 Jahre Historie im VCS
- >70k Commits
- 30 aktive Entwickler
- Code Peer Reviews



```
/* Process the input string received prior to the
newline. */
do
{
  /* Pass the string to FreeRTOSCLI. */
  xMoreDataToFollow = FreeRTOS_CLIProcessCommand( cInput
  /* Send the output generated by the command's
  implementation. */
  sendto( xSocket, cOutputString, strlen( cOutputString
) while( xMoreDataToFollow != pdFALSE ); /* Until the com
/* All the strings generated by the command processing
have been sent. Clear the input string ready to receive
the next command. */
cInputIndex = 0;
memset( cInputString, 0x00, cmdMAX_INPUT_SIZE );
/* Transmit a spacer, just to make the command console
easier to read. */
sendto( xSocket, "\r\n", strlen( "\r\n" ), 0, ( SOCKADDR
}
else
{
  if( cInChar == '\n' )
  {
    /* Ignore the character. Newlines are used to
    detect the end of the input string. */
  }
  else if( cInChar == '\b' )
  {
    /* Backspace was pressed. Erase the last character
    in the string - if any. */
    if( cInputIndex > 0 )
    {
      cInputIndex--;
      cInputString[ cInputIndex ] = '\0';
    }
  }
  else
  {

```

```
else
{
  if( cInChar == '\n' )
  {
    /* Ignore the character. Newlines are used to
    detect the end of the input string. */
  }
  else if( cInChar == '\b' ) || ( cInChar == cmdASCII_DEL )
  {
    /* Backspace was pressed. Erase the last character
    in the string - if any. */
    if( cInputIndex > 0 )
    {
      cInputIndex--;
      cInputString[ cInputIndex ] = '\0';
    }
  }
  else
  {

```

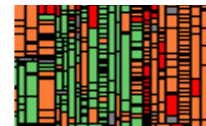
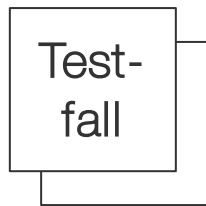


Forschungsfragen der empirischen Studie

- 1) Finden **Tester** mittels Ticket Coverage relevante Test-Gaps bei **strukturierten** Tests?
- 2) Finden **Entwickler** mittels Ticket Coverage relevante Test-Gaps bei **explorativen** Tests?

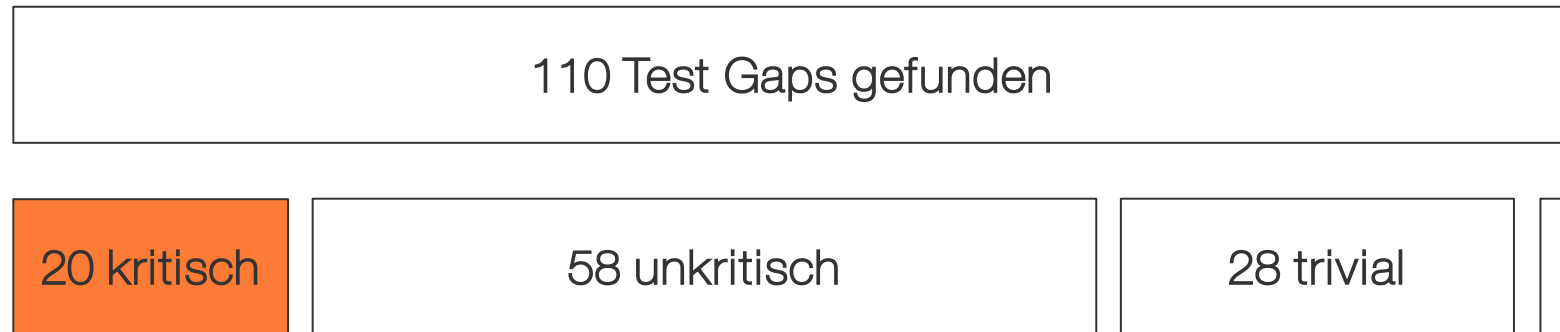
Study Design

Finden **Tester** mittels Ticket Coverage relevante Test-Gaps bei **strukturierten** Tests?



- 54 Tickets analysiert
- < 20 Monate alt
- ≤ 3 pro Entwickler

Ergebnis



Information in Tickets (und daraus abgeleiteten Testfällen) oft unvollständig.
Irrelevante Test-Gaps haben zu Verbesserung der Analyse beigetragen.

Empirische Studie (2)

Finden **Entwickler** mittels Ticket Coverage relevante Test-Gaps bei **explorativen** Tests?



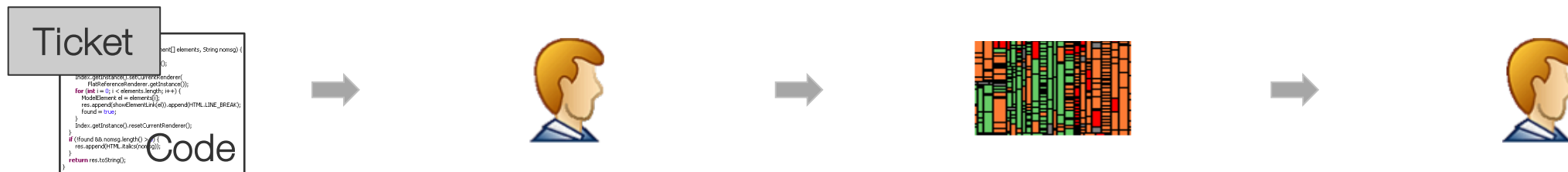
⌵ Affected methods (22) 

Ticket Coverage: 86%

Class	Method	Line Coverage	Uncovered Lines ^	Change type
ProjectCreationService	retrieveProjectConfig	100%	0	changed
ProjectCreationService	fieldChangeRequiresReAnalysis	100%	0	added
ProjectService	elementUpdateQuery	100%	0	added
ProjectReanalysisService	process	100%	0	changed
ProjectCreator	refreshProject	100%	0	added
ProjectCreationService	nullOrToString	66%	1	added
ProjectCreationService	findConnectorByName	75%	1	added
ProjectCreationService	connectorRequiresReAnalysis	82%	3	added
ProjectCreationService	processPutRequest	84%	3	changed
ProjectCreationService	validateProjectConfiguration	80%	3	changed
ProjectCreationService	projectReAnalysisRequired	61%	5	added
ProjectCreationService	connectorsRequireReAnalysis	50%	7	added
ConfigOptionDescriptorBase	ConfigOptionDescriptorBase	100%	0	changed
NamingConventionConfiguration	NamingRegexOption	100%	0	changed
ProjectService	ProjectUpdateResult	100%	0	added

Empirische Studie (2)

Finden **Entwickler** mittels Ticket Coverage relevante Test-Gaps bei **explorativen** Tests?



95 Methoden analysiert. 30 enthielten Test-Gaps. **23** davon relevant.

Für Entwickler sind Ticket & Code-Änderungen unzureichend für vollständigen Test.

Fazit

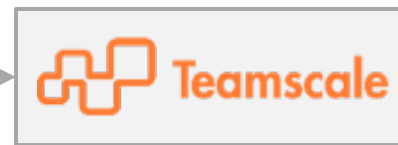
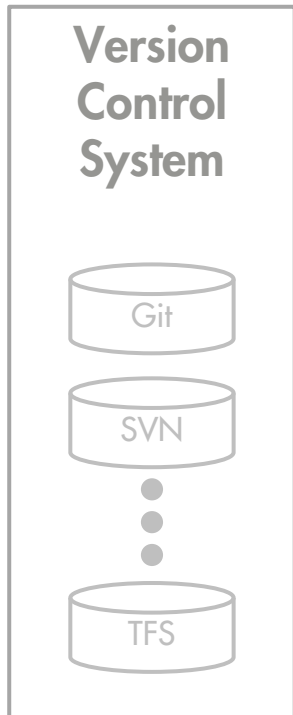
1) Finden **Tester** mittels Ticket Coverage relevante Test-Gaps bei **strukturierten** Tests?

JA: Information in Tickets (und daraus abgeleiteten Testfällen) oft unvollständig.

2) Finden **Entwickler** mittels Ticket Coverage relevante Test-Gaps bei **explorativen** Tests?

JA: Selbst für Entwickler sind Ticket & Code-Änderungen unzureichend für vollständigen Test.

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
CR#10037: Moved ReviewMetricsSynchronizer to Crucible package and made some improvements to its internal structure	26.07.16 14:31
CR#10037: Updated aggregation strategy of open reviews so each review is only counted once, even over multiple files	26.07.16 13:04
CR#10203: Fixed "field could be made final" for Java interfaces	26.07.16 12:16
CR#10200: Rename pathRestriction -> subPath (1)	26.07.16 11:35
CR#10200: Rename pathRestriction -> subPath (1)	26.07.16 11:35
CR#10172: Removed unwanted colons from headers in the commit view of the activity perspective	26.07.16 11:20
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



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();
}

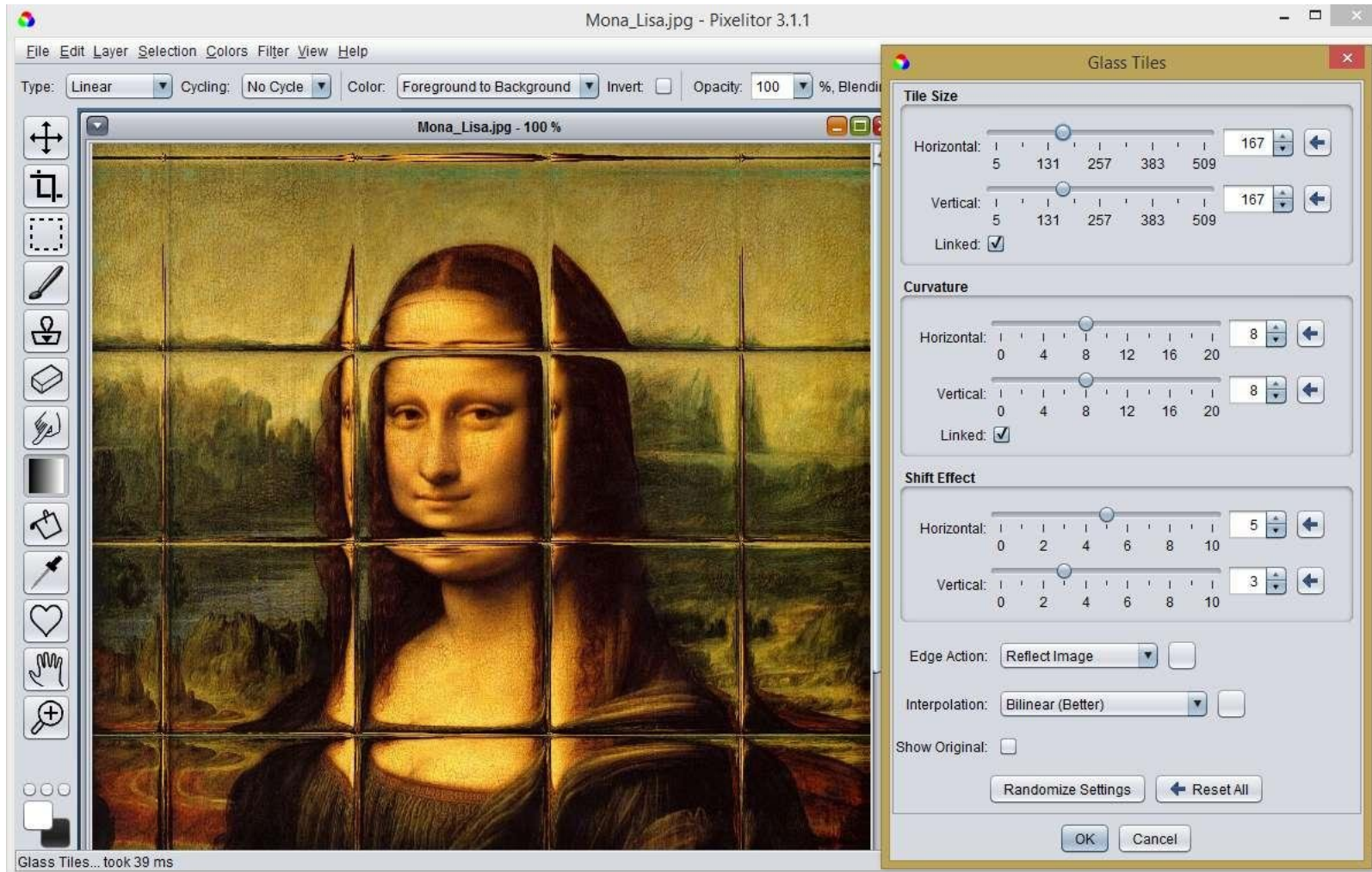
setMode(LoggingMode.FRAMING);

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

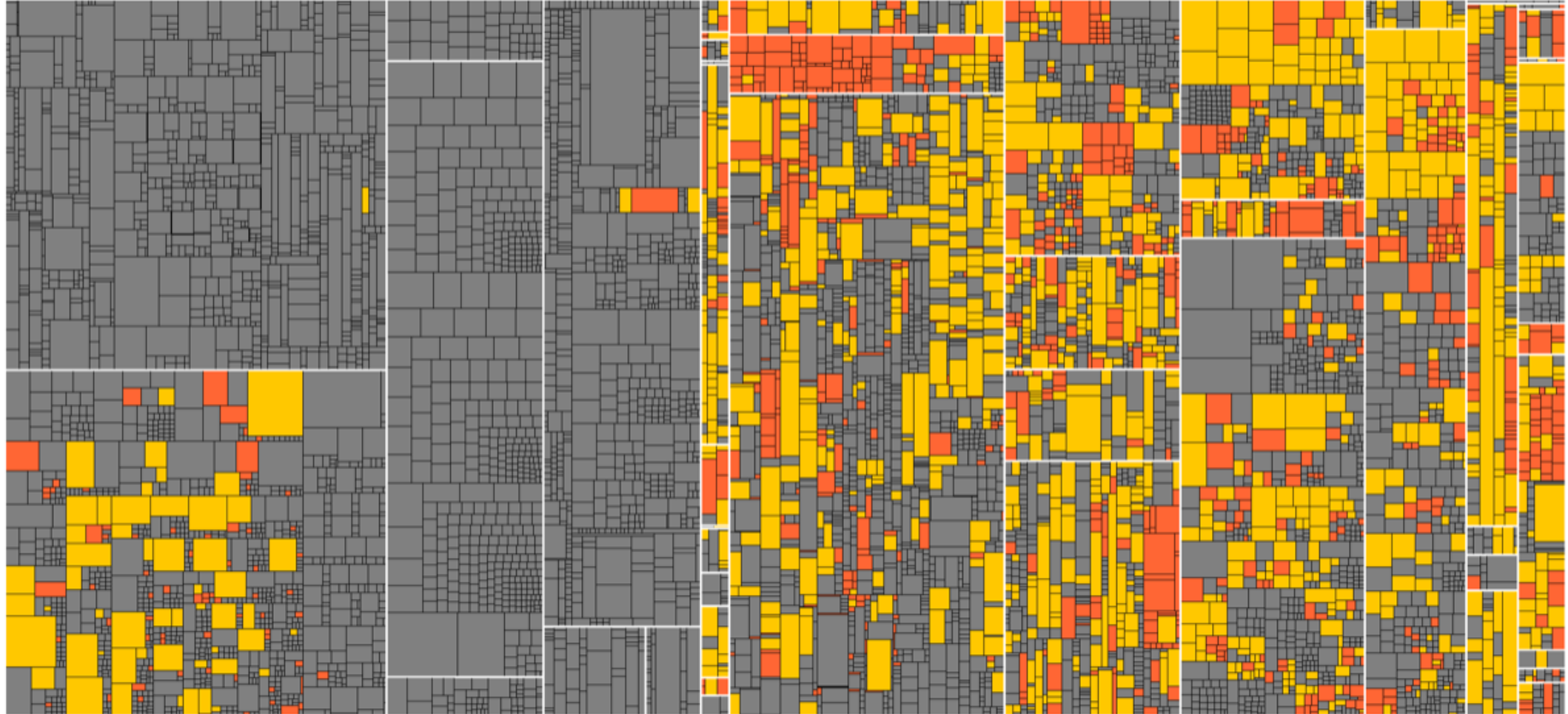
```



Pixelitor: Open Source Zeichenprogramm (Java)



Branch: master Timetravel: Current Dashboard



Changes

Execution

Test Gaps

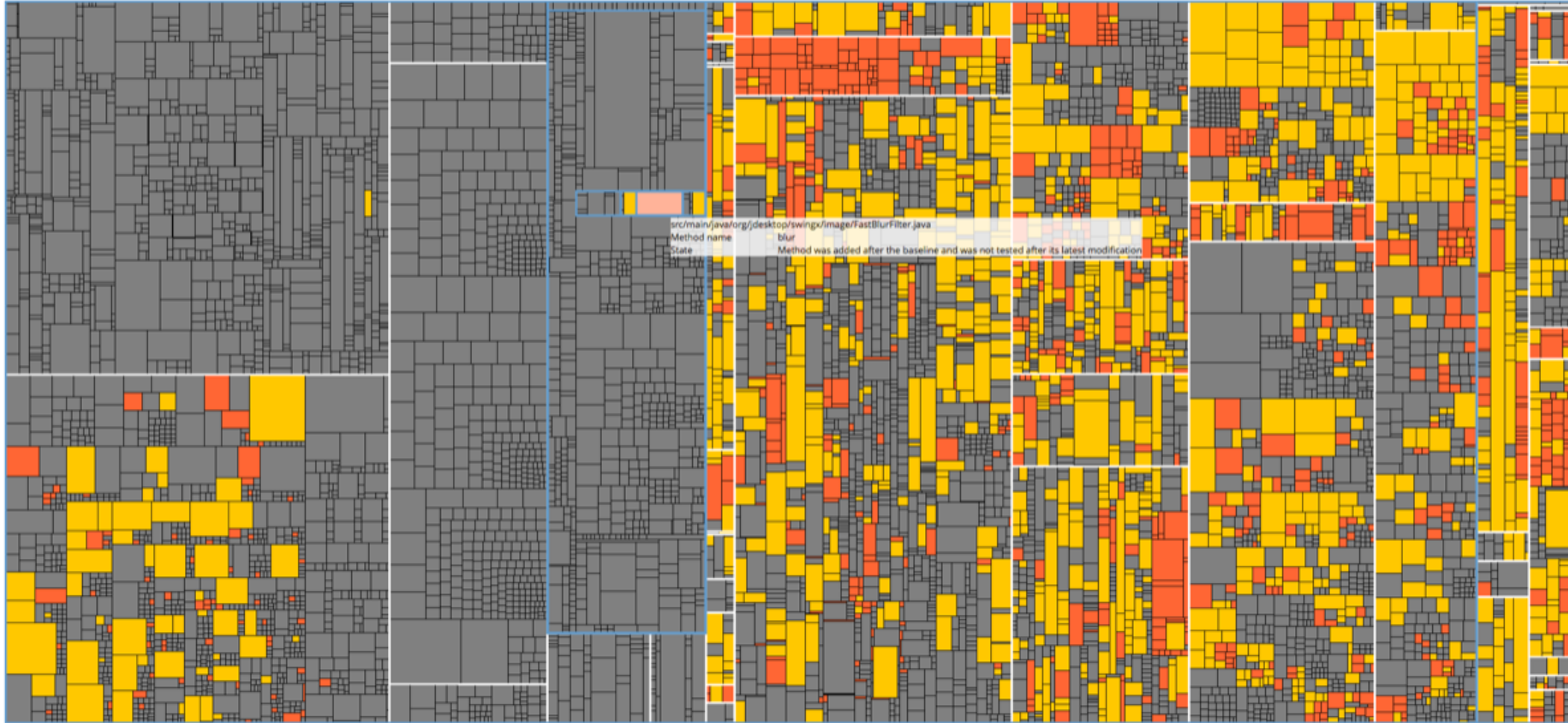


Show all dashboards

Branch: master Timetravel: Current Dashboard

Changes for pixelitor

Jan 01 2016 00:00 - now | Test Gap: 100%



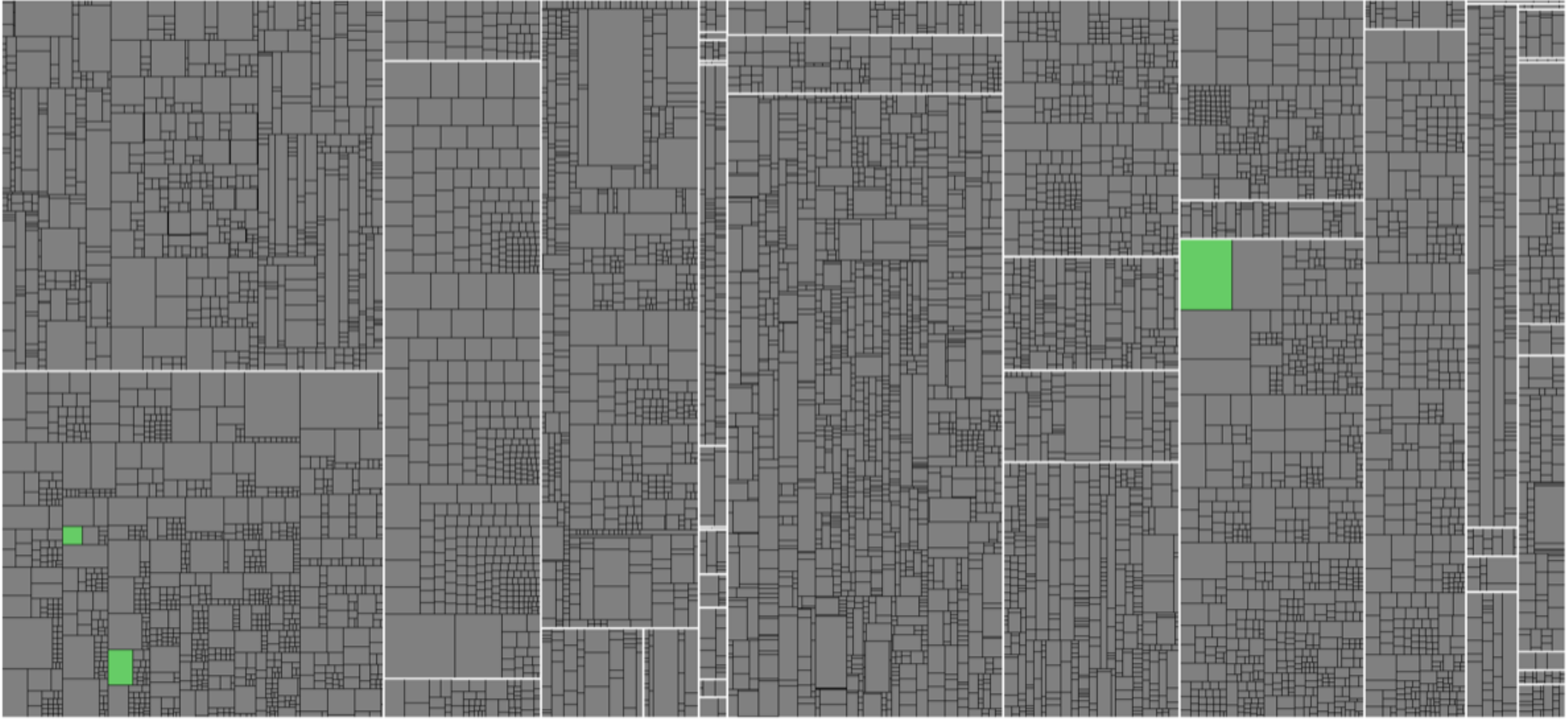
- Changes
- Execution
- Test Gaps

Navigation icons: Home, Download, Refresh

Show all dashboards

Execution for pixelator

Jan 01 2016 00:00 - now | Execution Ratio: 0.04%

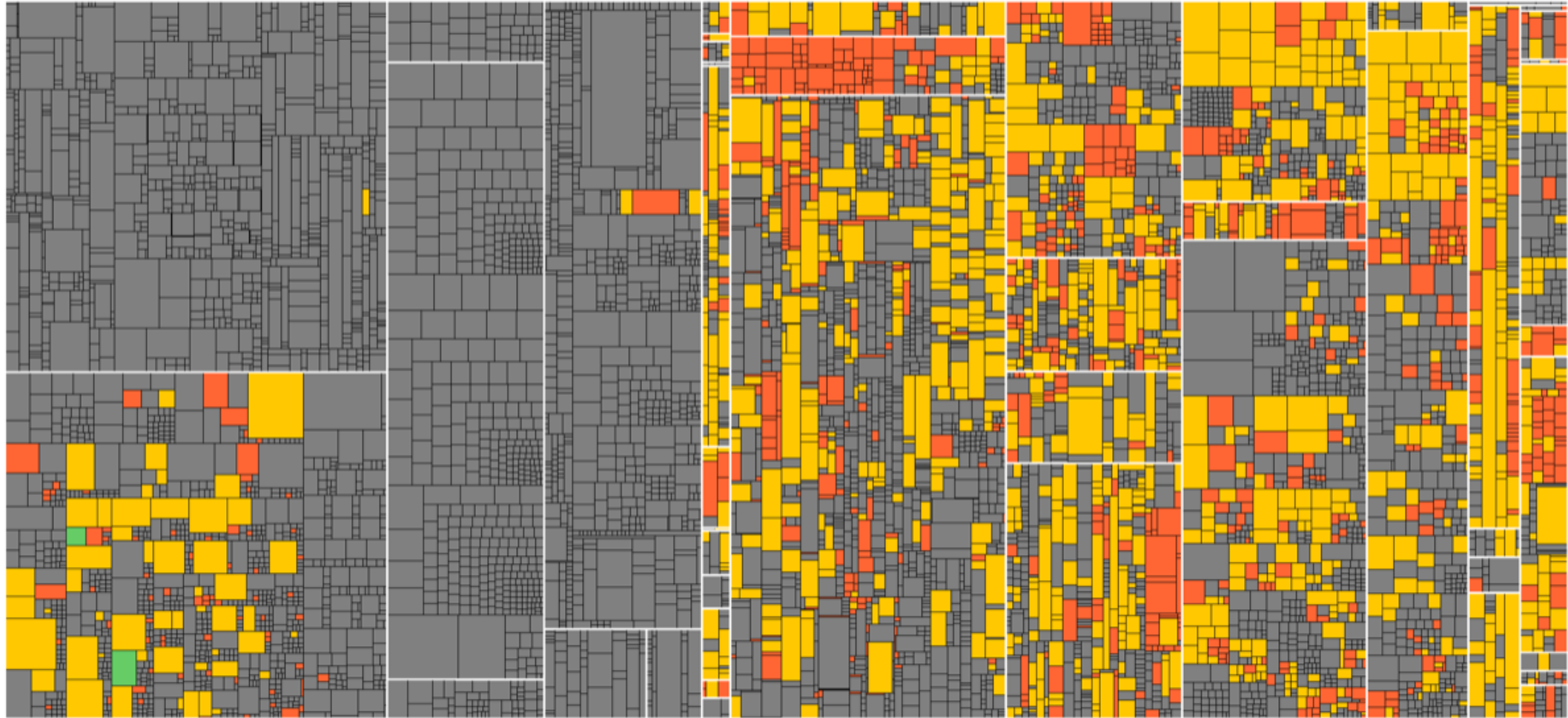


- Changes
- Execution
- Test Gaps

Filter, Download, and Refresh icons

Show all dashboards

Branch: master Timetravel: Current Dashboard



Execution for pixelitor

Jan 01 2016 00:00 - now | Test Gap: 99.89%

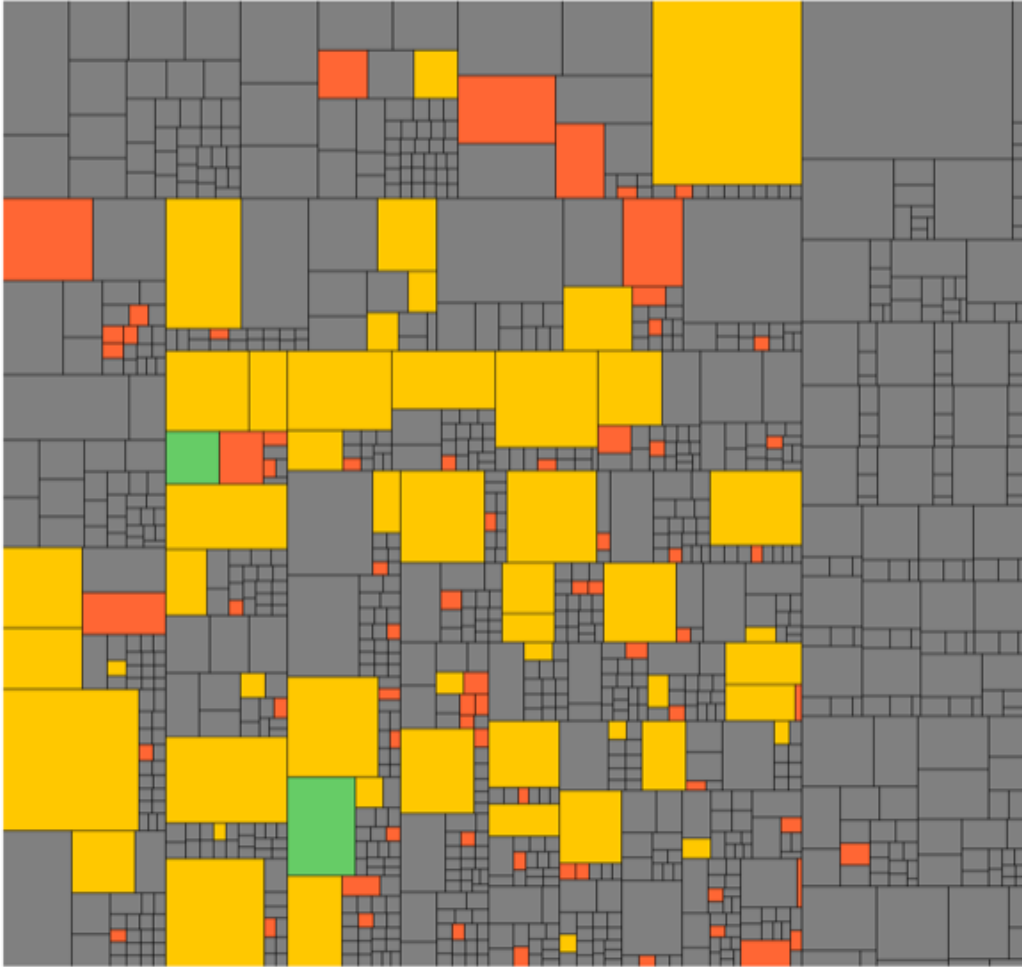
- Changes
- Execution
- Test Gaps



Show all dashboards

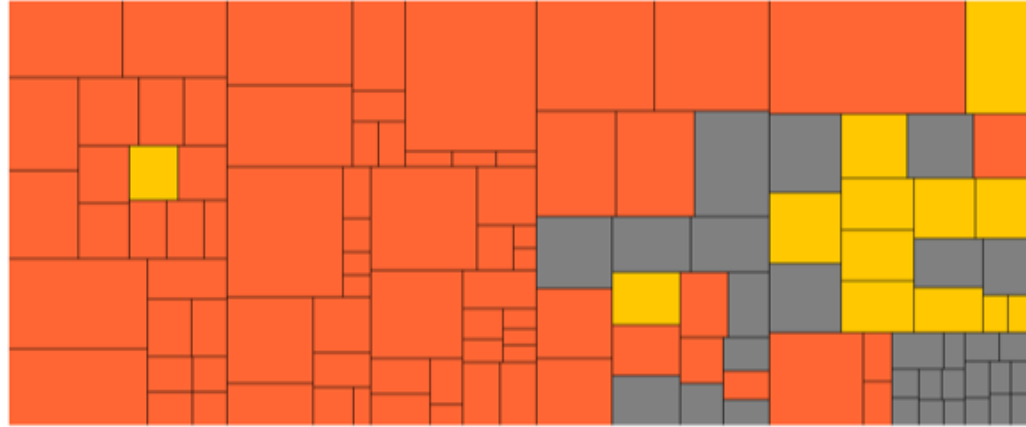
Test Gaps for pixelitor/src/main/java/com/jhlab

Jan 01 2016 00:00 - now | Test Gap: 98.35%



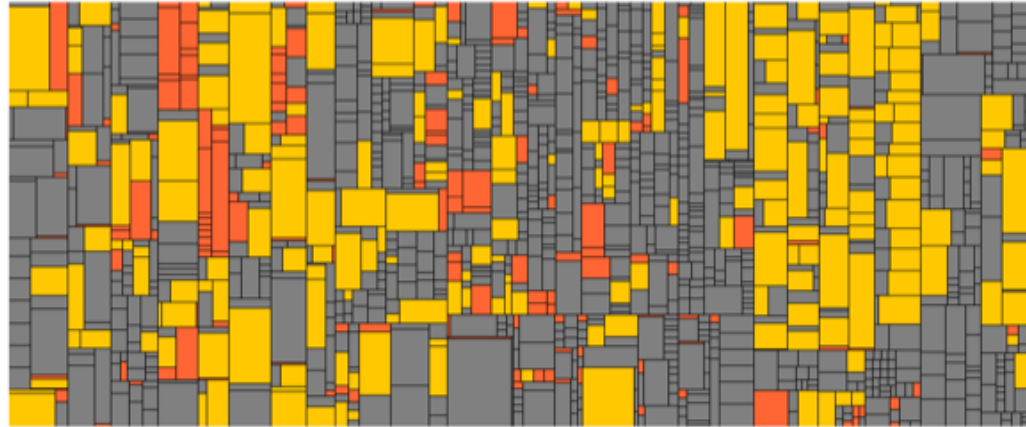
Test Gaps for pixelitor/src/main/java/pixelitor/colors

Jan 01 2016 00:00 - now | Test Gap: 100%



Test Gaps for pixelitor/src/main/java/pixelitor/filters

Jan 01 2016 00:00 - now | Test Gap: 100%



- Changes
- Execution
- Test Gaps
- Test Gaps by component

Filter, Download, Refresh icons

Show all dashboards

Teamscale Dashboard Activity Findings Metrics **Tests** Issues More

Project: pixelitor Branch: master Timetravel: Current Tests

Code Structure **Issues** Issue Metric: Open issues Coverage sources: All

Ticket #	Subject	Test Gap
1	Improve Gaussian blur filter	50%
2	Cloud rendering broken	0%
5	Fix problem with selection tool handles still being enabled while invisible after deselecting	100%
6	Improve how selection changes are detected	0%
7	Allow reporting of internal state in case of errors	100%
8	Copy and pasting of colors	100%
9	Refactor and clean up	100%

Issue details:

1: Improve Gaussian blur filter (»open«)



Created by
Dennis Pagano
on Jan 09 2018 16:04



Assigned to
Elmar Jürgens

[Open in bugtracker](#)

Last updated on Jan 09 2018 16:12

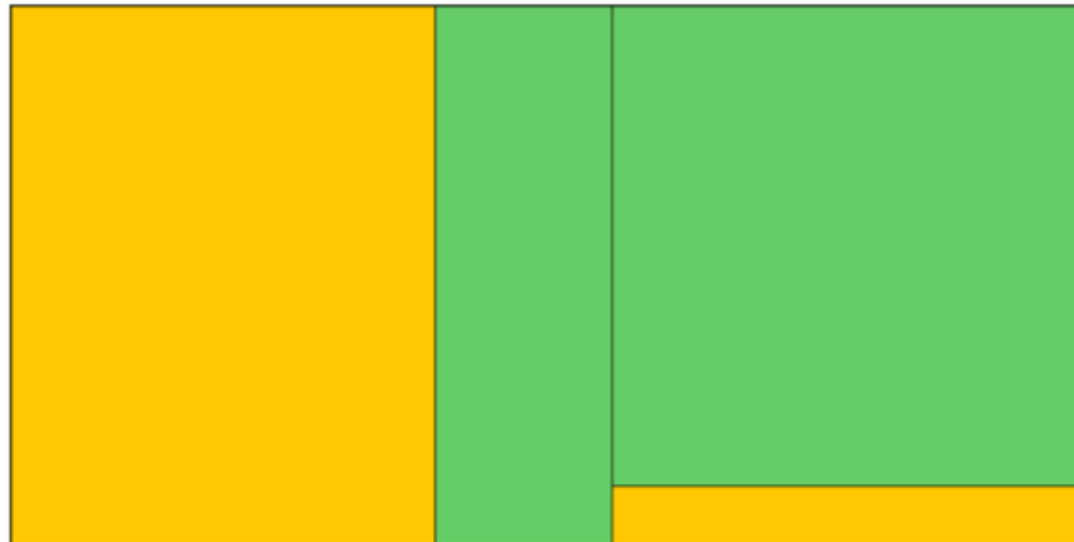
The Gaussian blur filter could be improved. It is just not really Gaussian enough.

▲ Affected files (2)

Path	Change type (aggregated)
src/main/java/com/jhlibs/image/GaussianFilter.java	changed
src/main/java/com/jhlibs/image/MotionBlurOp.java	changed

▲ Test Gap Treemap

Jan 10 2018 14:18 - now | Test Gap: 50%



Issue details:

1: Improve Gaussian blur filter (»open«)



Created by
Dennis Pagano
on Jan 09 2018 16:04



Assigned to
Elmar Jürgens

[Open in bugtracker](#)

Last updated on Jan 09 2018 16:12

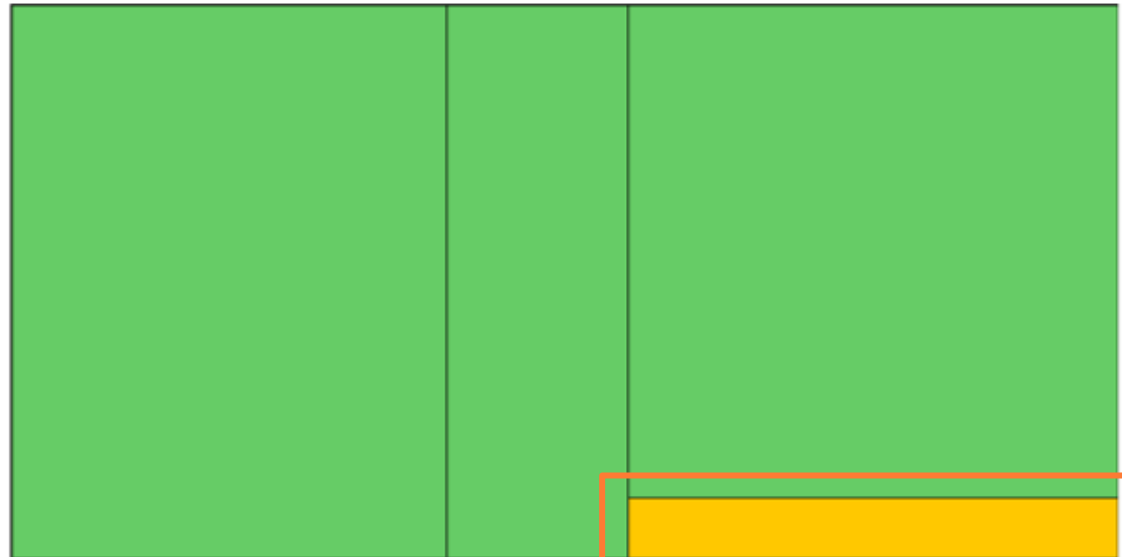
The Gaussian blur filter could be improved. It is just not really Gaussian enough.

^ Affected files (2)

Path	Change type (aggregated)
src/main/java/com/jhlibs/image/GaussianFilter.java	changed
src/main/java/com/jhlibs/image/MotionBlurOp.java	changed

^ Test Gap Treemap

Jan 10 2018 14:18 - now | Test Gap: 25%



Issue details:

1: Improve Gaussian blur filter (»open«)



Created by
[Dennis Pagano](#)
on Jan 09 2018 16:04



Assigned to
[Elmar Jürgens](#)

[Open in bugtracker](#)

Last updated on Jan 09 2018 16:12

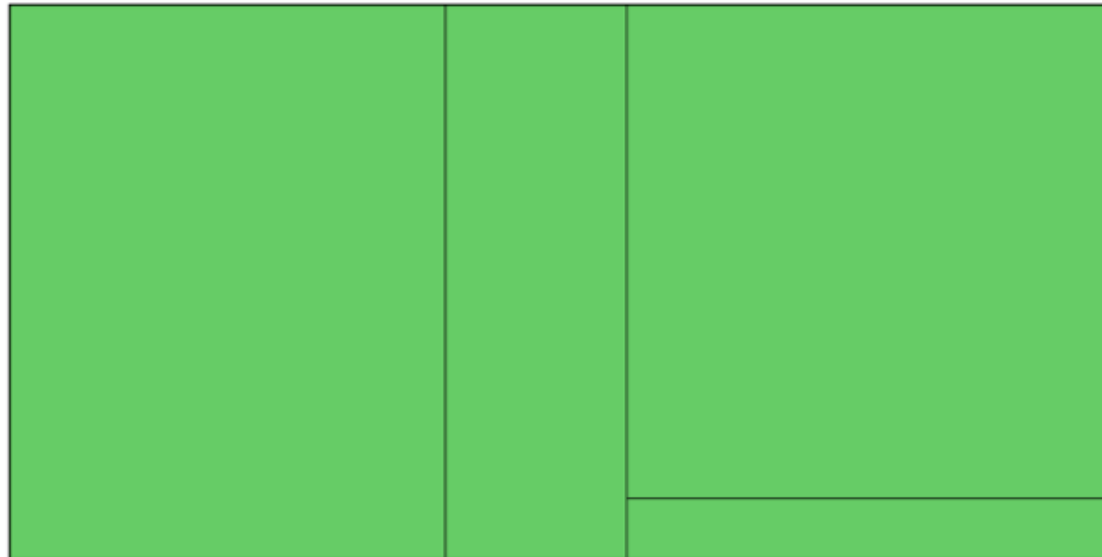
The Gaussian blur filter could be improved. It is just not really Gaussian enough.

^ Affected files (2)

Path	Change type (aggregated)
src/main/java/com/jhlibs/image/GaussianFilter.java	changed
src/main/java/com/jhlibs/image/MotionBlurOp.java	changed

^ Test Gap Treemap

Jan 10 2018 14:18 - now | Test Gap: 0%



Branch: master Timetravel: Current Dashboard

Overview

Test Gap

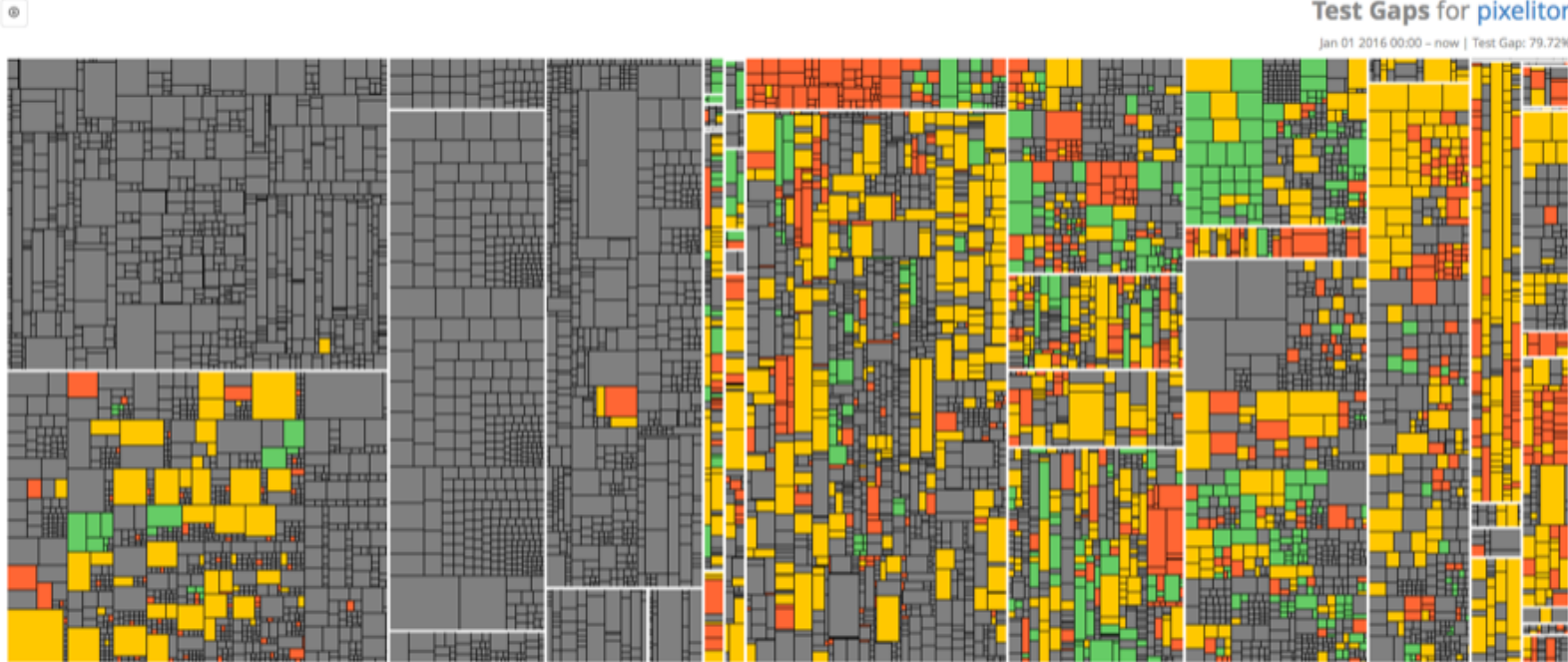
79.7%

Project Information

Description	Value
Project name	pixelitor
Baseline date	Jan 01 2016 00:00
End date	Now

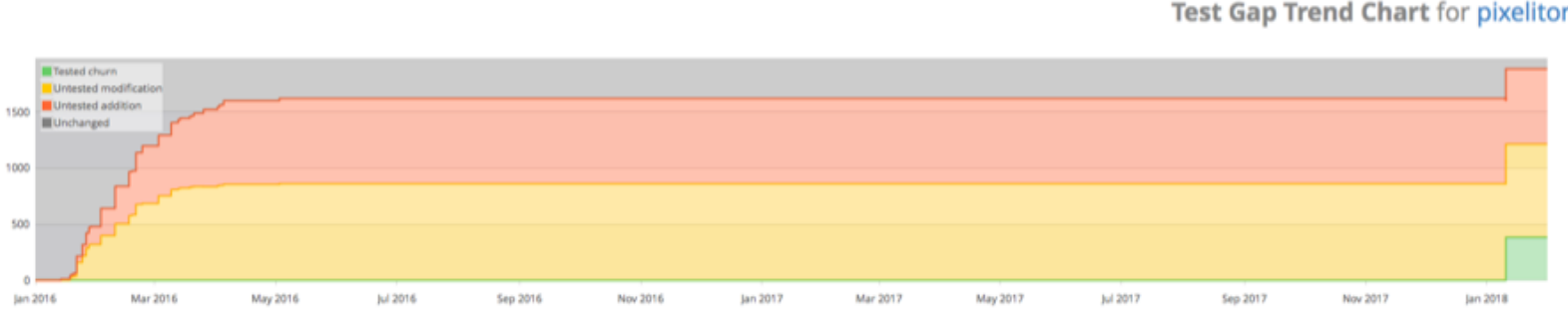
Coverage Sources

Name	First Coverage	Last Coverage
Manual Test Coverage	Jan 10 2018 14:18	Jan 10 2018 14:30
Unit Test Coverage	Jan 10 2018 14:18	Jan 10 2018 14:18



- Changes
 - Execution
 - Test Gaps
 - Test Gaps Over Time
 - Test Gaps by component
- Show all dashboards

Test Gap Trend Chart for pixelitor



ABAP

Ada

C#

C/C++

Cobol

Delphi

Fortran

Groovy

Gosu

HANA SQLScript

HANA Views

IEC 61131-3 ST

Java

JavaScript

Magik

Matlab

Open CL

OScript

PHP

PL/SQL

Python

Rust

SQLScript

Simulink/StateFlow

Swift

TypeScript

Visual Basic .NET

Xtend

Wie sag ich's im eigenen Haus?

Mit Vorträgen über Softwarequalität sind wir regelmäßig auf Industriekonferenzen oder Kunden-internen Workshops vertreten.



Impulsvorträge

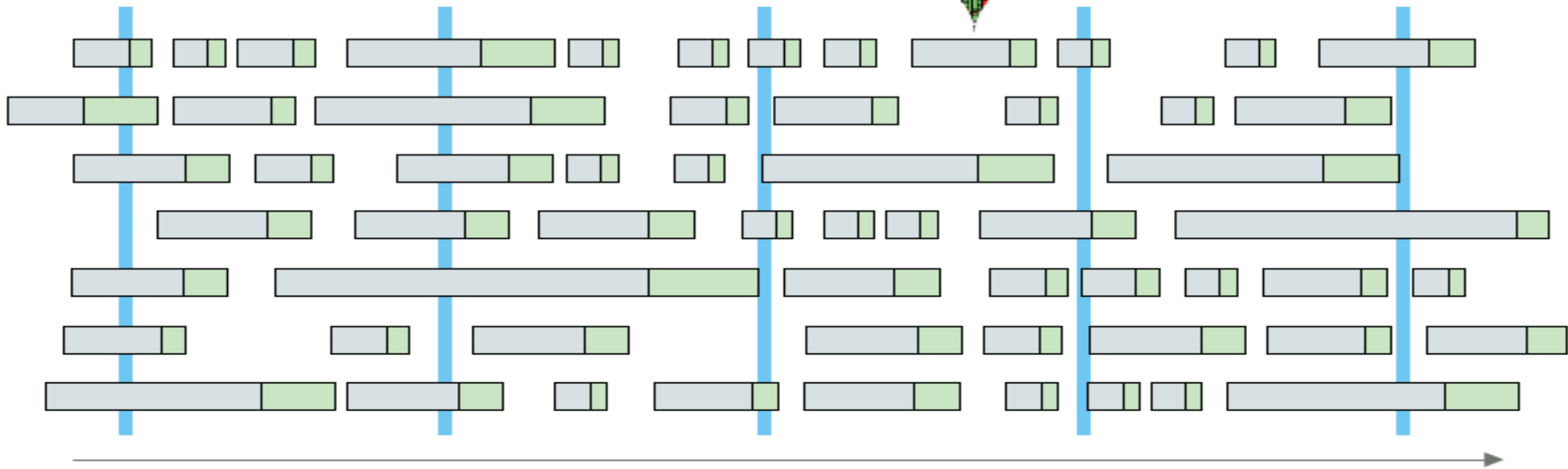
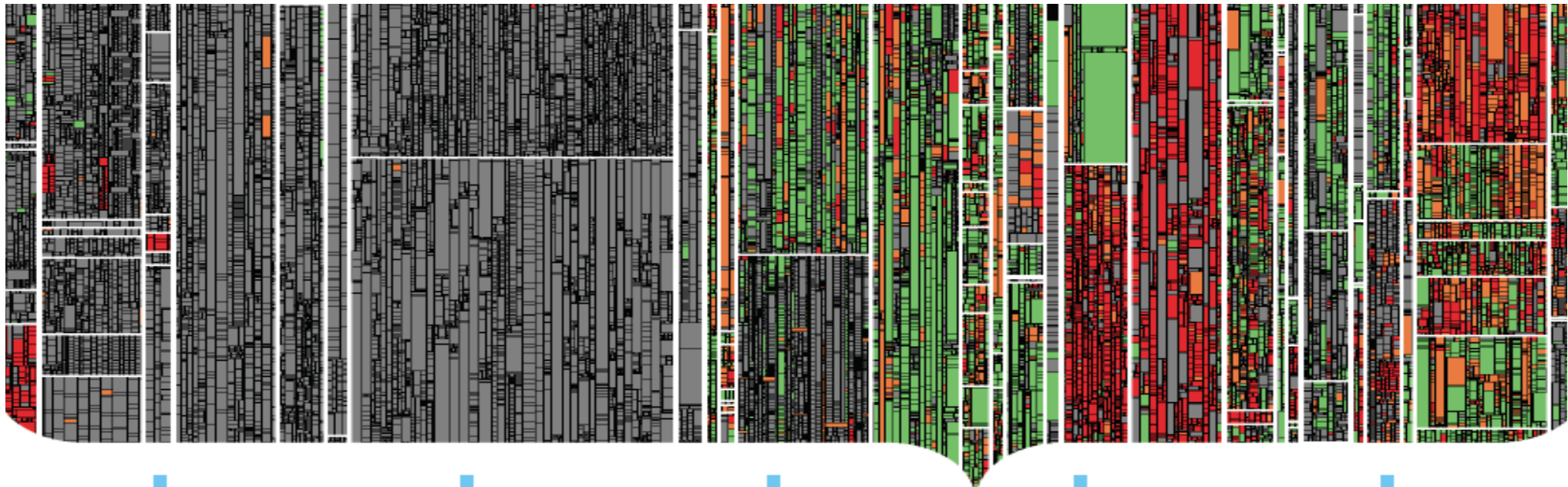
Gerne kommen wir auch zu Ihnen ins Haus, beispielsweise für interne Konferenzen oder Workshops. Unsere Themen reichen von Qualitätsanalysen über Qualitätscontrolling bis hin zu Testcontrolling oder der Einführung von Reviews. Oder aber Sie schlagen uns ein Thema Ihrer Wahl vor.

DAS ANGEBOT

- 🕒 60-90 MIN VORTRAG
- 💬 SOFTWAREQUALITÄT ALS THEMA
- 📍 BEI IHNEN IM HAUS
- € NUR UNSERE ANREISEKOSTEN
- 📅 TERMIN NACH VEREINBARUNG

[IMPULSVORTRAG ANFRAGEN](#)





Kontakt



Dr. Dennis Pagano · pagano@cqse.eu · +49 159 04062957

Dr. Elmar Jürgens · juergens@cqse.eu · +49 179 675 3863

CQSE GmbH
Lichtenbergstraße 8
85748 Garching bei München
www.cqse.eu

