

Don't look back in anger

Was ich als Architekt aus der Versionshistorie
eines Softwaresystems lernen kann



Dr. Nils Göde
(Dr. Dennis Pagano)



Praxis

Software-**Audits**

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

 **Teamscale**

CQSE GmbH



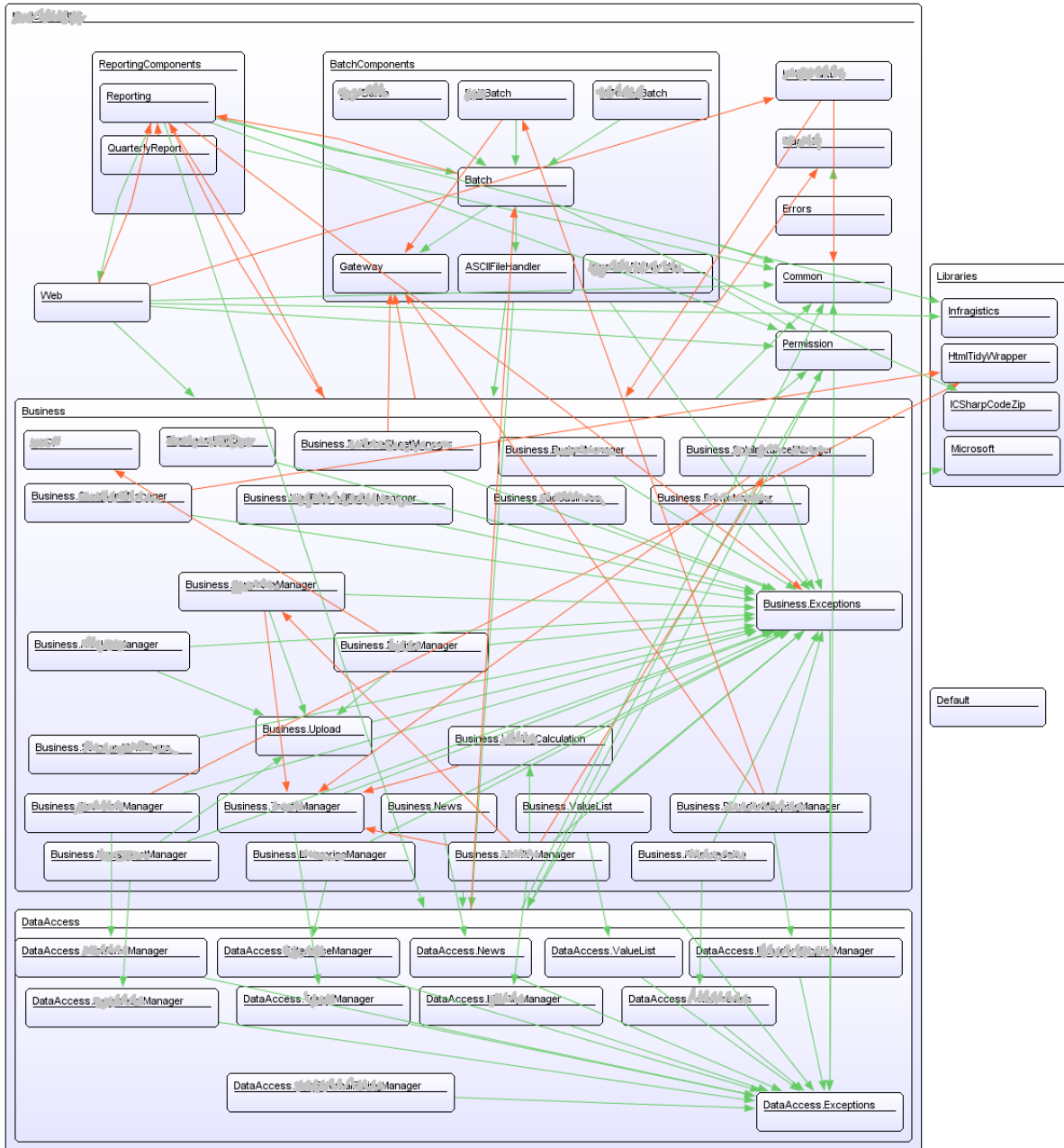
Forschung

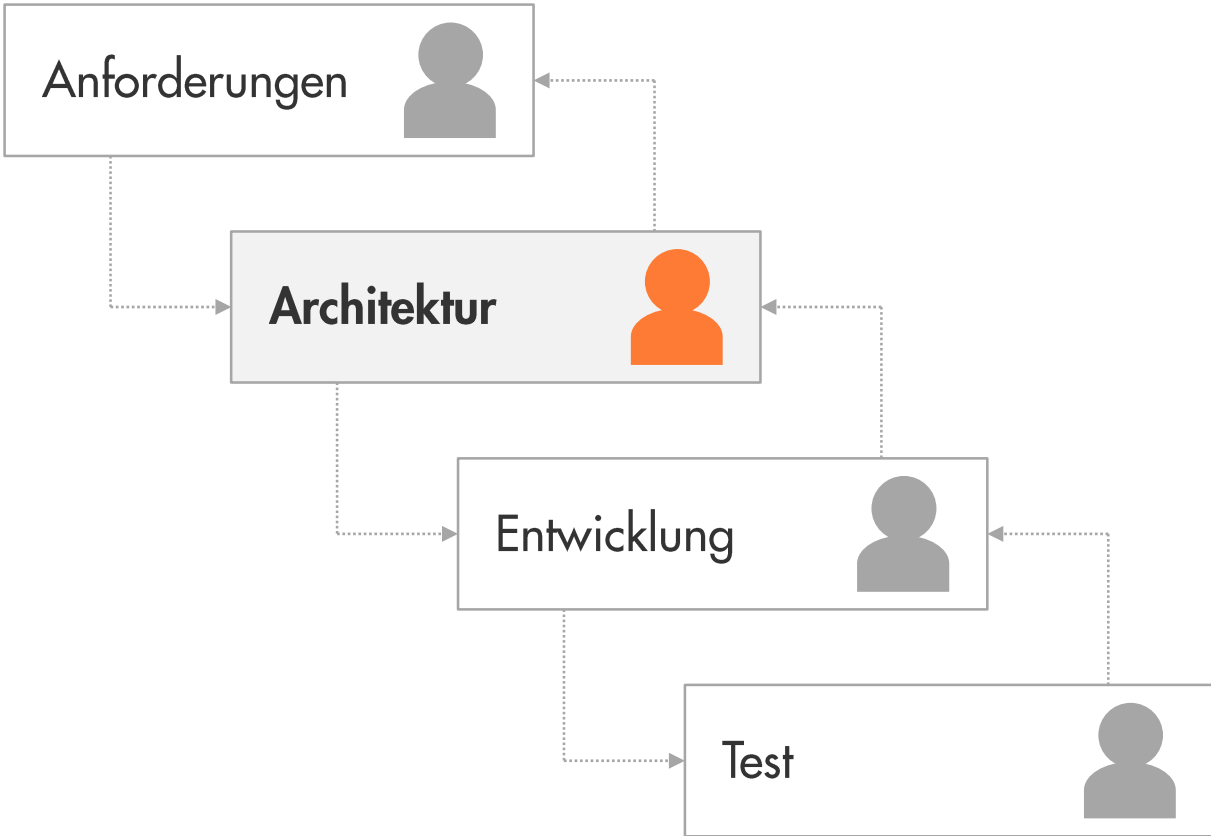
13+ **Promotionen** in
Software Engineering

Eigene **Forschung**

Enger Kontakt zu
Universitäten

Architekt



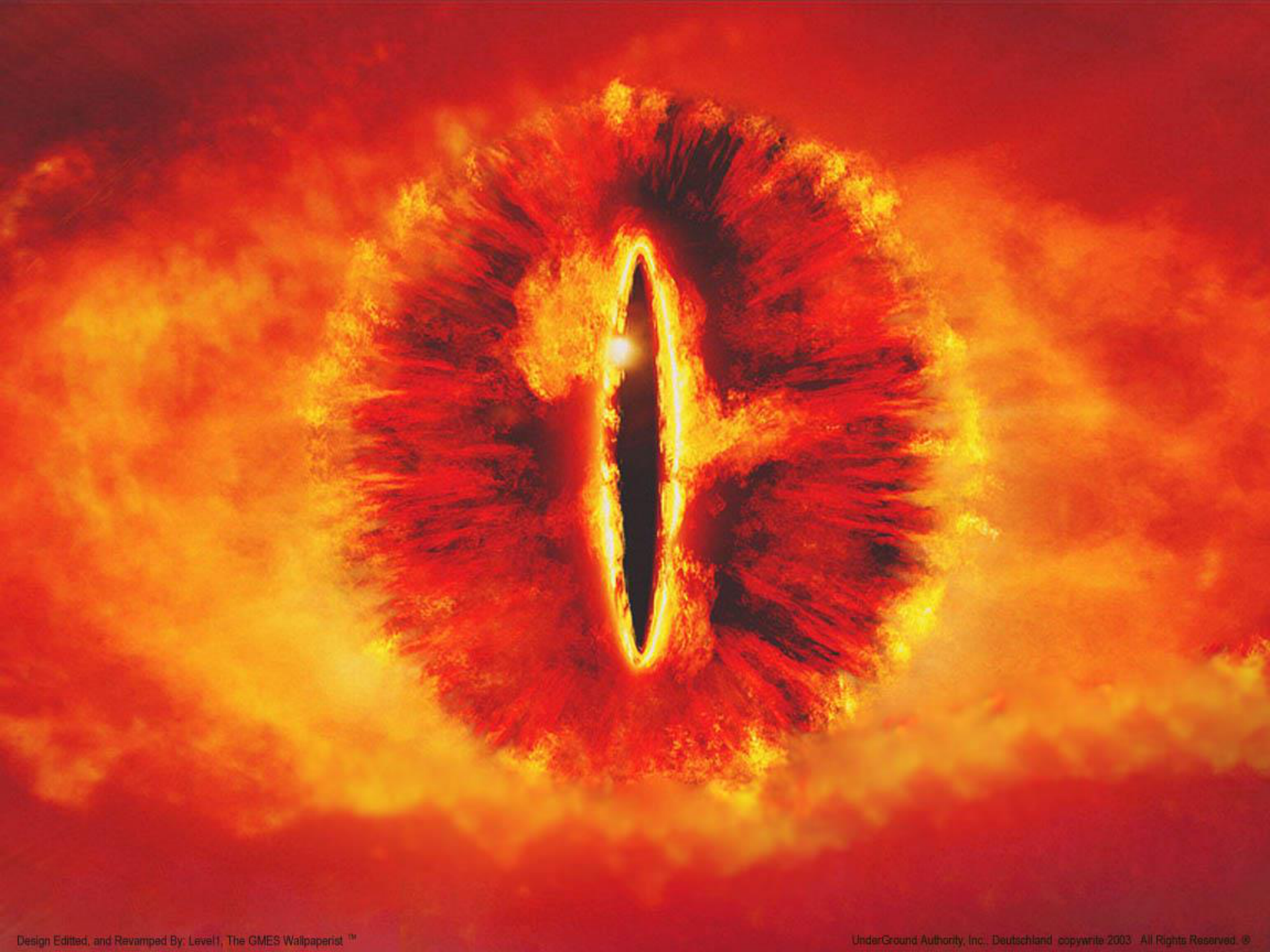


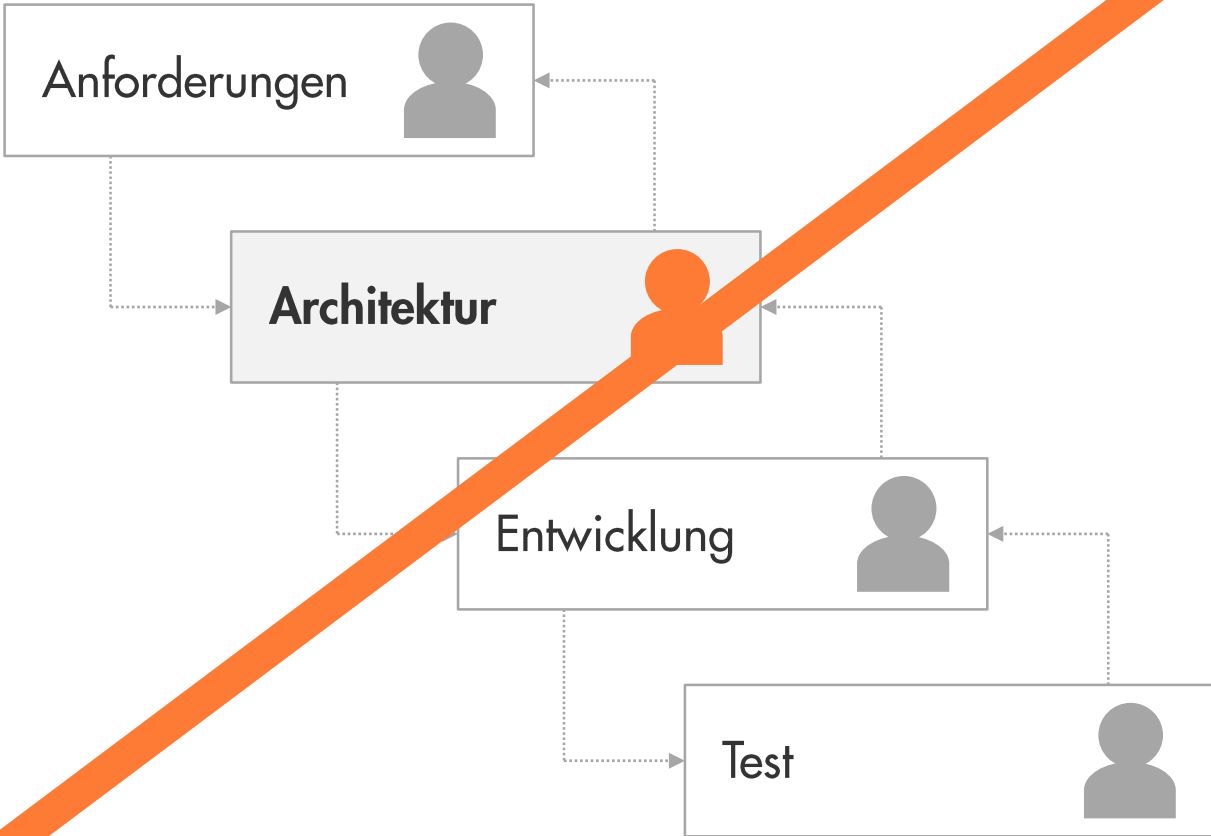
Ausfall beim Nasdaq-Index Herzstillstand an der Wall Street

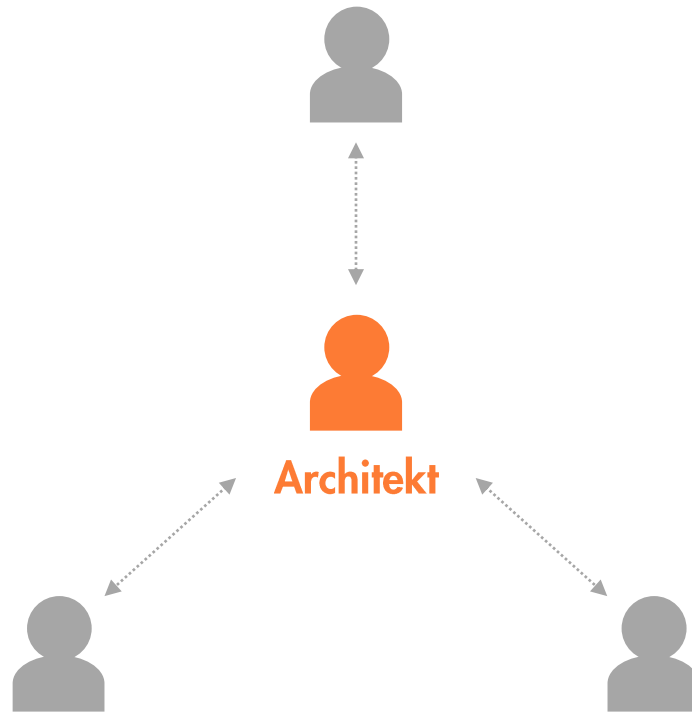


Nichts ging mehr am Times Square: Drei Stunden lang klemmte der Handel an der New Yorker Tech-Börse Nasdaq. Schuld war offenbar ein Softwarefehler. Die Panne war nicht die erste ihrer Art in letzter Zeit - sie zeigt die Anfälligkeit der elektronischen Märkte. *Von Marc Pitzke, New York mehr...* [Forum]

US-Technologiebörse: Nasdaq unterbricht Handel für drei Stunden








```

/* Process the input string received prior to
newline. */
do
{
    /* Pass the string to FreeRTOS+CLI. */
    xMoreDataToFollow = FreeRTOS_CLIProcessC

    /* Send the output generated by the comm
implementation. */
    sendto( xSocket, cOutString, strlen(

} while( xMo

/* All the s
have been se
the next com
cInputIndex

```



Added db2 database mapping after reading forum post

by Daniel Lewis in revision 91687a1146419dd23ceaed299185512696643dc1 (git)

Files: 11 changed

Findings: 0 4 12 1

Jul 17 2014 10:53

Filter:

Jabref

collab

imports

gui → export

Dependencies: 1

Dependency source

net.sf.jabref.gui.MergeAndResDialog

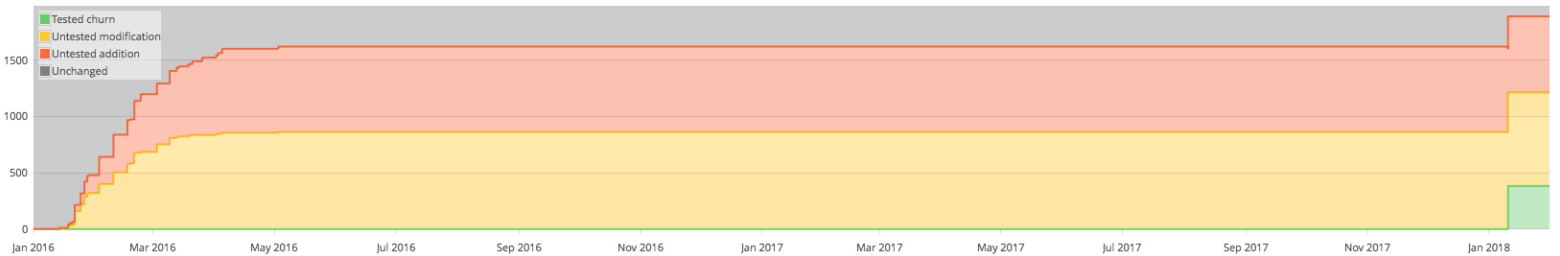
net.sf.jabref.export.LatexFieldFormatter

Test Gaps for pixelitor

Jan 01 2016 00:00 - now | Test Gap: 79.72%



Test Gap Trend Chart for pixelitor



Historienanalyse



Warum schon wieder **dieser** Fehler?

The central image is a collage of software development artifacts. On the left, there are two panels of code snippets with comments. On the right, there is a large heatmap visualization. In the center, there is a dashboard with an orange person icon and the word "Architekt" in orange text. The dashboard includes several sections:

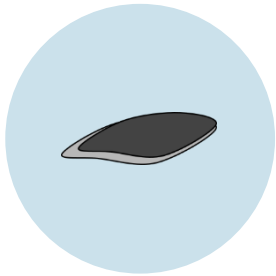
- Requirements:** A section with a green up arrow and a bar chart titled "Requirements Status" showing a distribution of values.
- Architecture and Design:** A section with a red down arrow and a bar chart titled "File Size" and " nesting Depth".
- Implementation:** A section with a green up arrow and a bar chart titled "Cloning" showing a value of 19.7k.
- Complexity:** A section with a green up arrow and a line chart titled "Metrics Trend Chart" showing a value of 17.



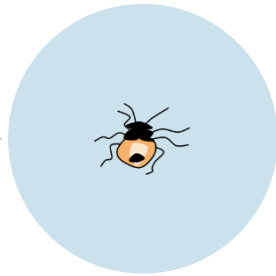
Entwicklung



Test



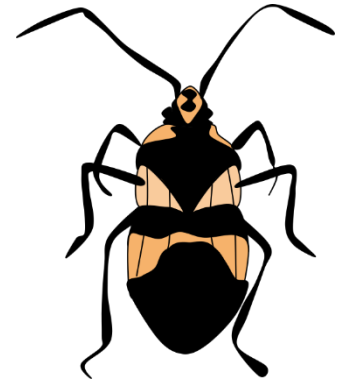
Team-Wechsel



Code-Ownership



Inkonsistenter Klon



Bug

Historienanalyse



Entwickler

- feilkas
- stemplinger
- plachot
- sahinagic
- bader
- malinskyi
- ribeiro
- vejda
- hodaie
- amann
- kanis
- junker
- steidl
- streitel
- beller
- hauptmab

Block-Arbeit

Sporadische Committer

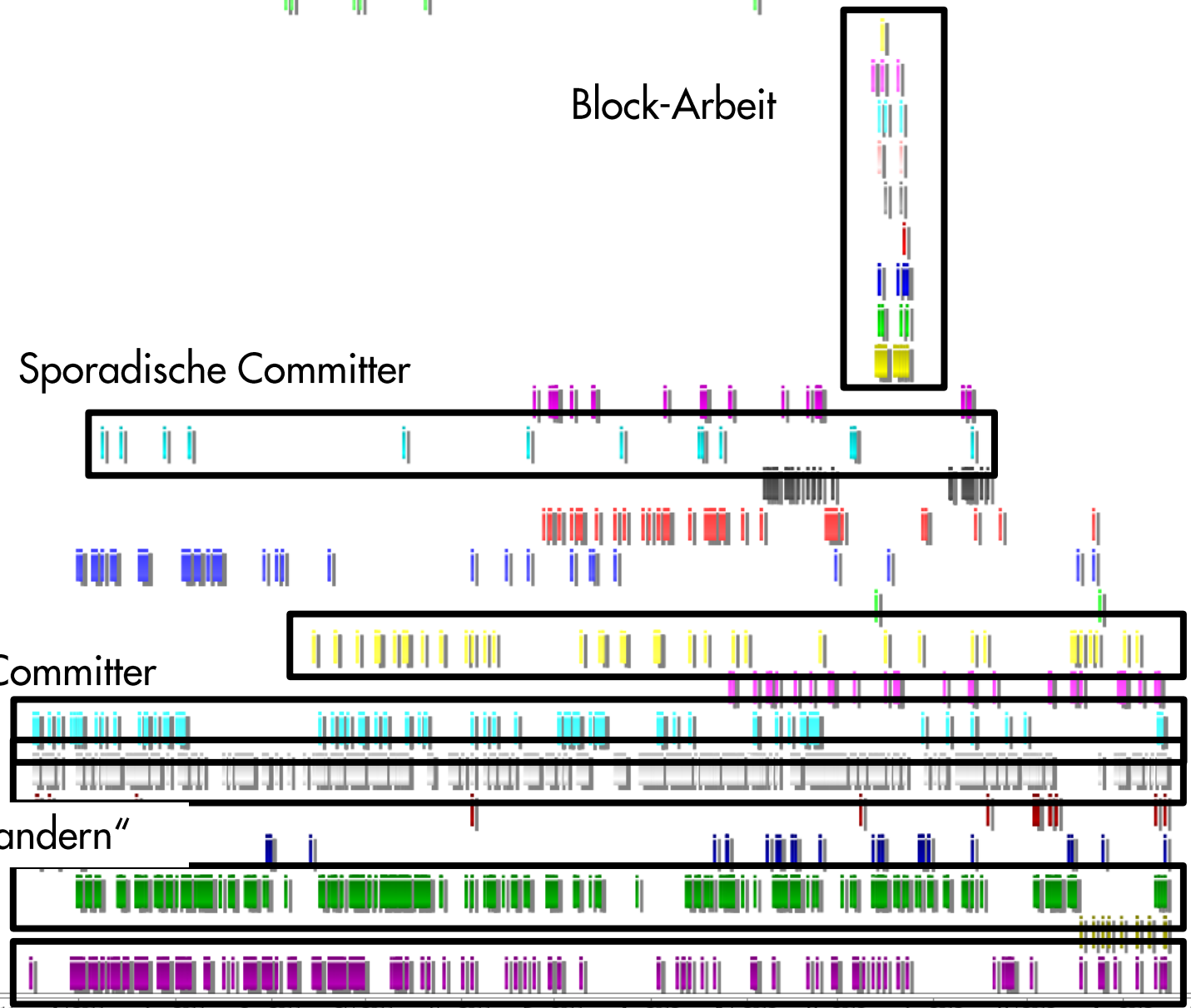
Haupt-Committer

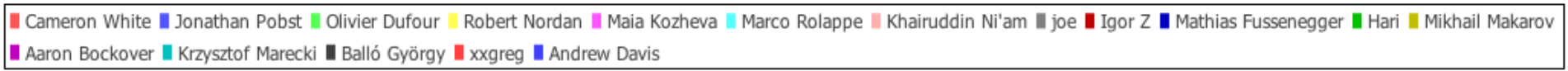
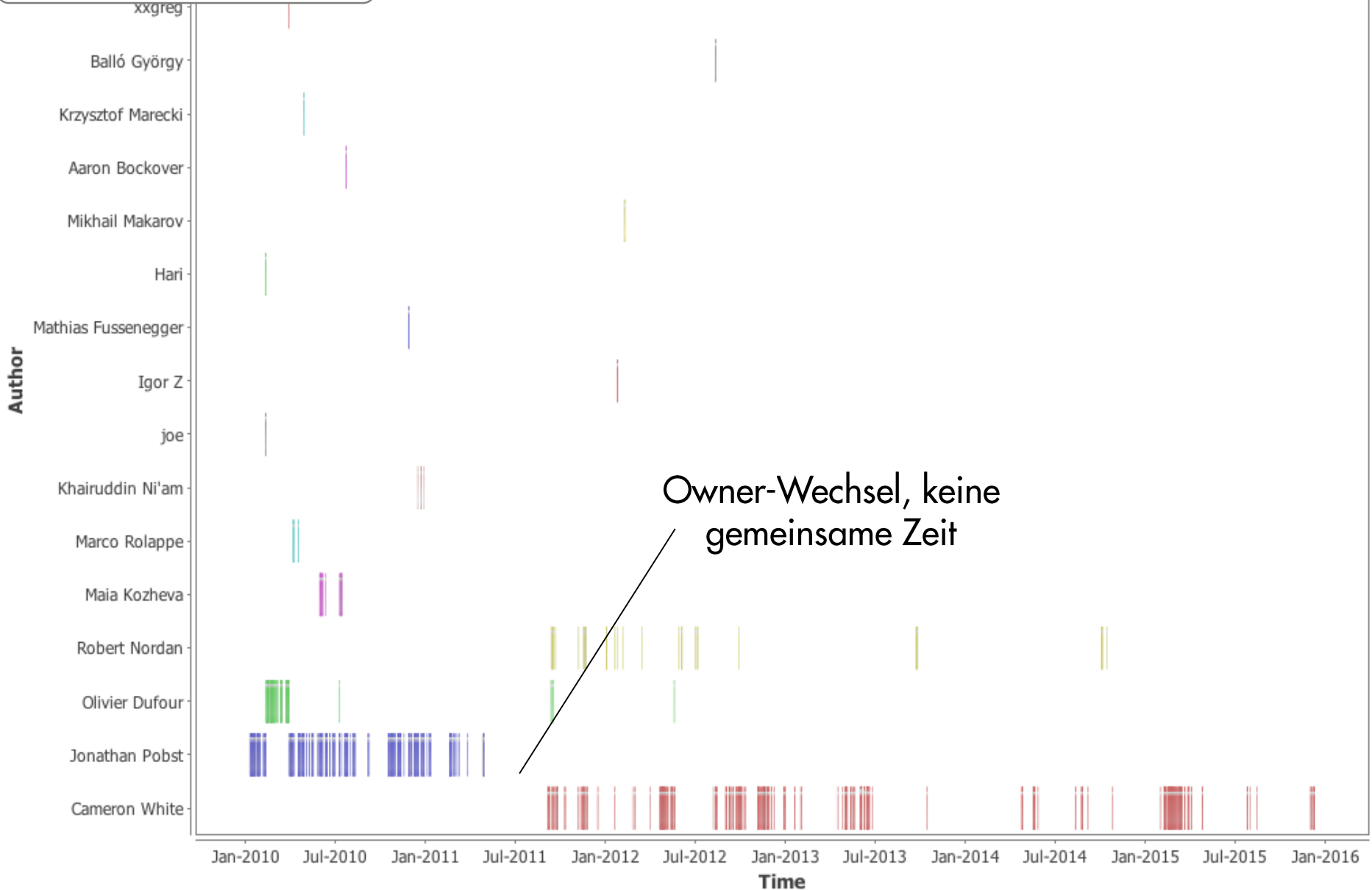
„Abwandern“

- heineman
- poehlman
- juergens

Jun-2011 Jul-2011 Aug-2011 Sep-2011 Okt-2011 Nov-2011 Dez-2011 Jan-2012 Feb-2012 Mrz-2012 Apr-2012 Mai-2012 Jun-2012 Jul-2012

Zeit







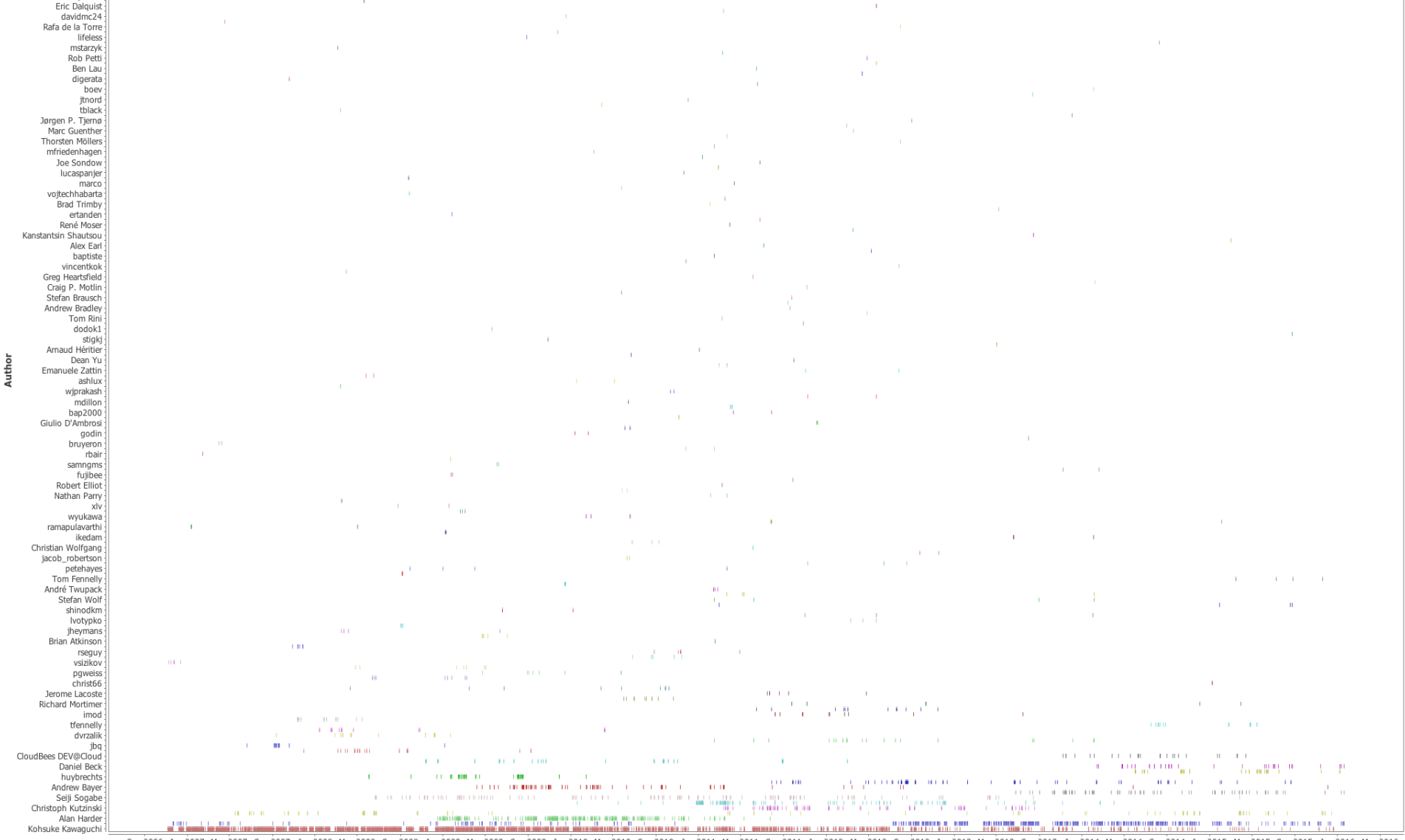
dotnet/roslyn



■ Tomáš Matoušek ■ Manish Vasani ■ Heejae Chang ■ Andrew Casey ■ Jared Parsons ■ Neal Gafter ■ Charles Stoner ■ AlekseyTs ■ Cyrus Najmabadi ■ VSadov ■ Andy Gocke ■ Matt Warren ■ Paul Harrington ■ Dustin Campbell ■ Kevin Halverson ■ Tom Meschter ■ Balaji Soundararajan ■ Ravi Chande ■ Jonathon Marolf ■ Jason Malinowski ■ Srivats Narayanan ■ David Poeschl ■ Shyam N ■ Brett V. Forsgren ■ Tanner Gooding ■ Vladimir Reshetnikov ■ Roslyn Team ■ Balaji Krishnan ■ Kevin Pilch-Bisson ■ pgavlin ■ Kevin_H ■ Wonseok Chae ■ Gen Lu ■ David Kean ■ YingP99 ■ Ty Overby ■ kayleh ■ dotnet bot ■ Kirill Osenkov ■ Manish Jayaswal ■ Stephen Toub ■ John Hamby ■ nslottow ■ Artur Spychaj ■ skytribe ■ Tagoo ■ Anthony D. Green ■ astasyuk ■ marstr ■ Evan Hauck ■ Larry Golding ■ Kevin Ransom ■ semihokur ■ Nick Guerrero ■ matell ■ jeremymeng ■ lasekar ■ Llewellyn Pritchard ■ Daniel King ■ MuradT ■ Matt Mitchell ■ Eric Feveson ■ Tristan Labelle ■ Patrick Nelson ■ weswigham ■ Kent Boogaart



jenkinsci/jenkins



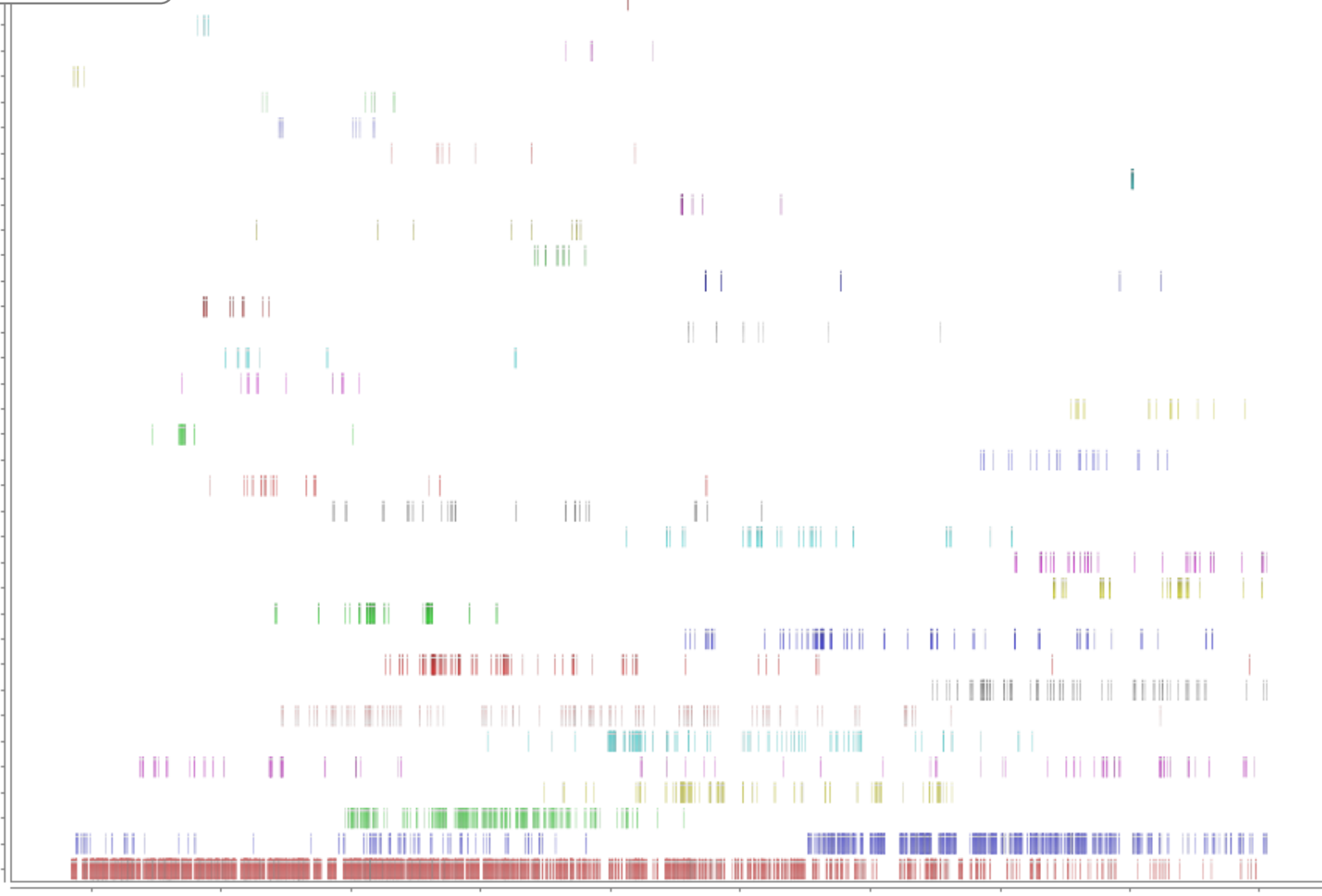
- Kohsuke Kawaguchi ■ Jesse Glick ■ Alan Harder ■ Stephen Connolly ■ Christoph Kutzinski ■ Olivier Lamy ■ Seiji Sogabe ■ Oliver Gondzo ■ Andrew Bayer ■ Nicolas De Loof ■ Huybrechts ■ Oleg Nenashv ■ Daniel Beck ■ dty ■ CloudBees DEV@Cloud ■ redsolo ■ jba ■ Vojtech Juranek ■ dvrzalik ■ cactusman ■ tfennelly ■ dwdyer ■ imod ■ vjuranek ■ Richard Mortimer ■ StevenBrown ■ Jerome Lacoste ■ swiest ■ christ66 ■ martinlicker ■ pgweiss ■ imdonohue ■ vsizkov ■ kutzi ■ rseguy ■ bwestrich ■ Brian Atkinson ■ kaxelson ■ jheymans ■ lucamilanesio ■ Ivotypko ■ Fred G ■ shinodkm ■ James Nord ■ Stefan Wolf ■ Ulli Hafner ■ André Twupack ■ lacostej ■ Tom Fennelly ■ jjasper ■ petehayes ■ OHTAKE Tomohiro ■ jacob_robertson ■ Erik Molekamp ■ Christian Wolfgang ■ km ■ ikedam ■ brucechapman ■ ramapularvarthi ■ Ryan Campbell ■ wyukawa ■ draco2k8 ■ xlv ■ jasonchaffee ■ Nathan Parry ■ jpederzoli ■ Robert Elliot ■ Erik Ramfelt ■ fujibee ■ Harald Albers ■ samngms ■ rtyler ■ rbair ■ Jesse Farinacci ■ bruyeron ■ Vojtěch Juránek ■ godin ■ mode ■ Giulio D'Ambrosi ■ wolfs ■ bap2000 ■ Martin Baay ■ mdillon ■ Vincent Latombe ■ wjprakash ■ drulll ■ ashlux ■ frizbog ■ Emanuele Zattin ■ Tomer Cohen ■ Dean Yu ■ teilo ■ Arnaud Héritier ■ dnodolny ■ stigkj ■ Sam Van Oort ■ dodok1 ■ Dominik Bartholdi ■ Tom Rini ■ Reynald Borer ■ Andrew Bradley ■ Stephen Ware ■ Stefan Brausch ■ kbertelson ■ Craig P. Motlin ■ Michael Strasser ■ Greg Heartsfield ■ elefevre ■ vincentkok ■ Alexandre Garnier ■ baptiste ■ David Reiss ■ Alex Earl ■ John Crawford ■ Kanstantsin Shautsou ■ Sami Tikka ■ René Moser ■ Richard Bywater ■ ertanden ■ olivergondza ■ Brad Trimby ■ Olav Reinert ■ vojtechhabarta ■ mcrooney ■ marco ■ david_calavera ■ lucaspanjer ■ Nigel Magnay ■ Joe Sondow ■ mleinart ■ mriedenhagen ■ Ken Bertelson ■ Thorsten Möllers ■ Mike Robinet ■ Marc Guenther ■ Andrew Melo ■ Jørgen P. Tjørna ■ Josh Gibbs ■ tblack ■ vlatombe ■ jtnord ■ Michael Clarke ■ boev ■ dwliden ■ digerata ■ Bruno P. Kinoshita ■ Ben Lau ■ Dave Hunt ■ Rob Petti ■ Paul Weiss ■ mstarzyk ■ Ben McCann ■ lifeless ■ javadude ■ Rafa de la Torre ■ vglushenko ■ davidmc24 ■ Paul Sandoz ■ Eric Dalquist ■ davidseymore ■ jsirola ■ Bruno Meneguello ■ GLundh ■ Christoph Thelen ■ f_cavarretta ■ Ciprian Ciobotariu ■ Stuart McCulloch ■ Lucien Weller ■ willemv ■ jhm ■ Surya Gaddipati ■ valentina ■ Jonathan A. Stenberg ■ Kevin Sawicki ■ Yoann Dubreuil ■ baileys



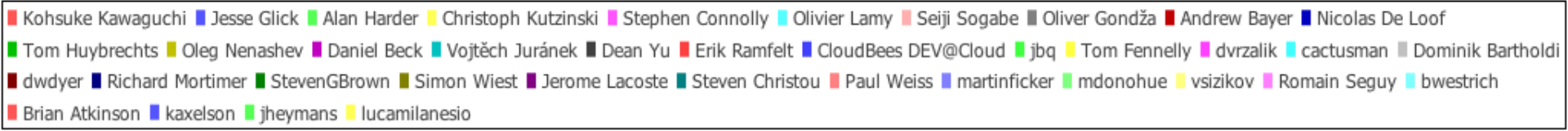
jenkinsci/jenkins

Author

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- dwdyer
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- cactusman
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- jbq
- CloudBees DEV@Cloud
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- Alan Harder
- Jesse Glick
- Kohsuke Kawaguchi



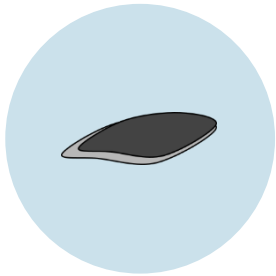
Time





Kundenprojekt





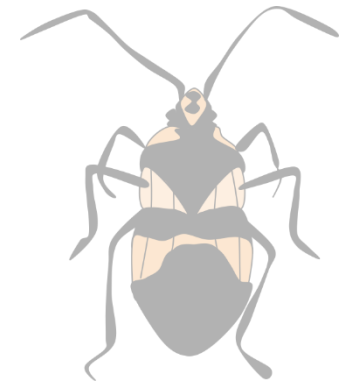
Team-Wechsel



Code-Ownership

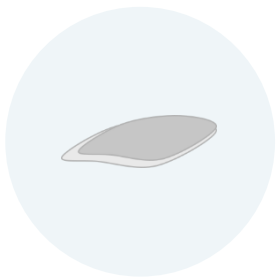


Inkonsistenter Klon

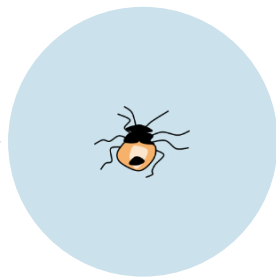


Bug

Historienanalyse



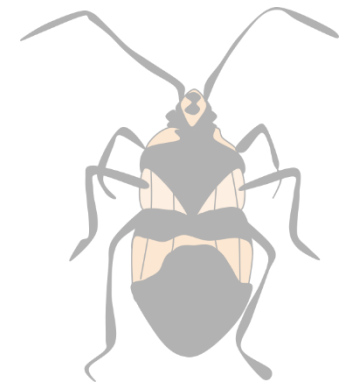
Team-Wechsel



Code-Ownership



Inkonsistenter Klon

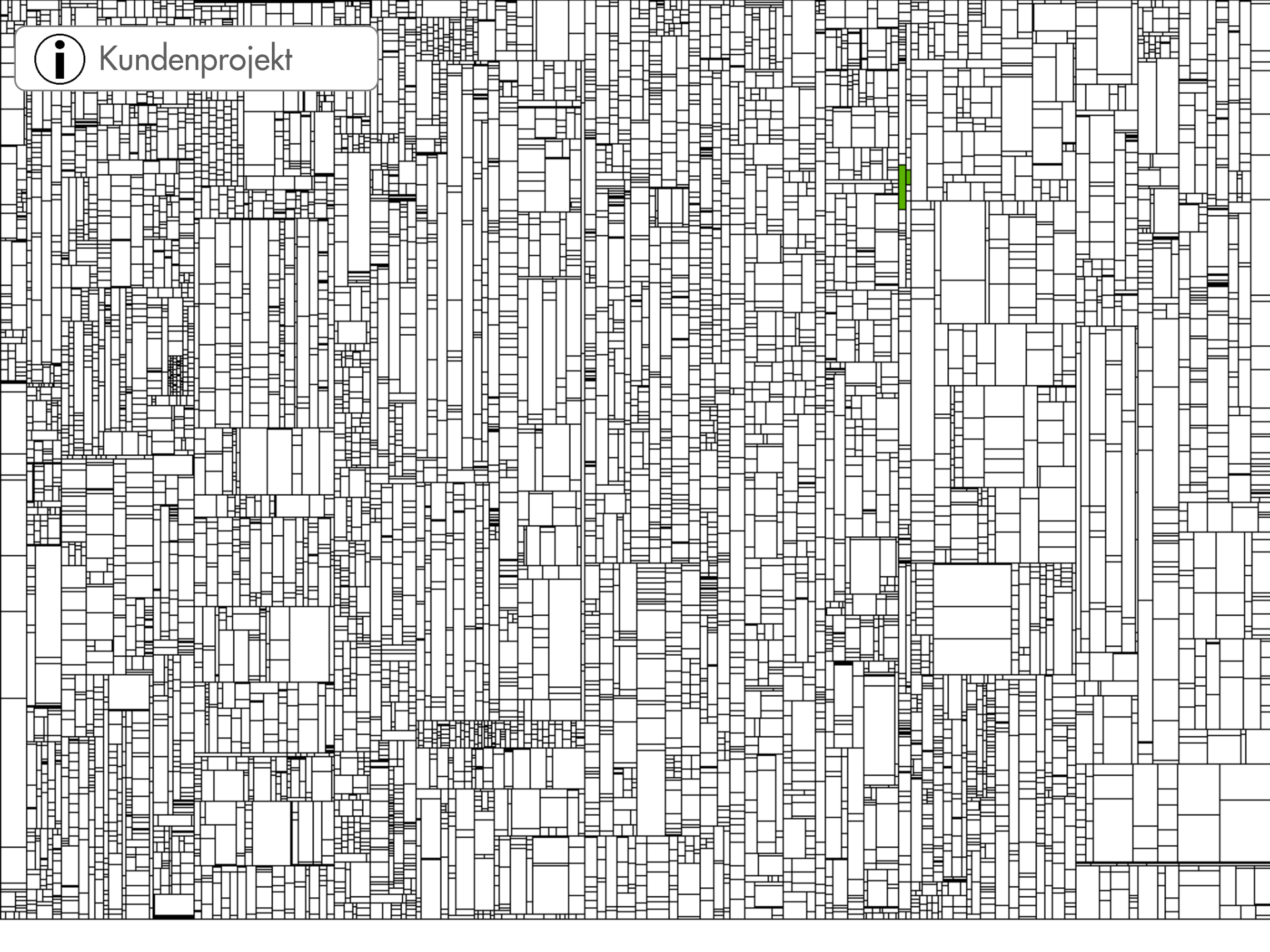


Bug

Historienanalyse

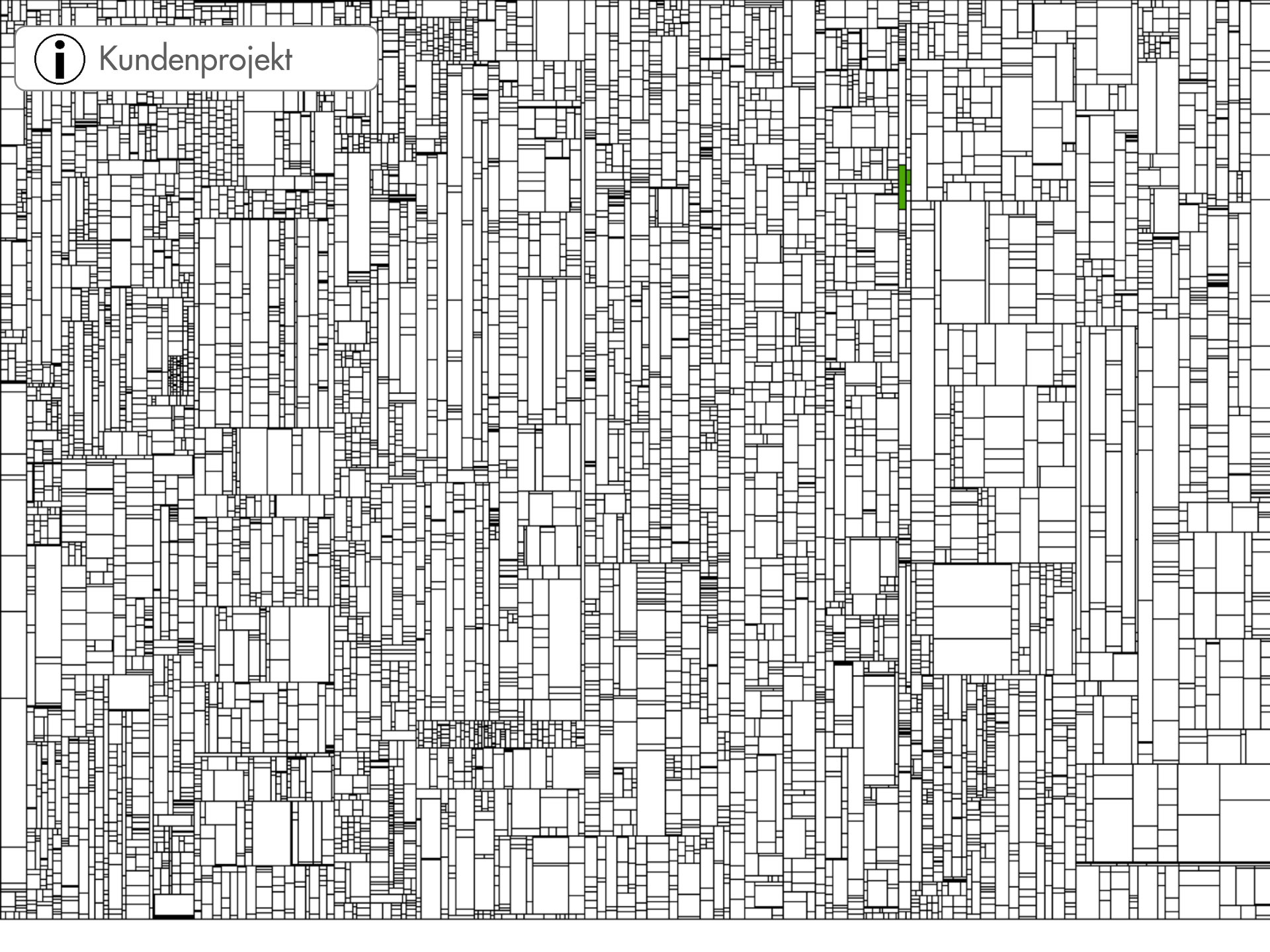


Kundenprojekt





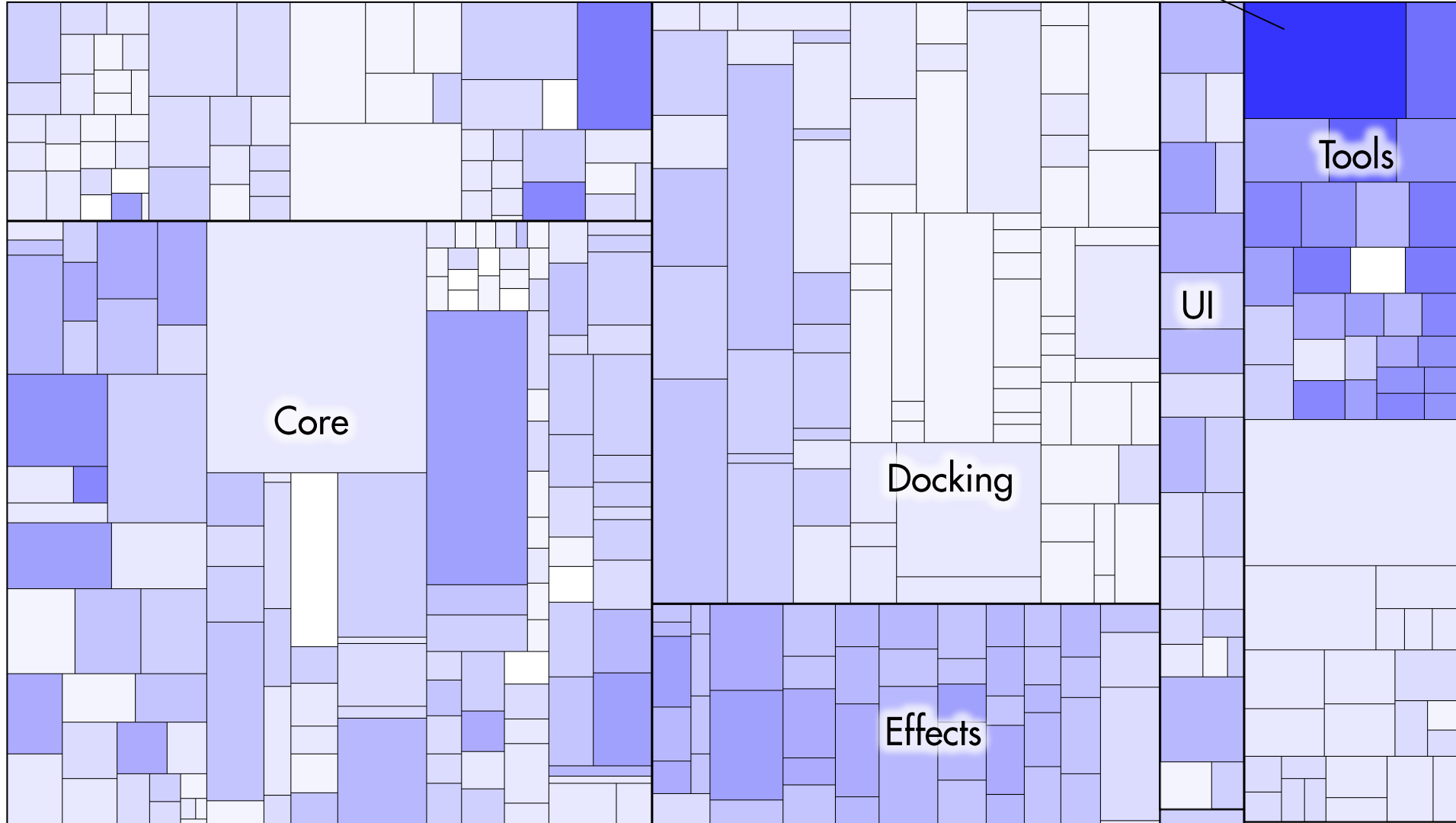
Kundenprojekt





TextTool.cs (17 Entwickler)

Ownership Distribution for [pinta](#)





Wissenslücke

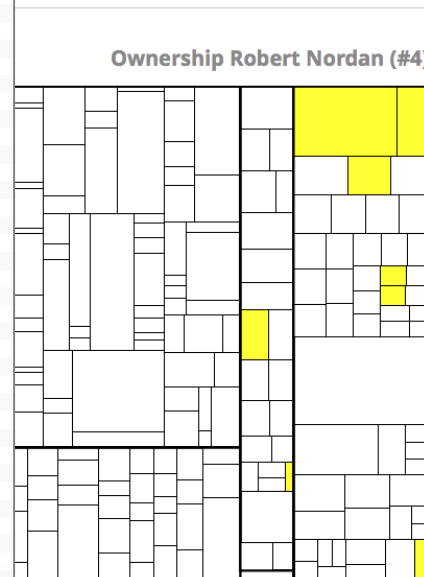
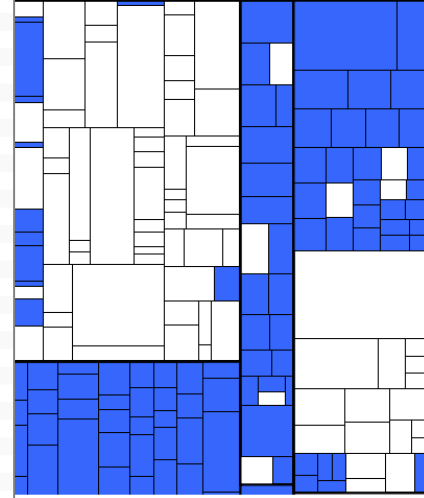
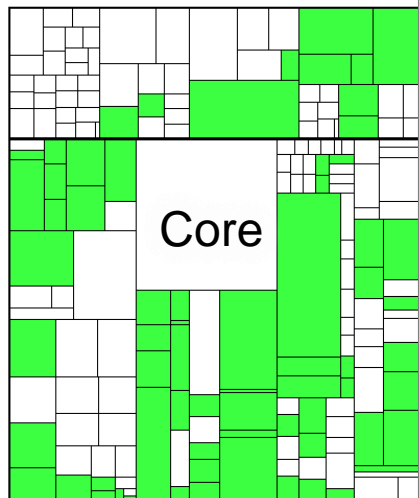
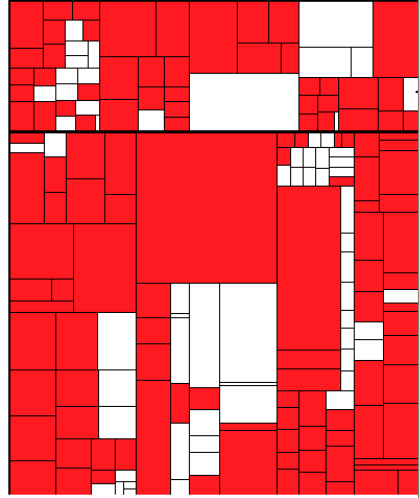
„Abgewandert“

Ownership Jonathan Pobst (#2)

```

pinta / Pinta / WindowShell.cs
26
27 using System;
28 using Gtk;
29
30 namespace Pinta
31 {
32     public class WindowShell : Window
33     {
34         private VBox shell_layout;
35         private VBox menu_layout;
36         private HBox workspace_layout;
37
38         private MenuBar main_menu;
39         private Toolbar main_toolbar;
40
41         public WindowShell (string name, string title, int width, int height, bool maximize) : base (WindowType.Toplevel)
42         {
43             Name = name;
44             Title = title;
45             DefaultWidth = width;
46             DefaultHeight = height;
47
48             WindowPosition = WindowPosition.Center;
49             AllowShrink = true;
50
51             if (maximize)
52                 Maximize ();
53
54             shell_layout = new VBox () { Name = "shell_layout" };
55             menu_layout = new VBox () { Name = "menu_layout" };
56
57             shell_layout.PackStart (menu_layout, false, false, 0);
58
59             Add (shell_layout);
60
61             shell_layout.ShowAll ();
62         }
63
64         public MenuBar CreateMainMenu (string name)
65         {
66             main_menu = new MenuBar ();
67             main_menu.Name = name;
68
69             menu_layout.PackStart (main_menu, false, false, 0);
70             main_menu.Show ();
71
72             return main_menu;
73         }
74
75         public Toolbar CreateToolBar (string name)
76         {
77             main_toolbar = new Toolbar ();
78             main_toolbar.Name = name;
79
80             menu_layout.PackStart (main_toolbar, false, false, 0);
81             main_toolbar.Show ();
82
83             return main_toolbar;
84         }
85
86         public HBox CreateWorkspace ()
87         {
88             workspace_layout = new HBox ();

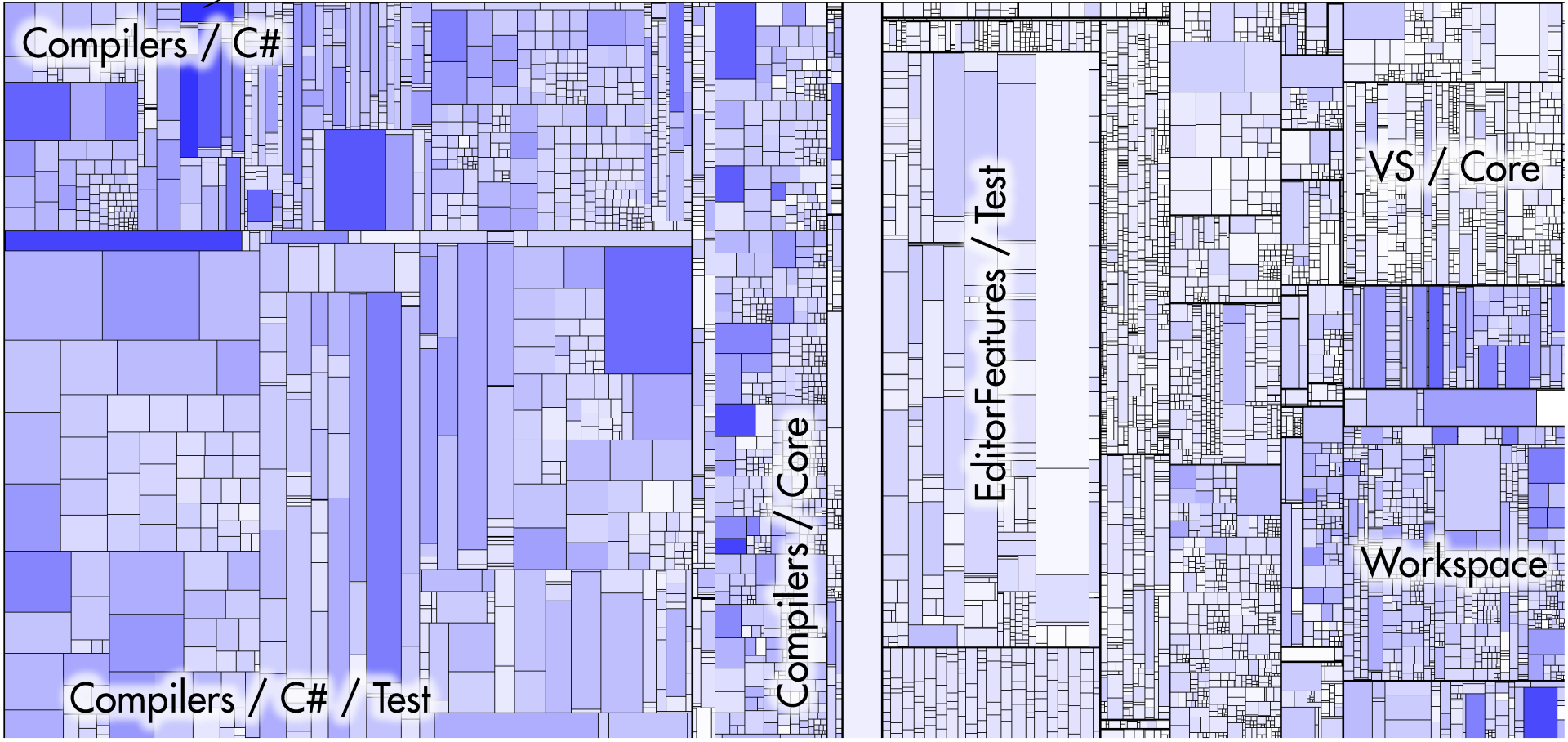
```



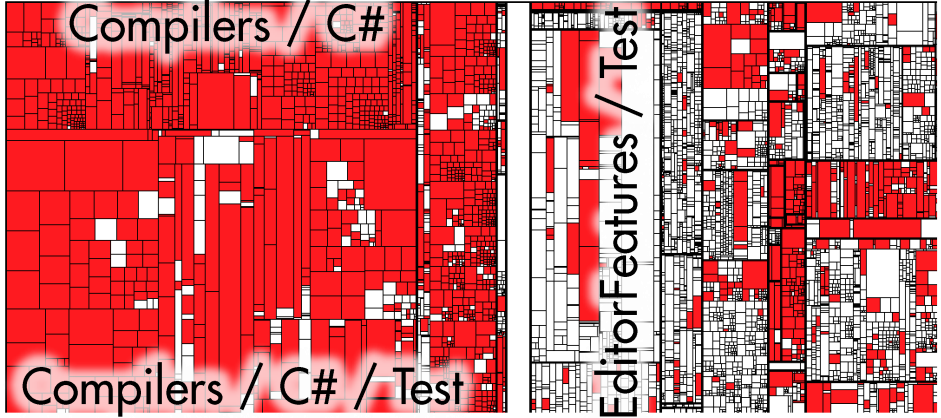
Ownership Robert Nordan (#4)

CSharpCommandLineParser.cs (47 Entwickler)

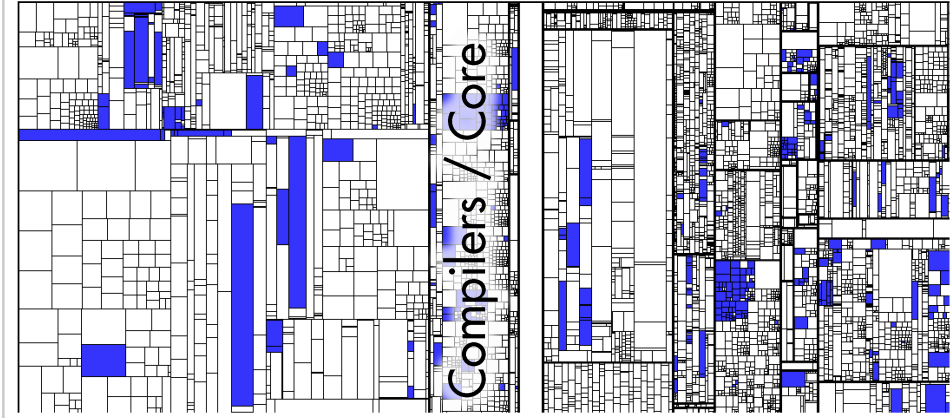
Ownership Distribution



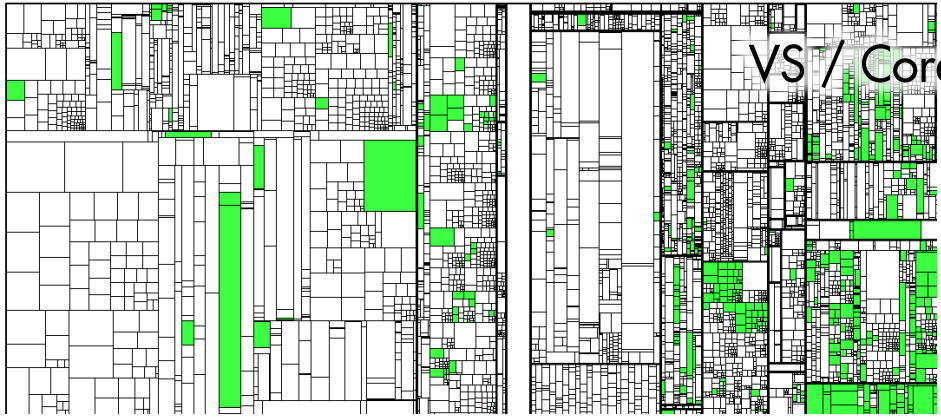
Ownership Tomáš Matoušek (#1)



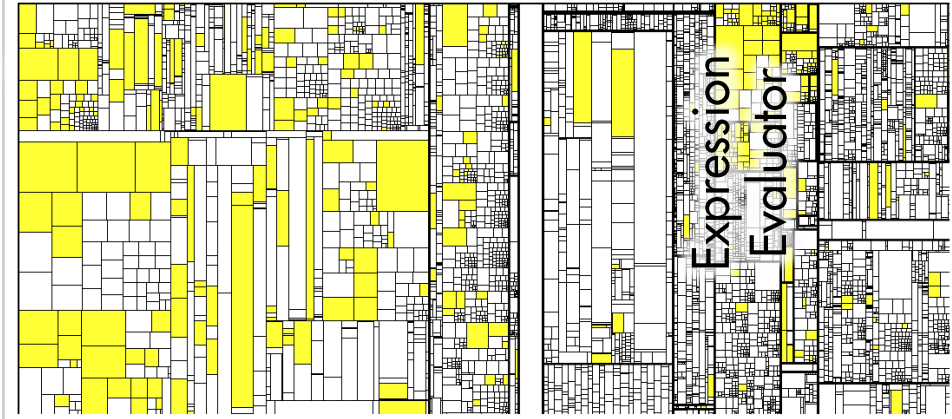
Ownership Manish Vasani (#2)

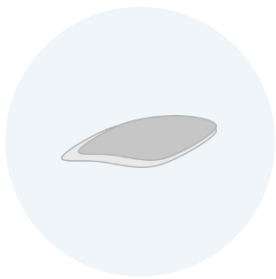


Ownership Heejae Chang (#3)

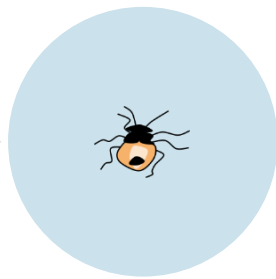


Ownership Andrew Casey (#4)

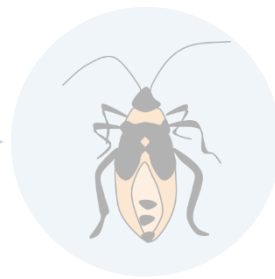




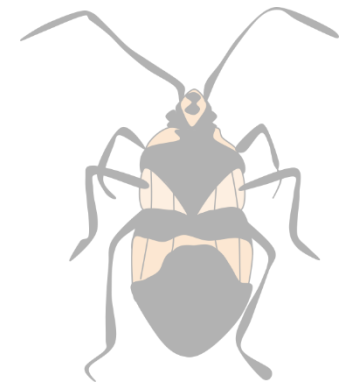
Team-Wechsel



Code-Ownership

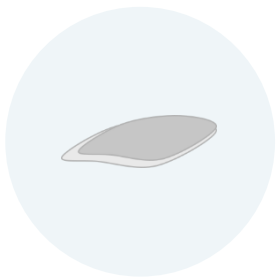


Inkonsistenter Klon

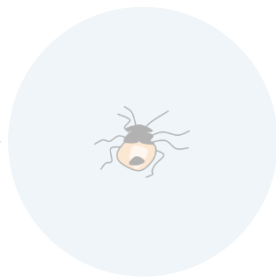


Bug

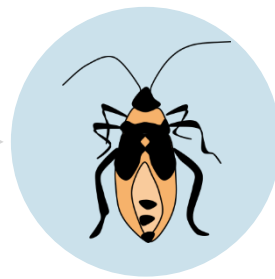
Historienanalyse



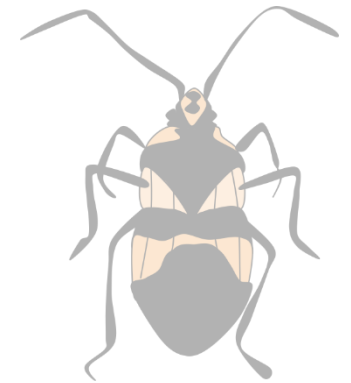
Team-Wechsel



Code-Ownership

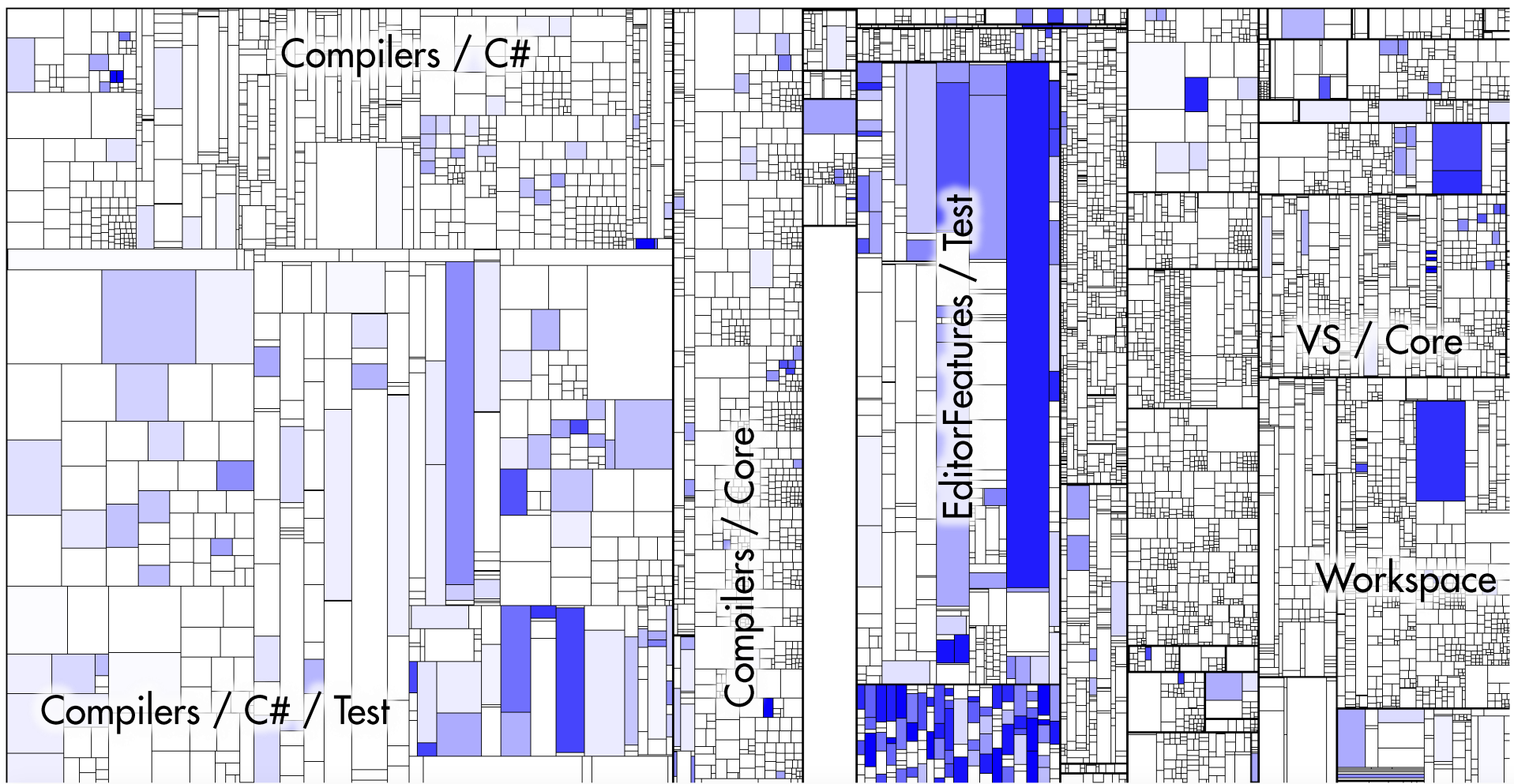


Inkonsistenter Klon

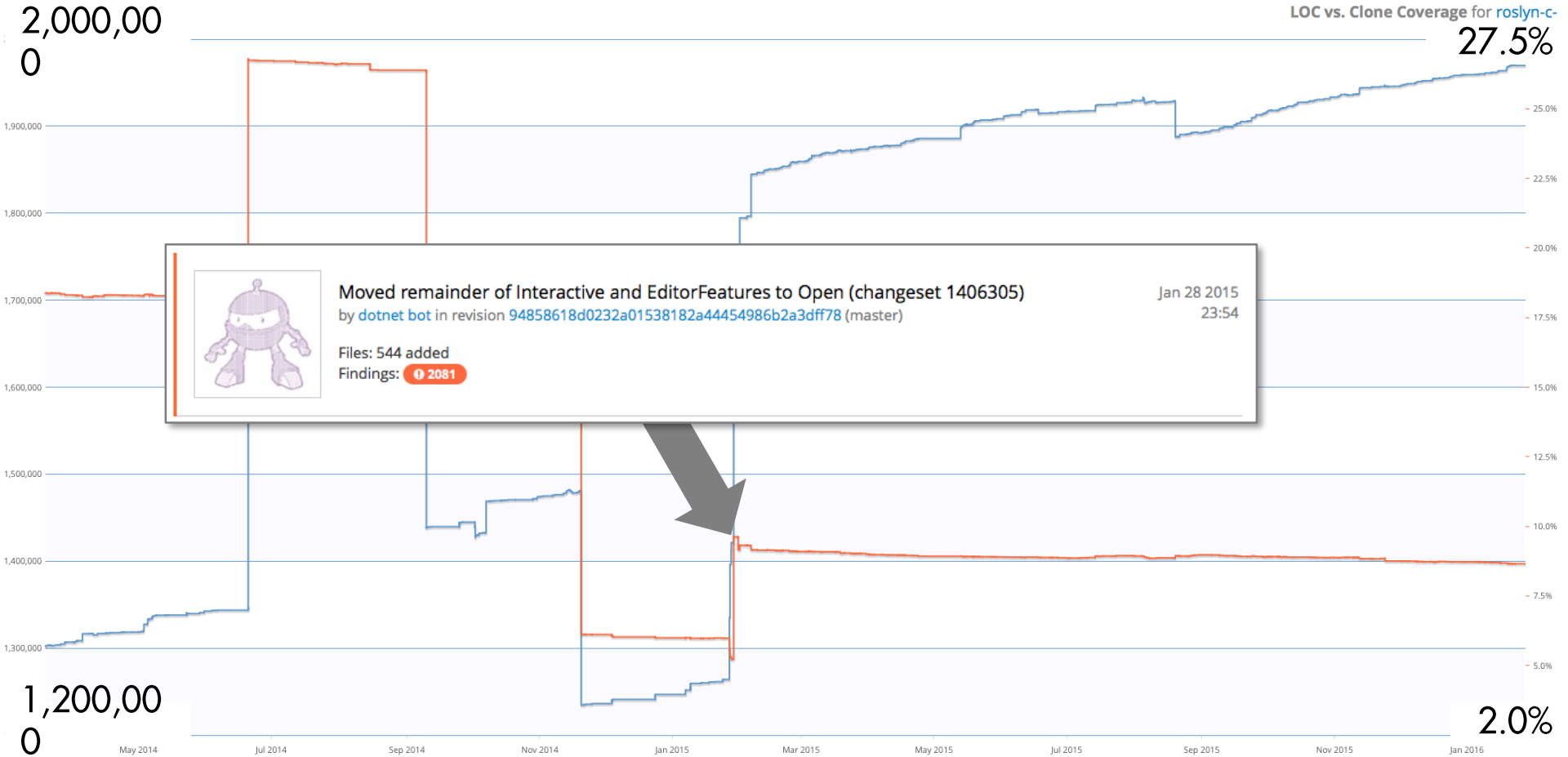


Bug

Historienanalyse



Head (Feb 2016)
Klonüberdeckung: 8,7%



Moved remainder of Interactive and EditorFeatures to Open (changeset 1406305)

by [dotnet bot](#) in revision [94858618d0232a01538182a44454986b2a3dff78](#) (master)

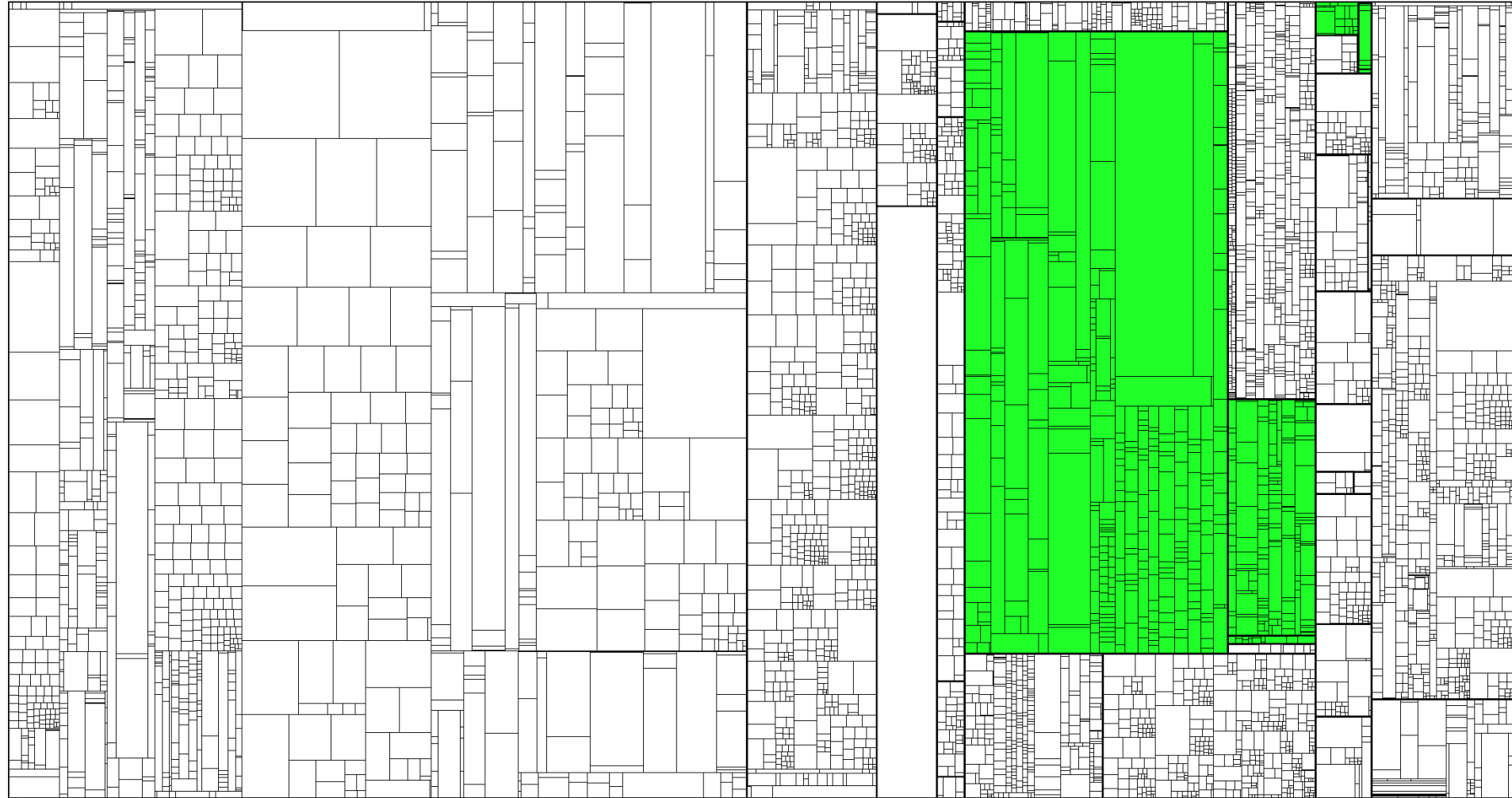
Jan 28 2015

23:54

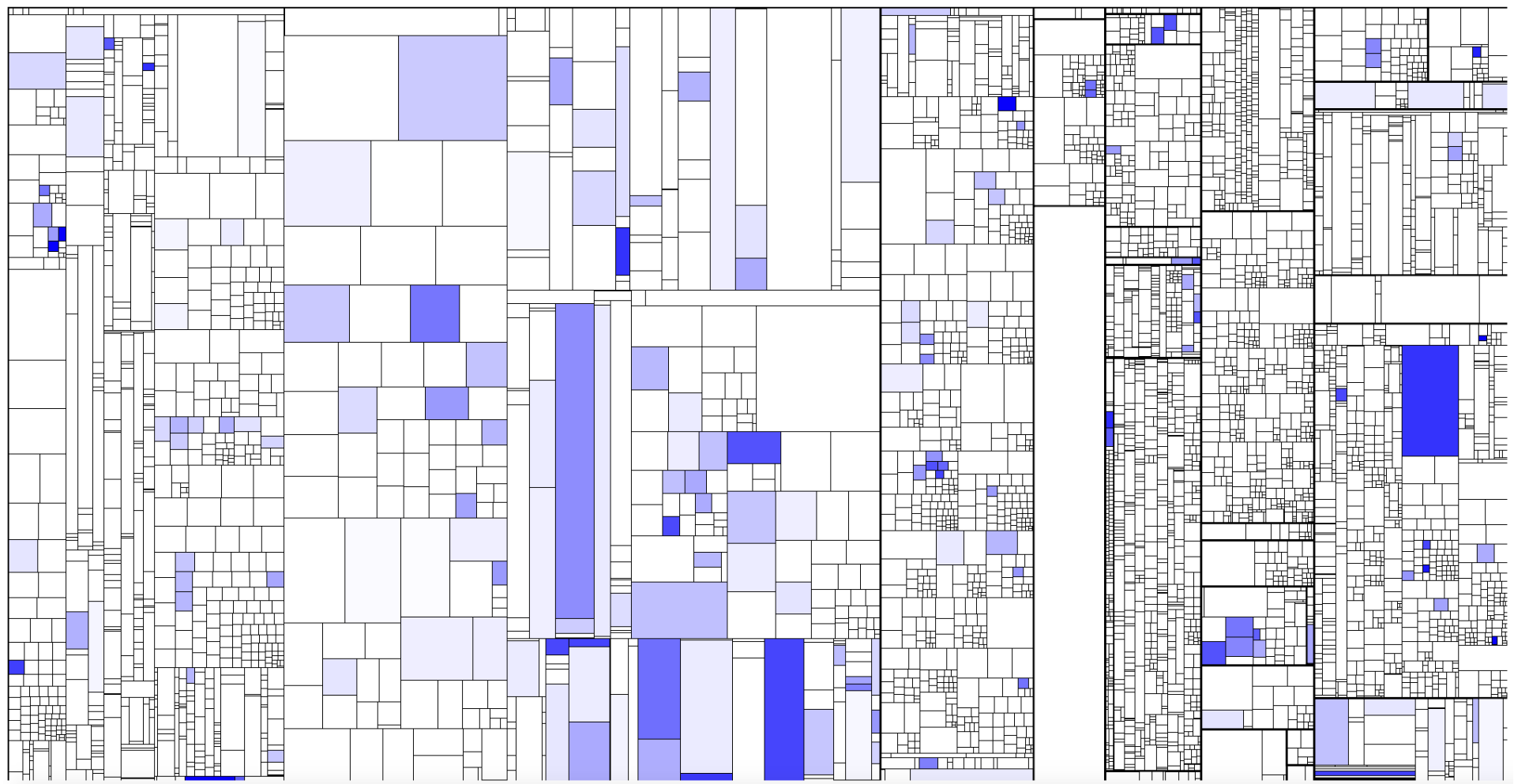
Files: 544 added

Findings: 2081





Änderungen

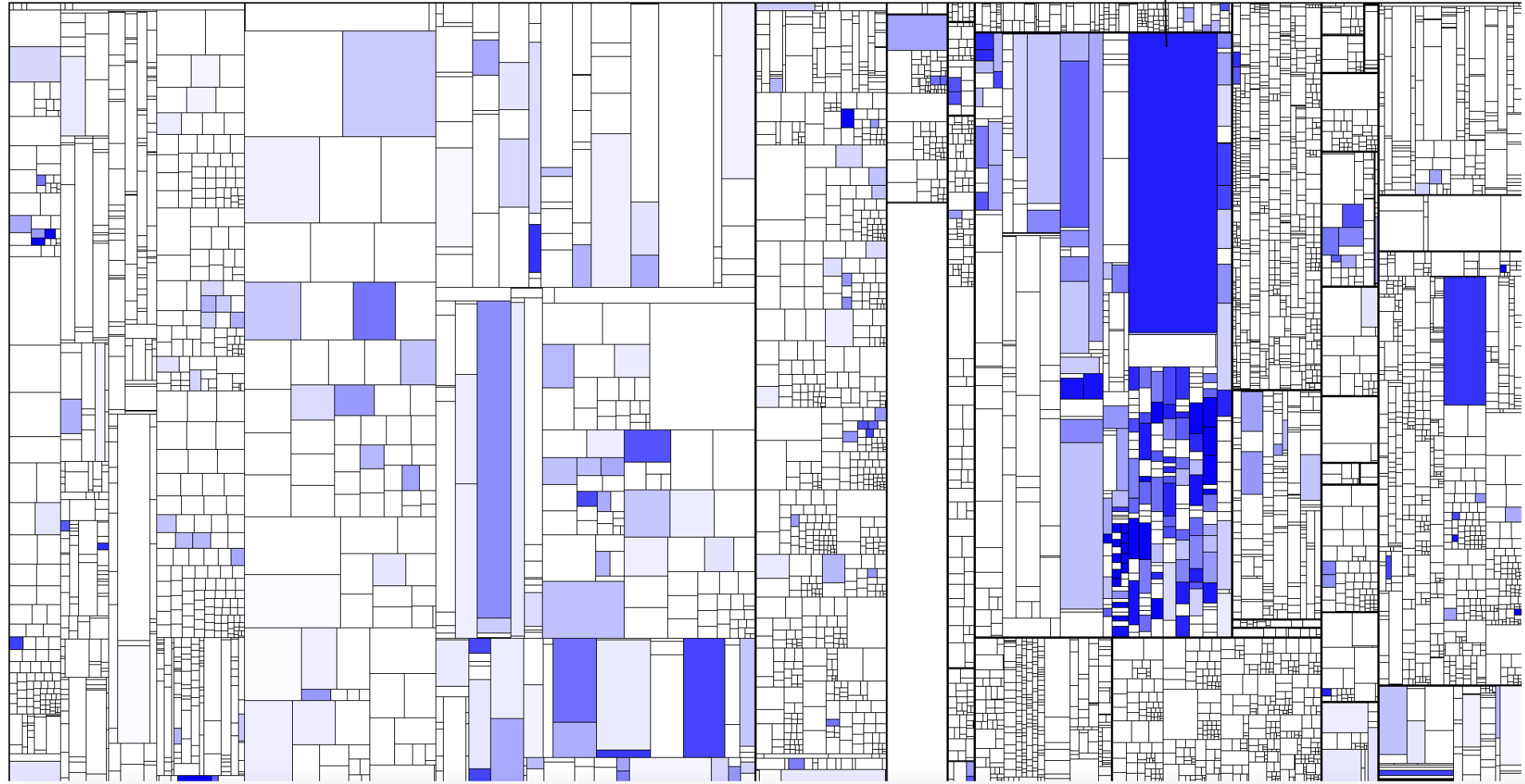


Vorher (Klonüberdeckung
5,2%)

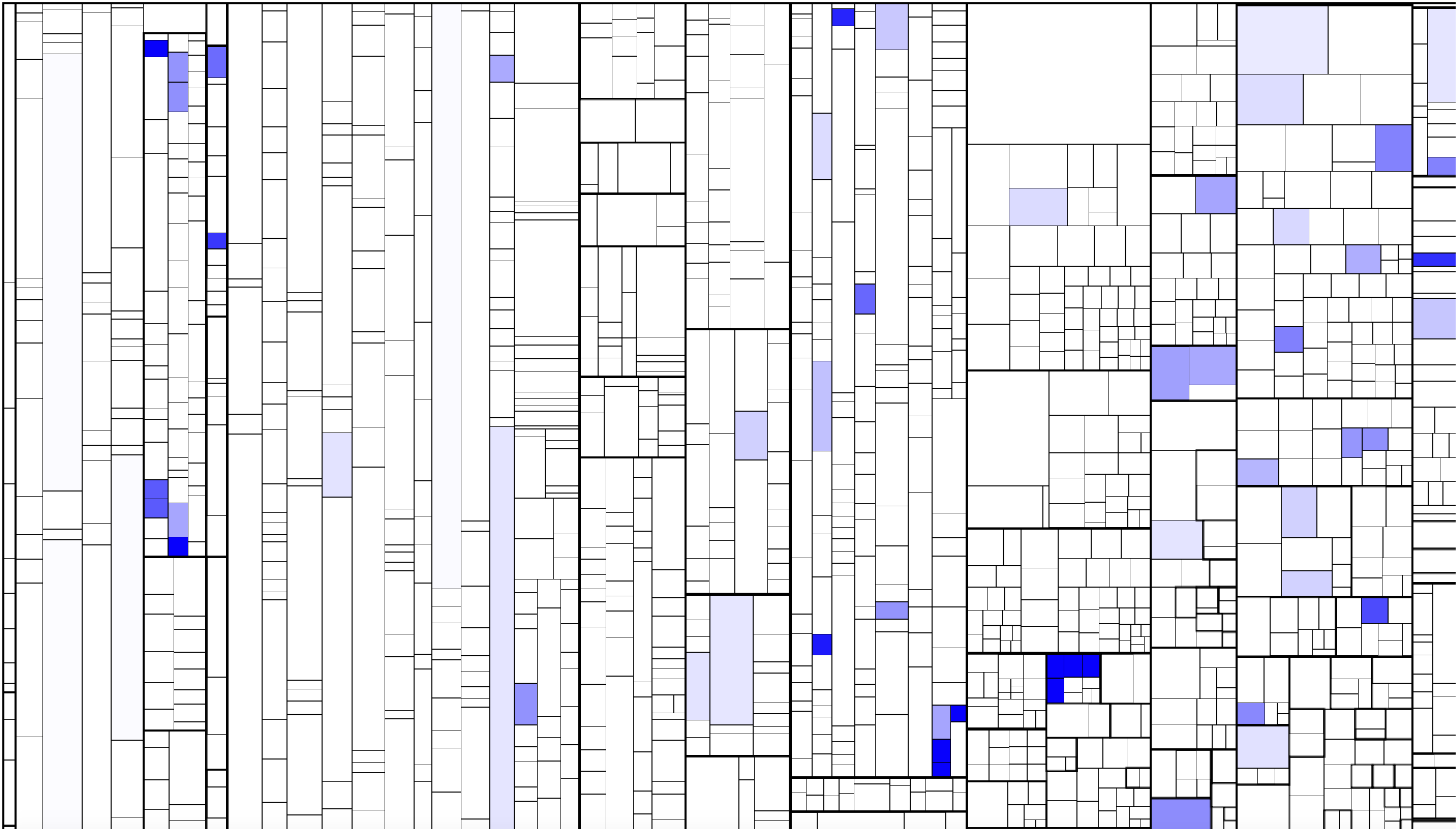


Performance-Test Case (89% Klonüberdeckung)

Clone Coverage Treemap for roslyn-c-



Nachher
(Klonüberdeckung 9,6%)



Head (Feb. 2016)
Klonüberdeckung: 2,2%



220,000

0



Merge pull request #294 from stephenc/master Nice improvement to Jenkins testability

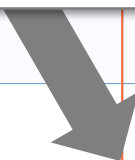
Oct 19 2011

by Nicolas De loof in revision c24a2b1ec93064eb2e085ba6d07ca4c85b2c7675 (master)

18:07

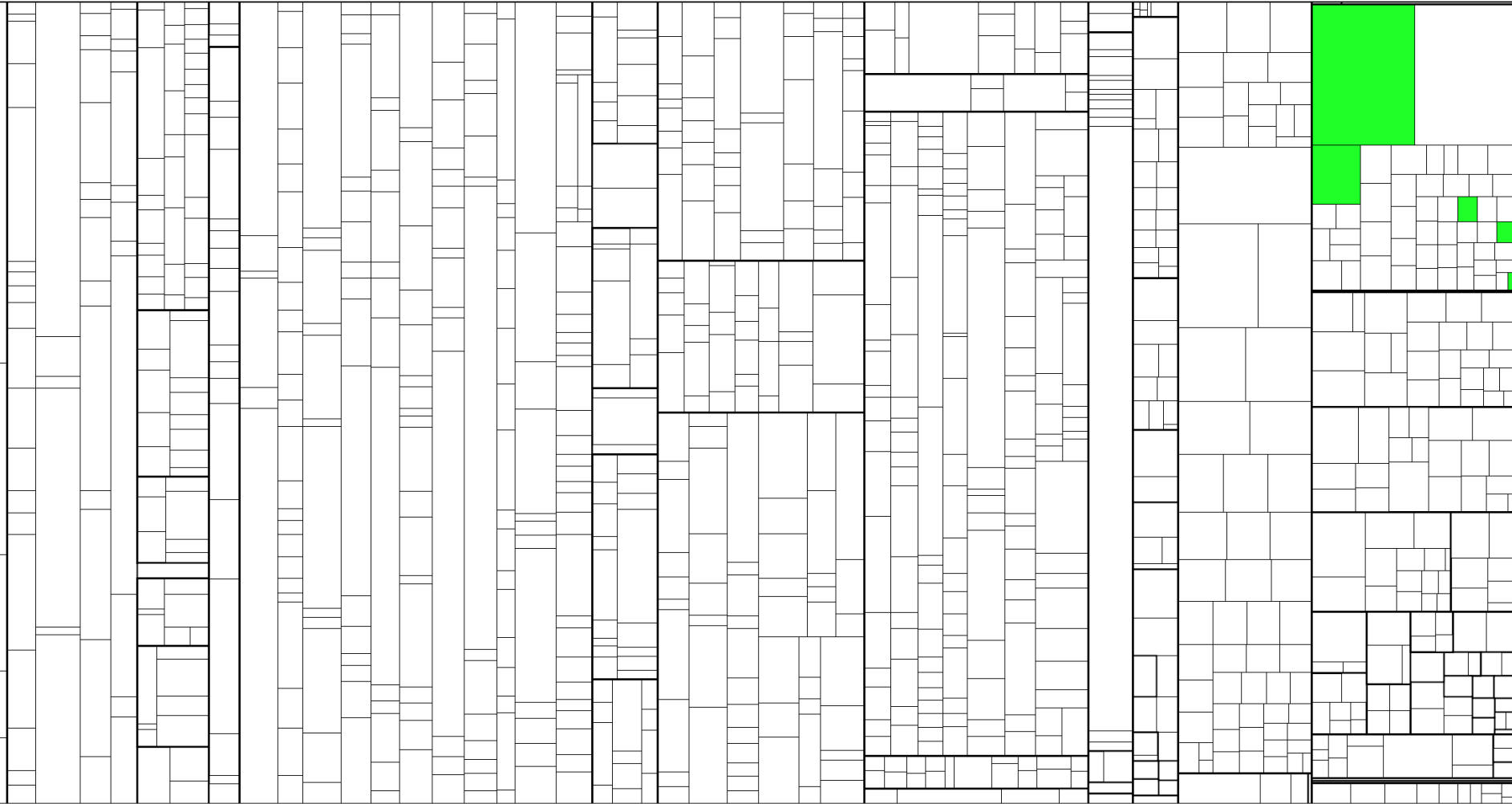
Files: 5 added

Findings: 34



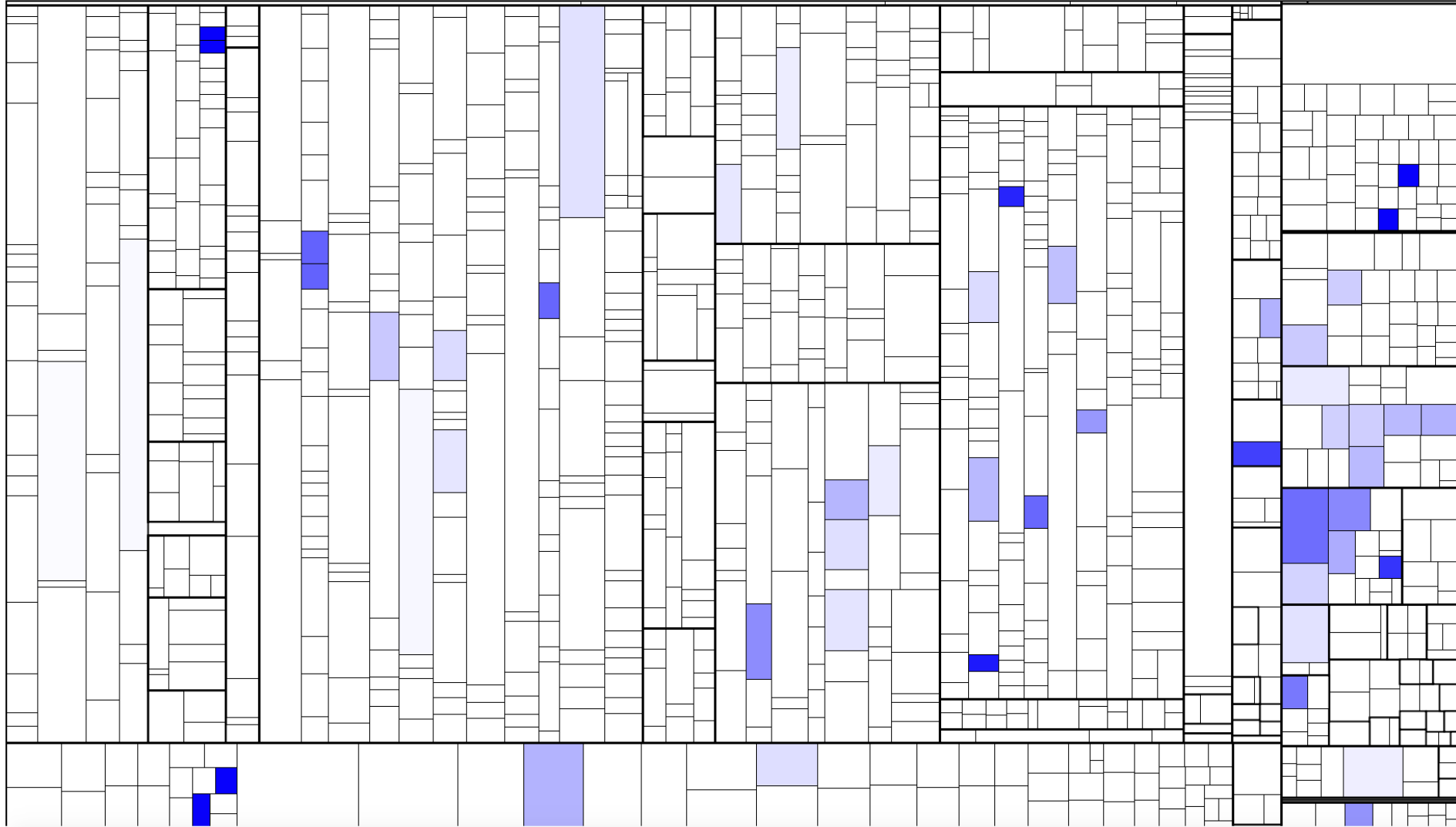
Legend:

- Blue square: Lines of Code
- Orange square: Clone Coverage



red: deleted, blue: edited, green: added

Änderungen

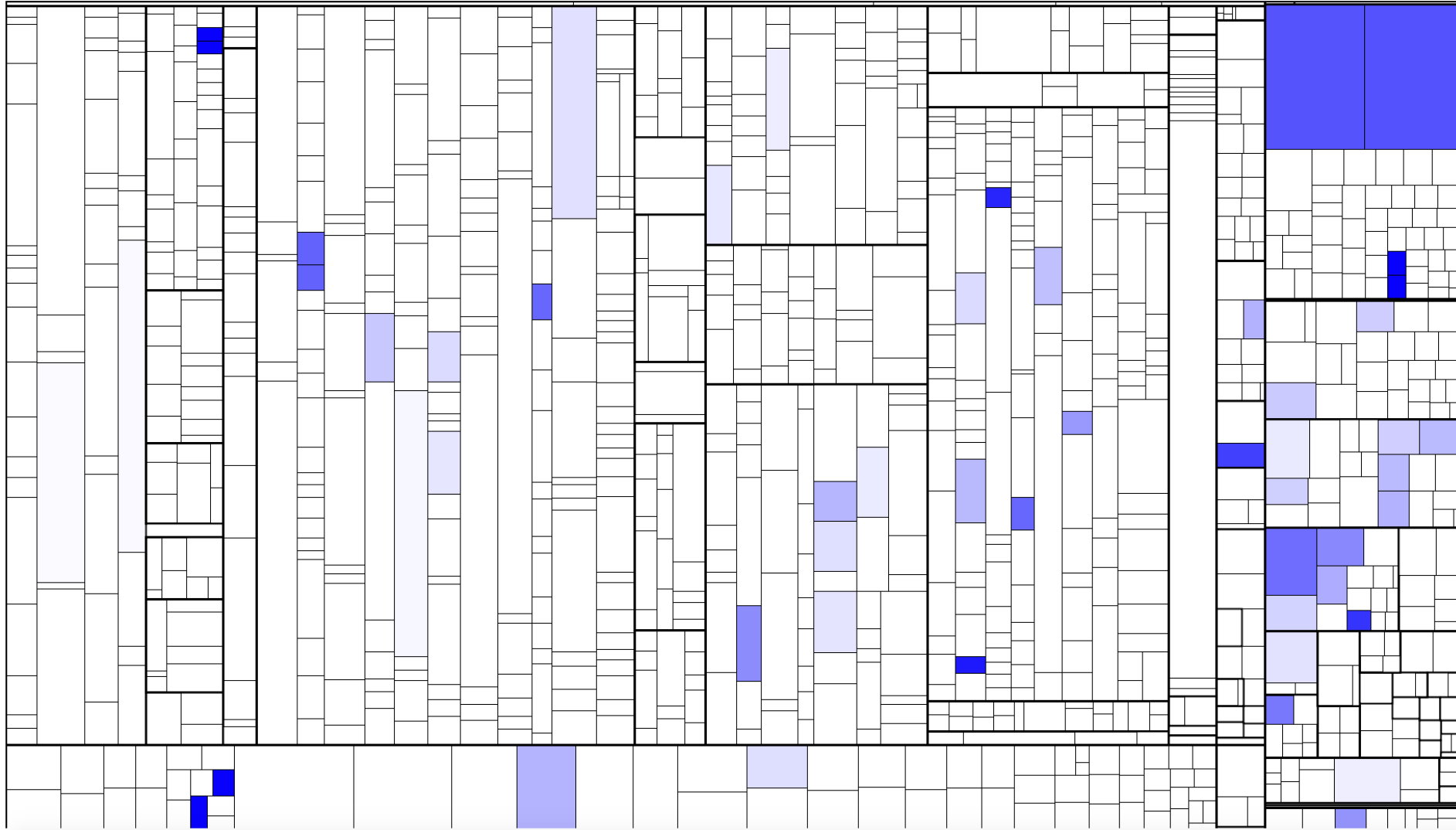


Vorher (Klonüberdeckung 2,3%)

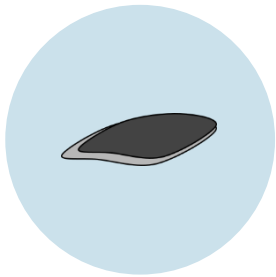


JenkinsRule.java / HudsonTestCase.java (68% Klonüberdeckung)

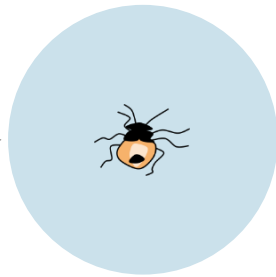
Clone Coverage Treemap for jenkins



Nachher
(Klonüberdeckung 4,2%)



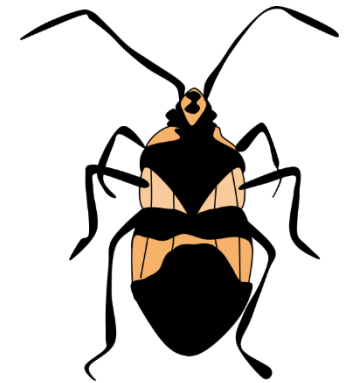
Team-Wechsel



Code-Ownership



Inkonsistenter Klon



Bug

Historienanalyse



Warum schon wieder **dieser** Fehler?

Architekt

The dashboard displays several key metrics and charts:

- Requirements:** A bar chart showing 'Requirements Status' with categories like 'Not implemented', 'Implemented', and 'Rejected'.
- Architecture and Design:** A section with a red arrow pointing down, indicating a decrease in a metric.
- Implementation:** A section with green arrows pointing up, indicating an increase in a metric.
- Cloning:** A metric showing '19.7k' with a red arrow pointing down.
- Complexity:** A metric showing '17' with a green arrow pointing up.
- Matrix Trend Chart:** A line graph showing trends over time.



Entwicklung



Test

Änderungen



Test-Gap-Analyse

Ausführung



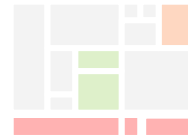
Ungetestete
Änderungen

Änderungen



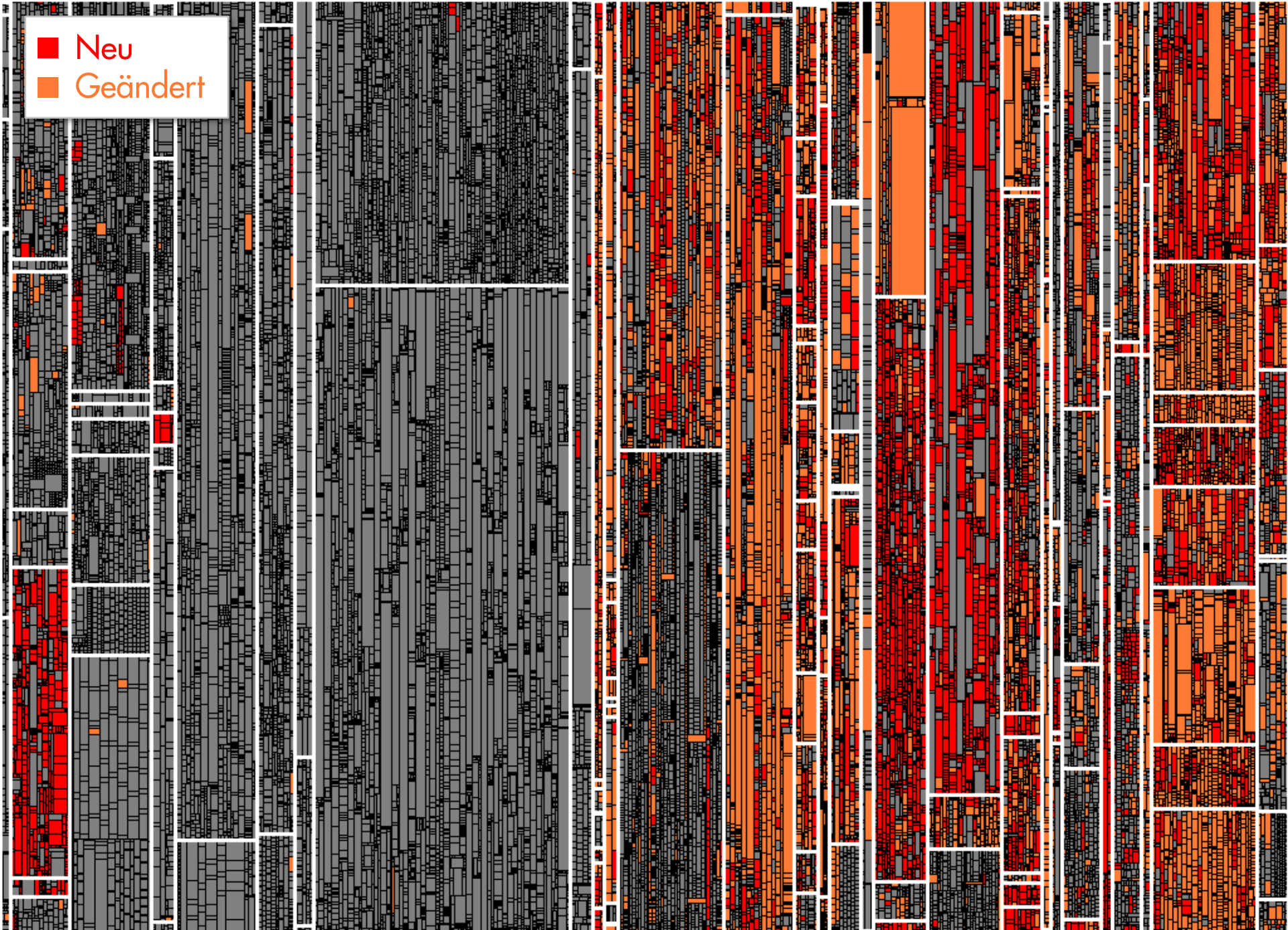
Test-Gap-Analyse

Ausführung

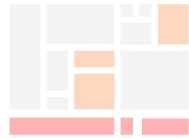


Ungetestete
Änderungen

■ Neu
■ Geändert

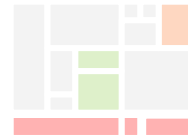


Änderungen



Test-Gap-Analyse

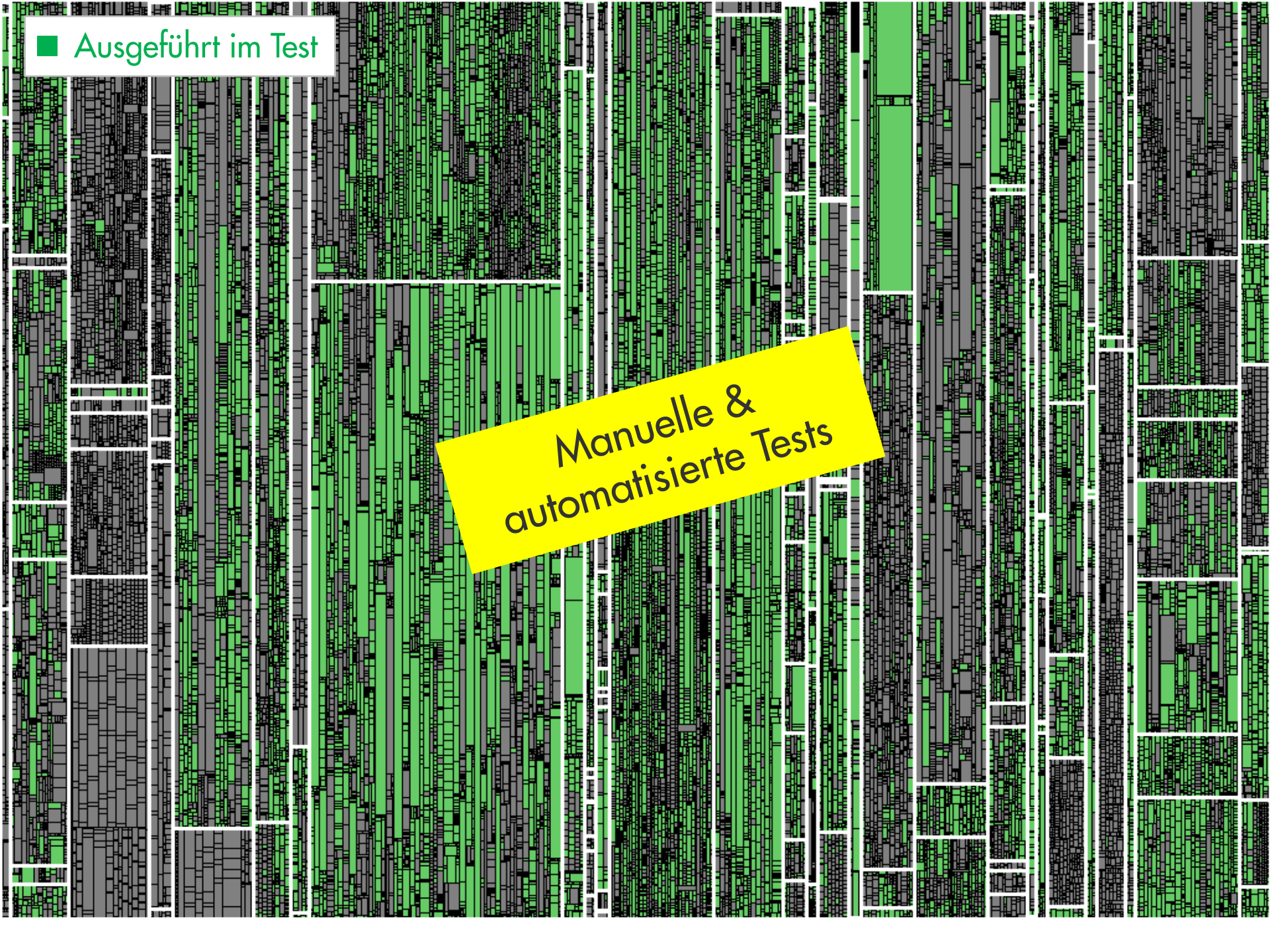
Ausführung



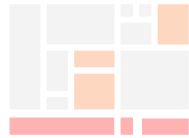
Ungetestete
Änderungen

■ Ausgeführt im Test

Manuelle & automatisierte Tests



Änderungen



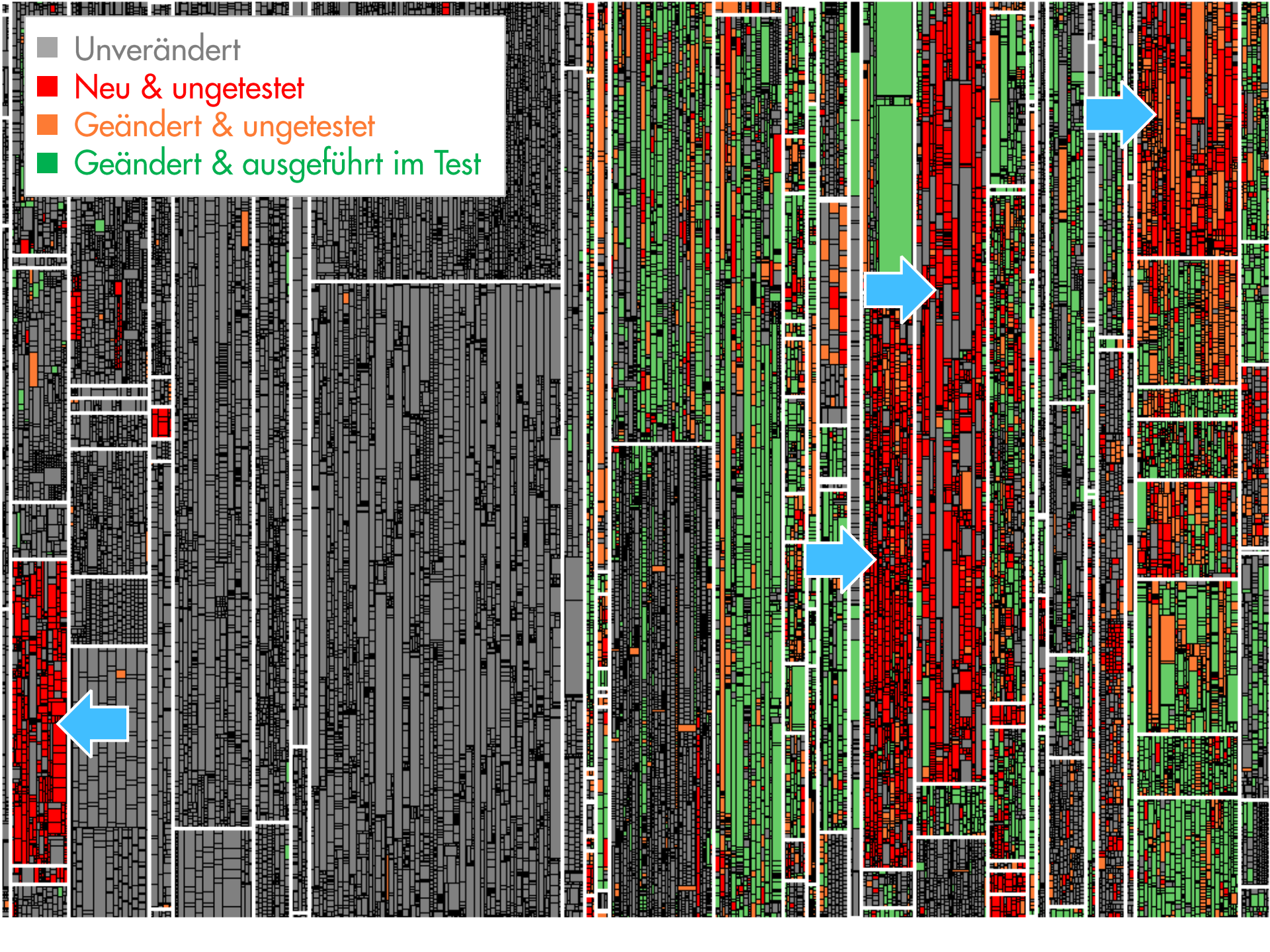
Test-Gap-Analyse

Ausführung

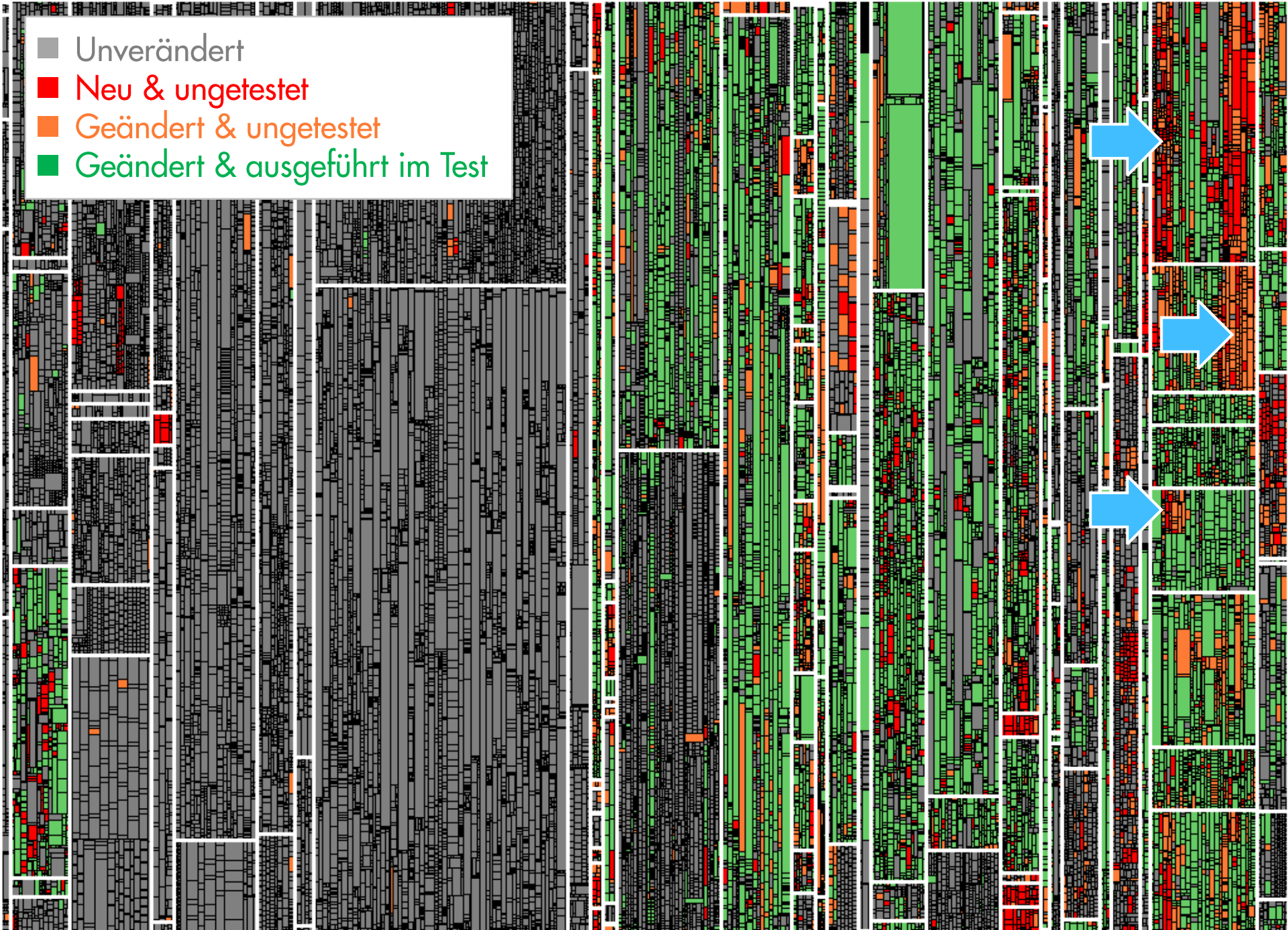


Ungetestete
Änderungen

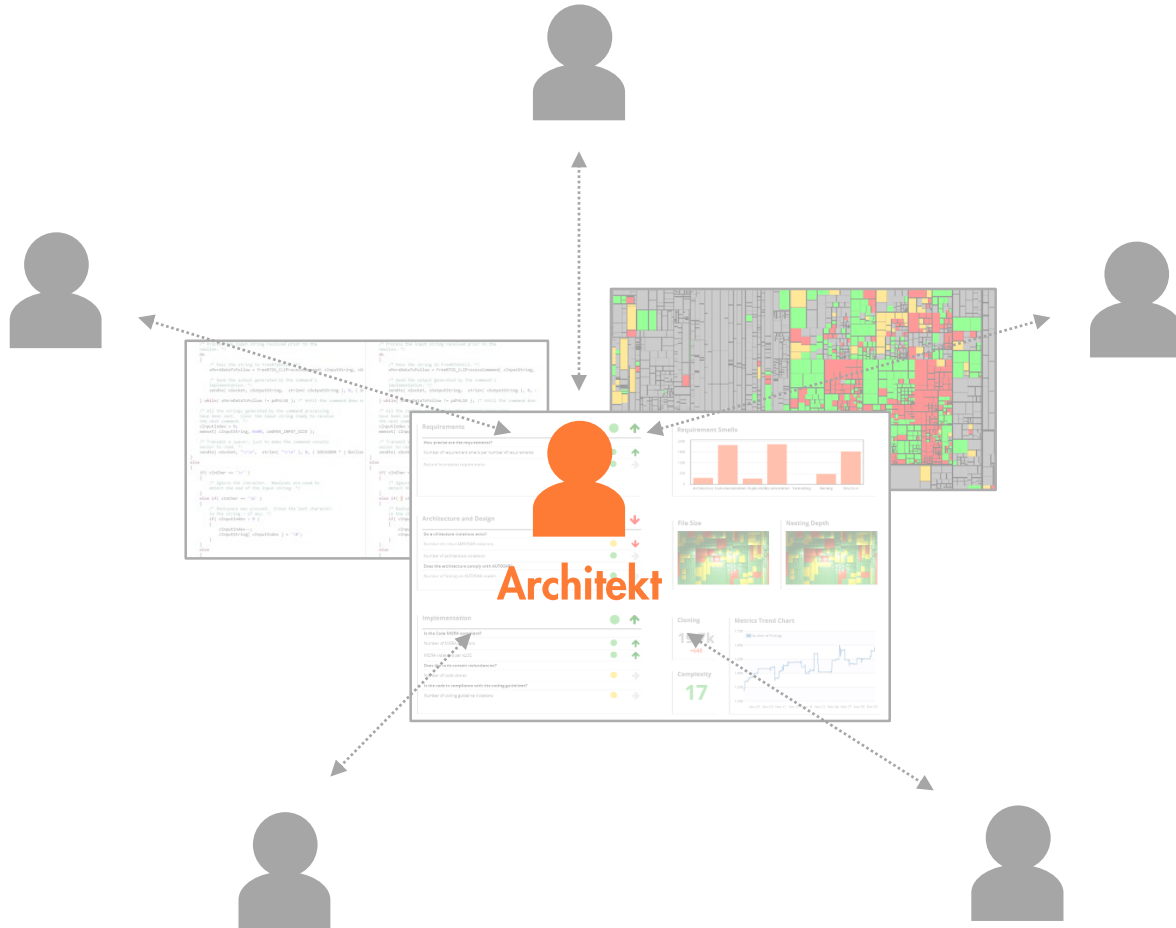
- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test

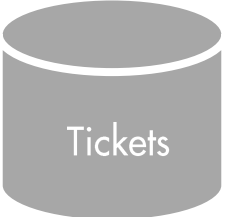
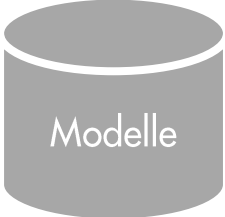
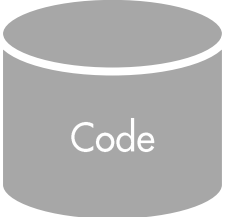


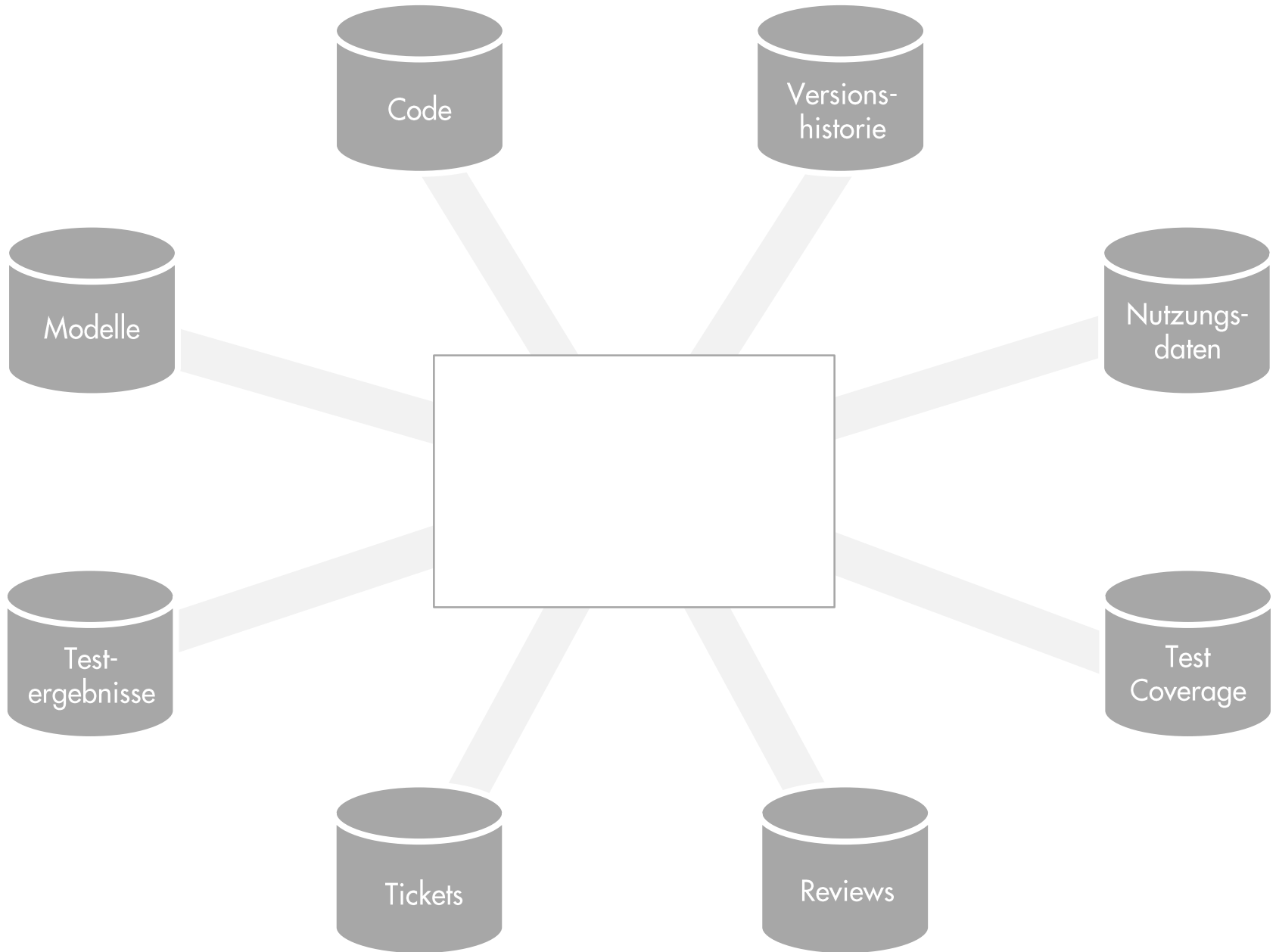
- Unverändert
- Neu & ungetestet
- Geändert & ungetestet
- Geändert & ausgeführt im Test

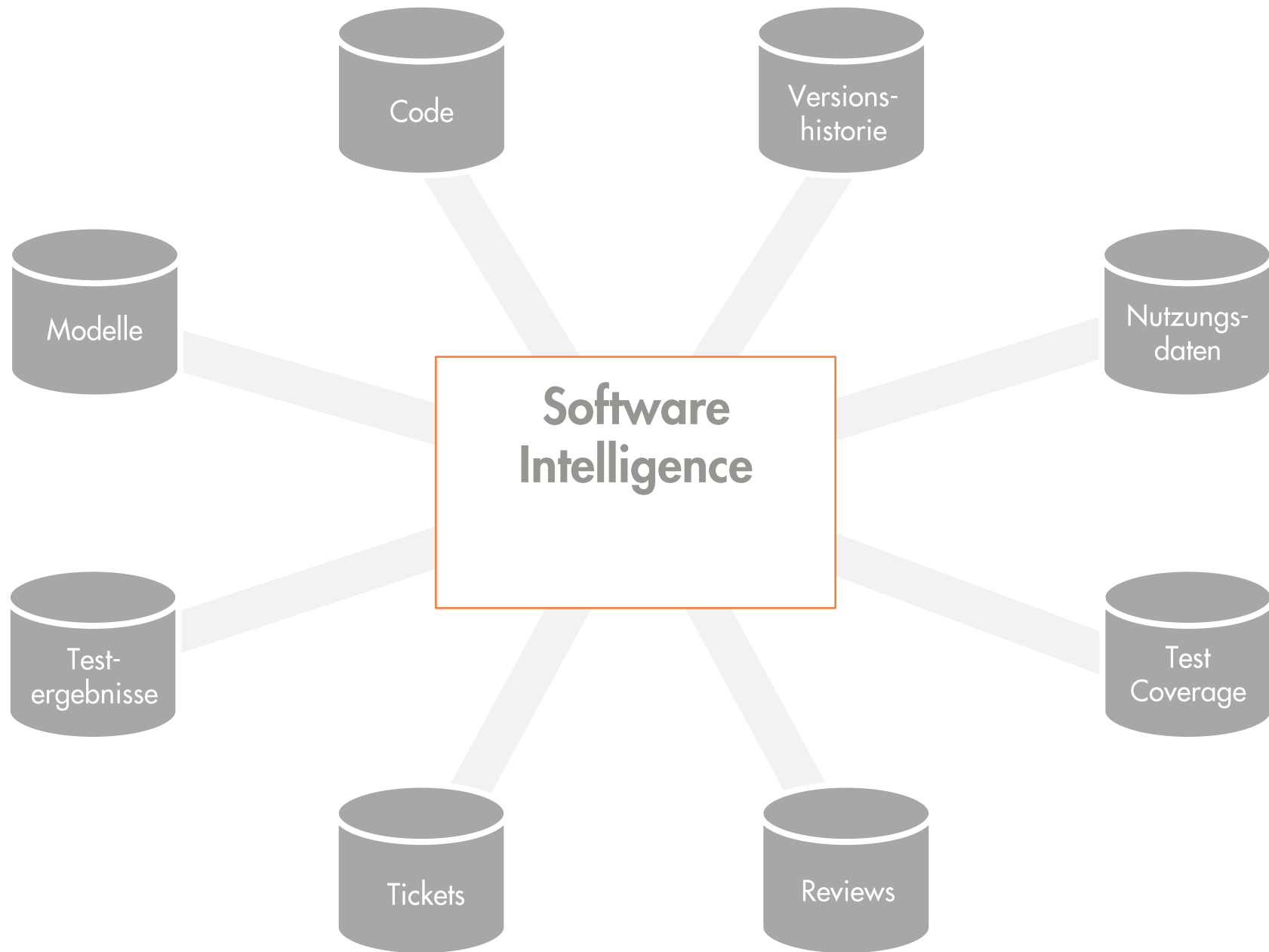


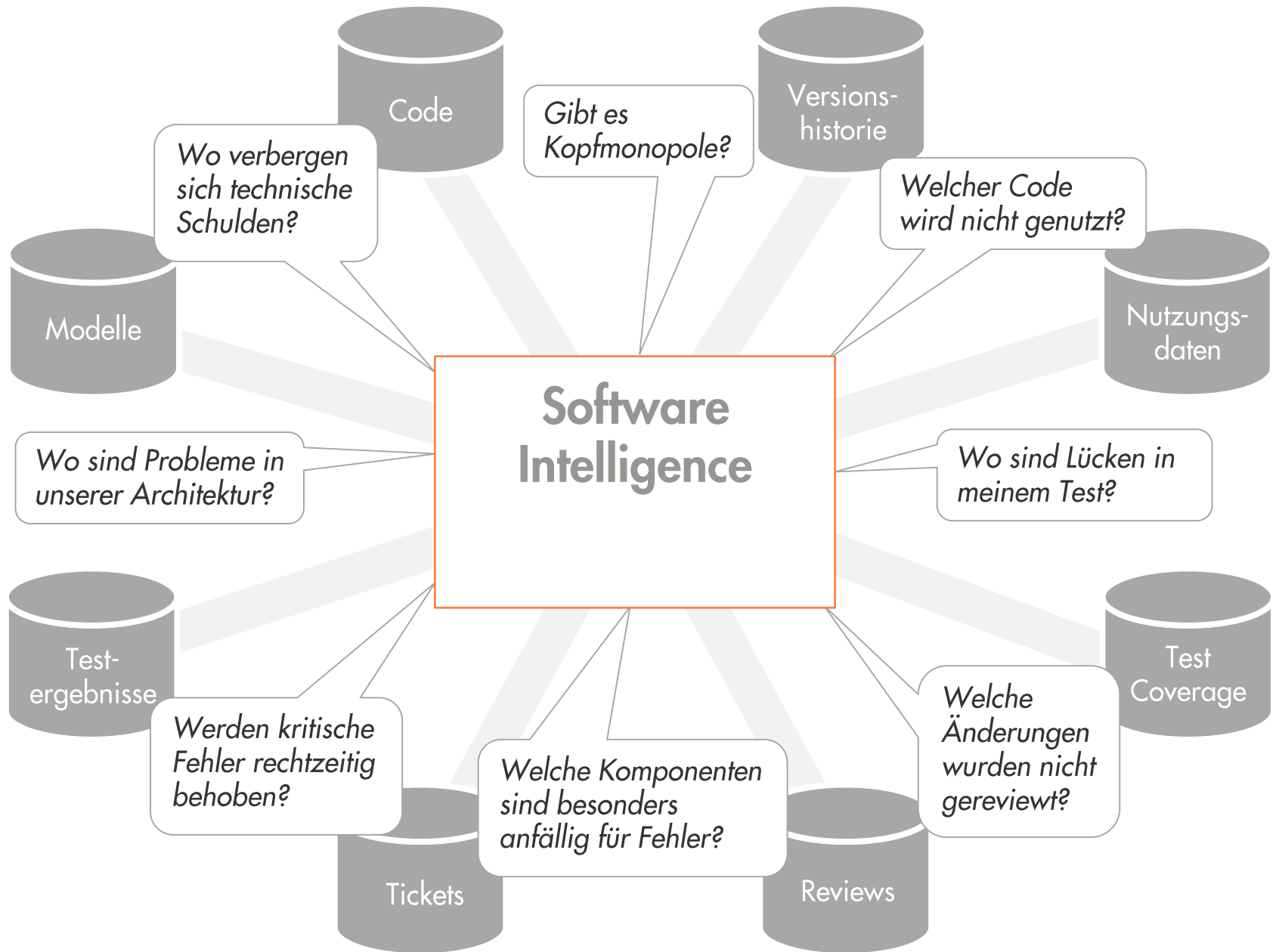
Software Intelligence

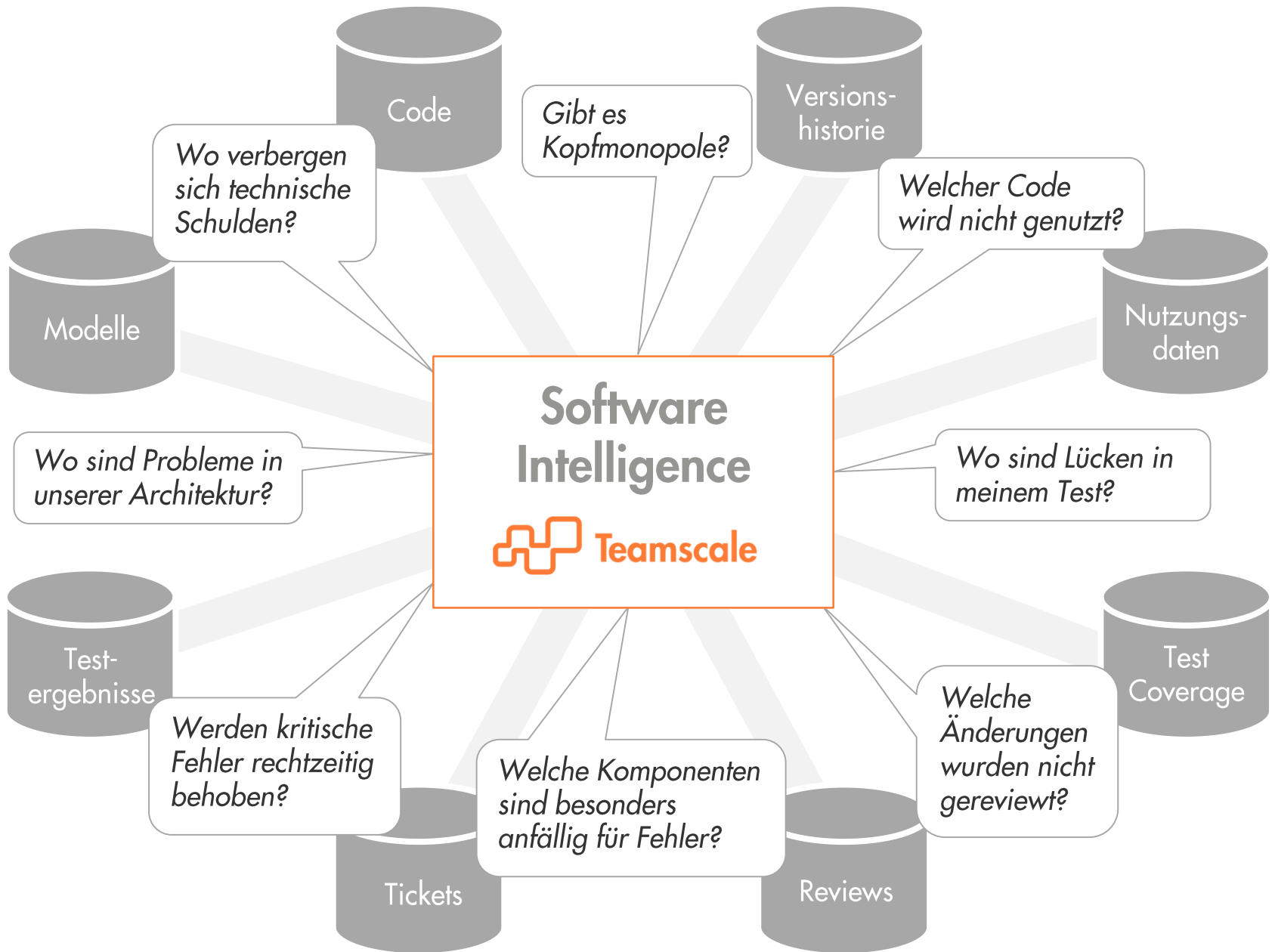












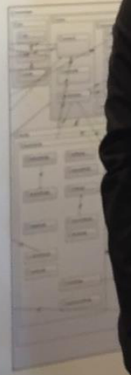
Software Intelligence

Welche Überraschungen lauern in Ihrer Software?

QSE

Wo sind Probleme
in Ihrem Quelltext?

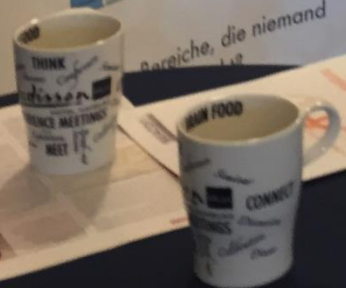
Welche Schwächen
hat Ihre Architektur
und welche Änderungen
sind ungetestet?



CGS

CIO

Besser messen



Bereiche, die niemand

Sind die zugrundeliegenden Technologien z...

... von den Anwendern ... verwendet?
... bergen sich vermutlich ... meisten Fehler?

CG

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