



Test Intelligence

How to use your existing software development process data to find more bugs in less time

Elmar Jürgens

My slides are / will be available for you at:

http://cqse.eu/atd_2022_vortrag

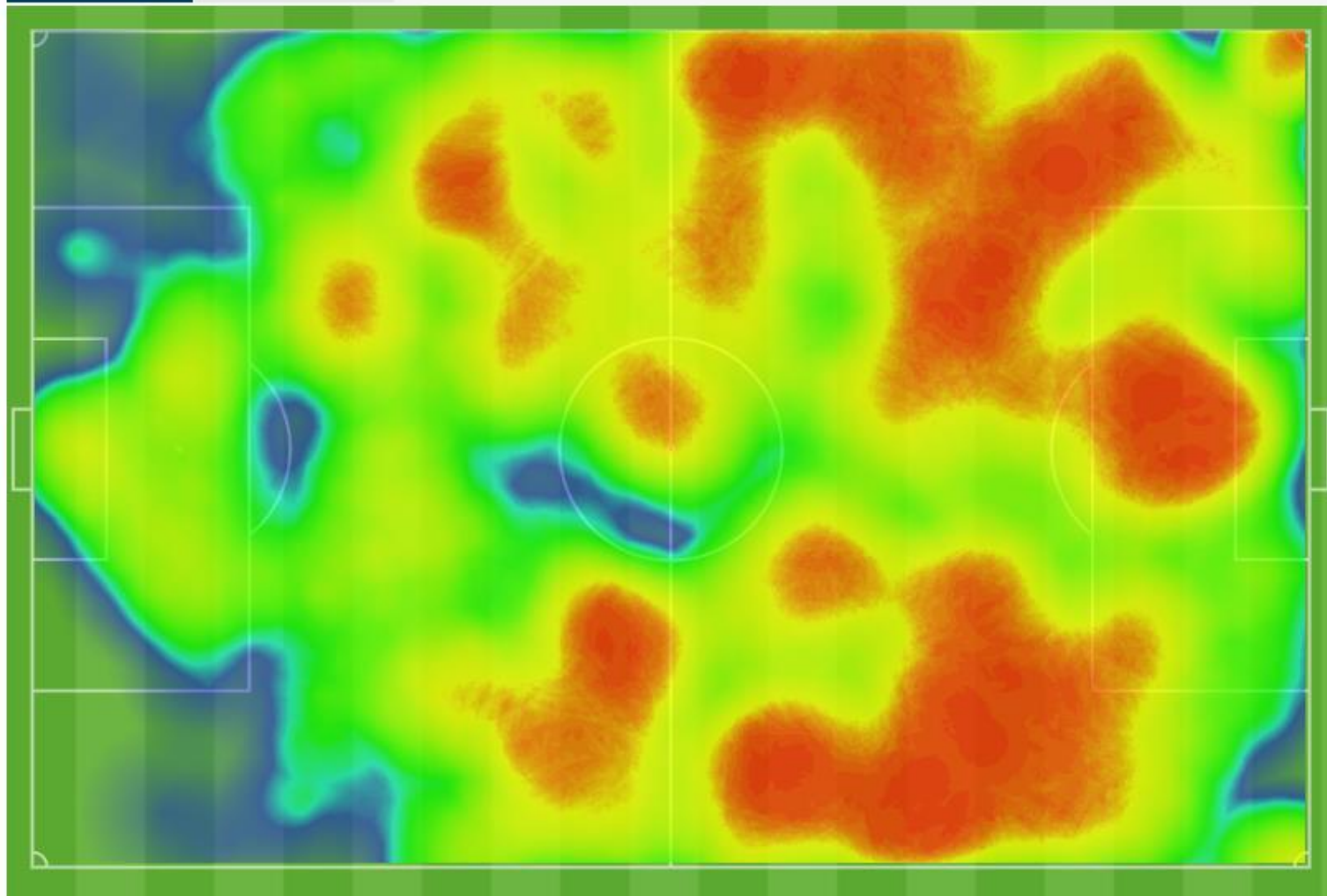




FC Bayern München

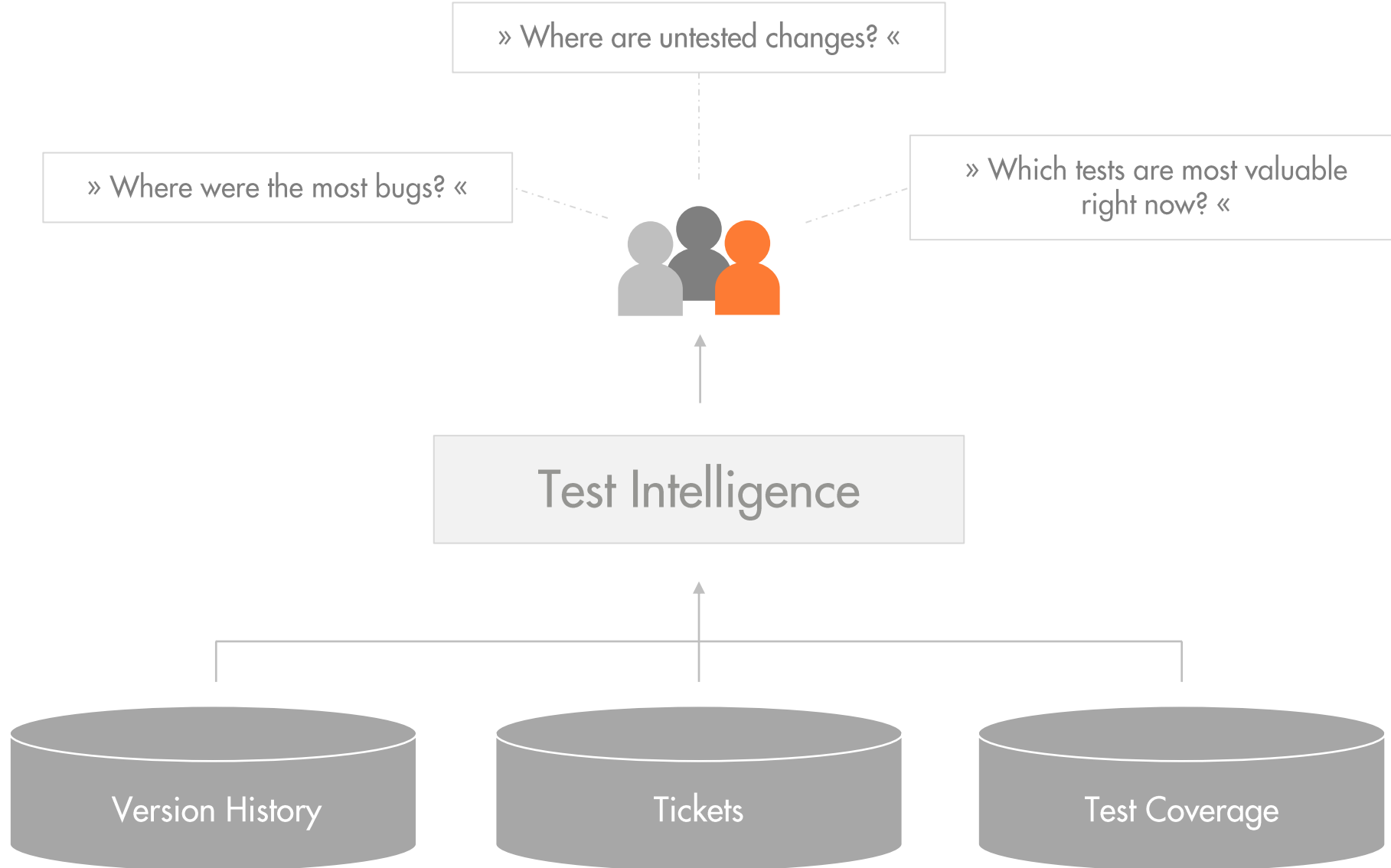
- FC Bayern München
- TW 1 Manuel Neuer
- AW 21 Lucas Hernández
- AW 5 Benjamin Pavard
- AW 4 Niklas Süle
- AW 27 David Alaba
- MF 29 Kingsley Coman
- MF 10 Leroy Sané
- MF 25 Thomas Müller
- MF 6 Joshua Kimmich
- MF 18 Leon Goretzka
- ST 13 Eric Maxim Choupo-Moting
- Einwechselfspieler
- 17 Jérôme Boateng
- 19 Alphonso Davies

Heatmap Touchmap



Paris Saint-Germain

- Paris Saint-Germain
- TW 1 Keylor Navas
- AW 5 Marquinhos
- AW 31 Colin Dagba
- AW 22 Abdou Diallo
- AW 3 Presnel Kimpembe
- MF 23 Julian Draxler
- MF 27 Idrissa Gueye
- MF 10 Neymar
- MF 15 Danilo Pereira
- MF 11 Ángel Di María
- ST 7 Kylian Mbappé
- Einwechselfspieler
- 25 Mitchel Bakker
- 18 Moise Kean
- 21 Ander Herrera
- 12 Rafinha

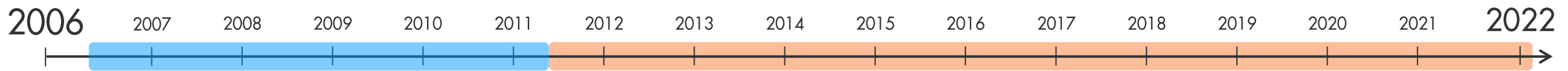


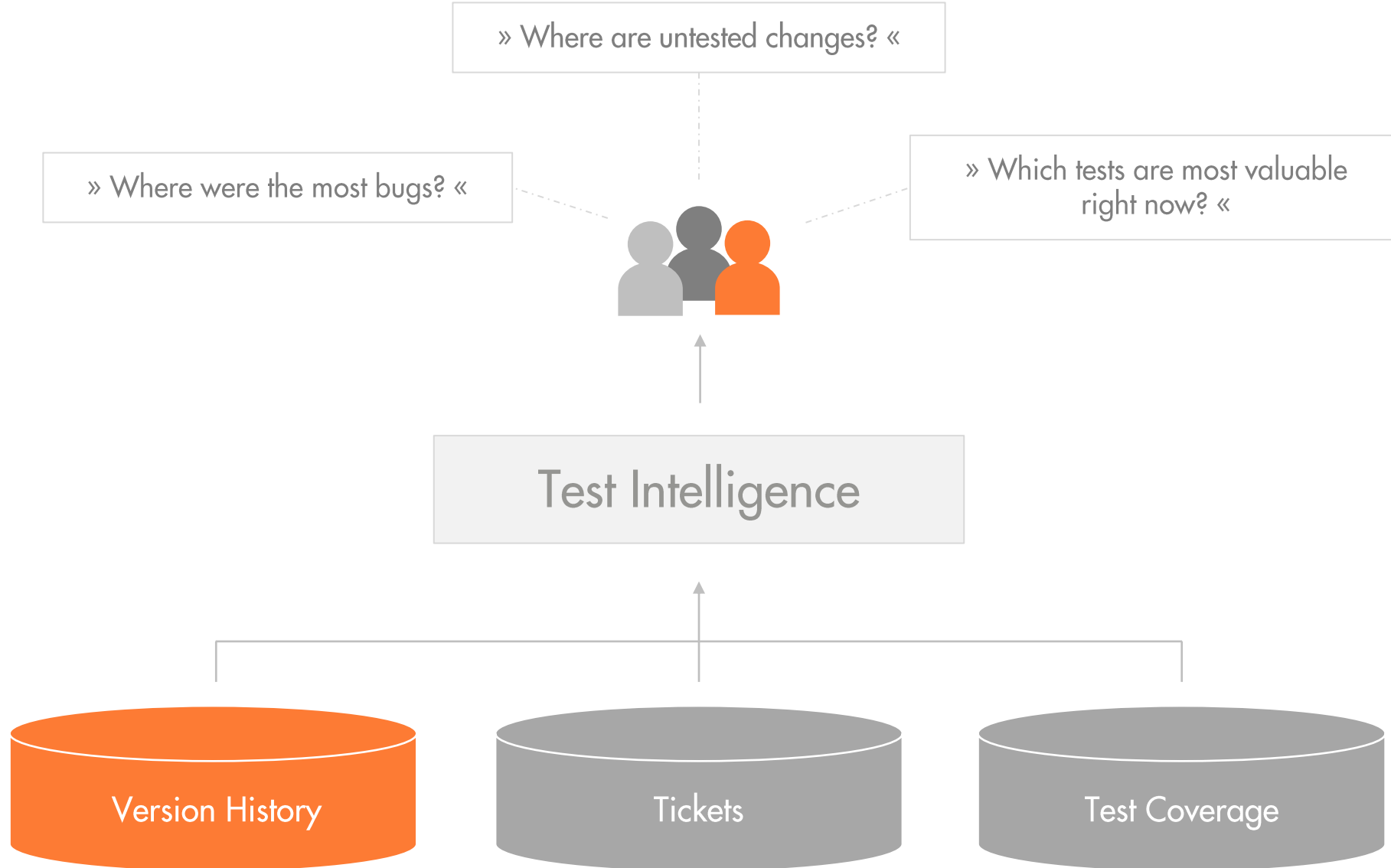


TUM



CQSE





```

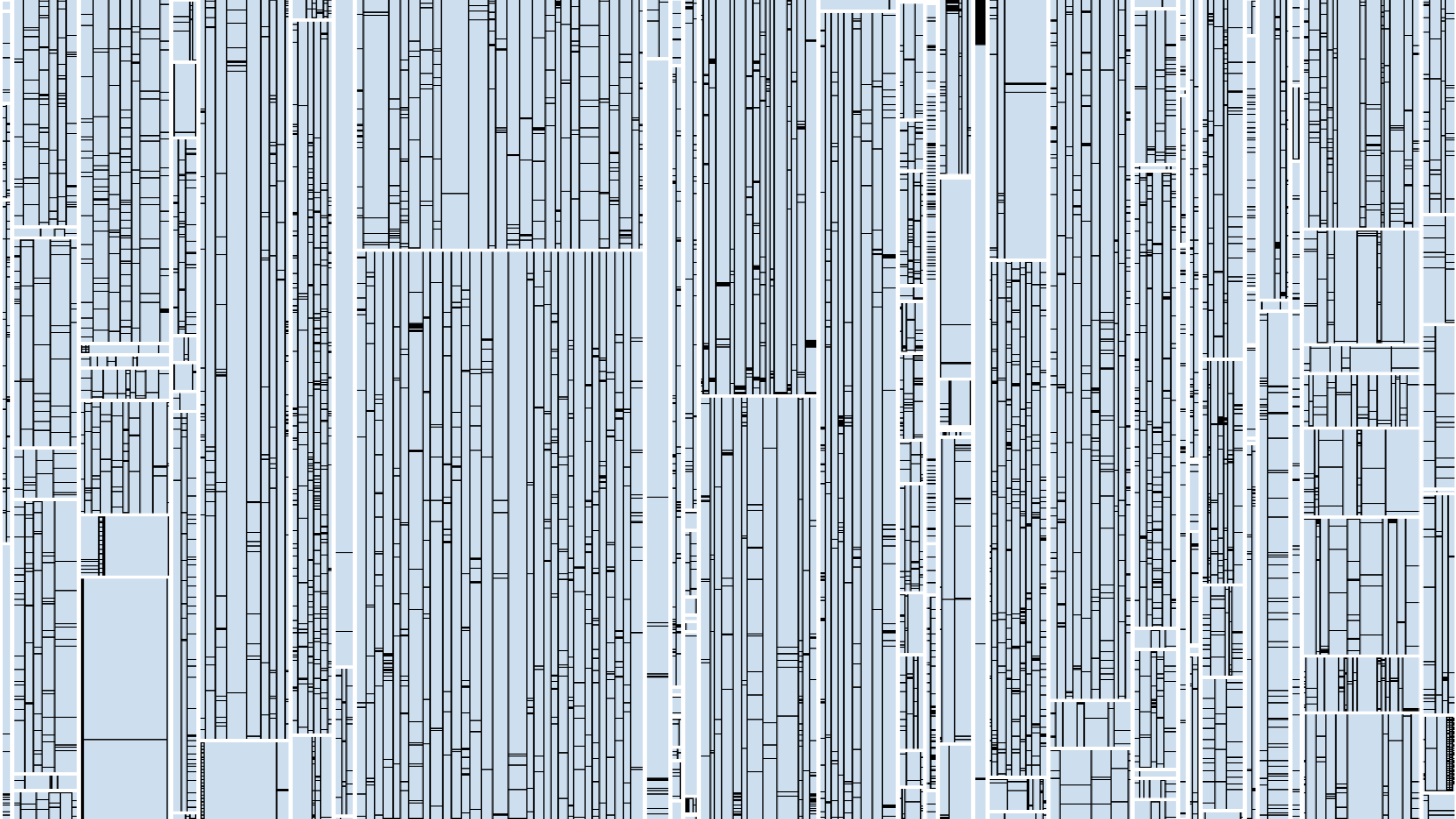
23
24
25
26 /* package */class NamespaceRenames {
27
28     /** Maps from old name fragment to new name fragment */
29     public Set<ImmutablePair<String, String>> namespaceRenames = new HashSet<
30
31     /**
32      * Computes a rename rule from an old and a new namespace name based on a
33      * type name correspondence. <code>
34      * For name1 = a.oldnamespace.b.c.D and name2 = a.newnamespace.b.c.D, res
35      * </code>
36      * */
37     public static ImmutablePair<String, String> computeRenameRule(
38         String fqTypeName1, String fqTypeName2, String separator) {
39
40         if (fqTypeName1.equals(fqTypeName2)) {
41             return null;
42         }
43
44         String commonSuffix = StringUtils.longestCommonSuffix(fqTypeName1,
45             fqTypeName2);
46         if (StringUtils.isEmpty(commonSuffix)) {
47             return null;
48         }
49
50         int separatorPosition = commonSuffix.indexOf(separator);
51         if (separatorPosition != -1) {
52             commonSuffix = commonSuffix.substring(separatorPosition);
53         }
54
55         String from = StringUtils.stripSuffix(commonSuffix, fqTypeName1);
56         String to = StringUtils.stripSuffix(commonSuffix, fqTypeName2);
57
58         return new ImmutablePair<String, String>(from, to);
59     }
60
61
62
63
64

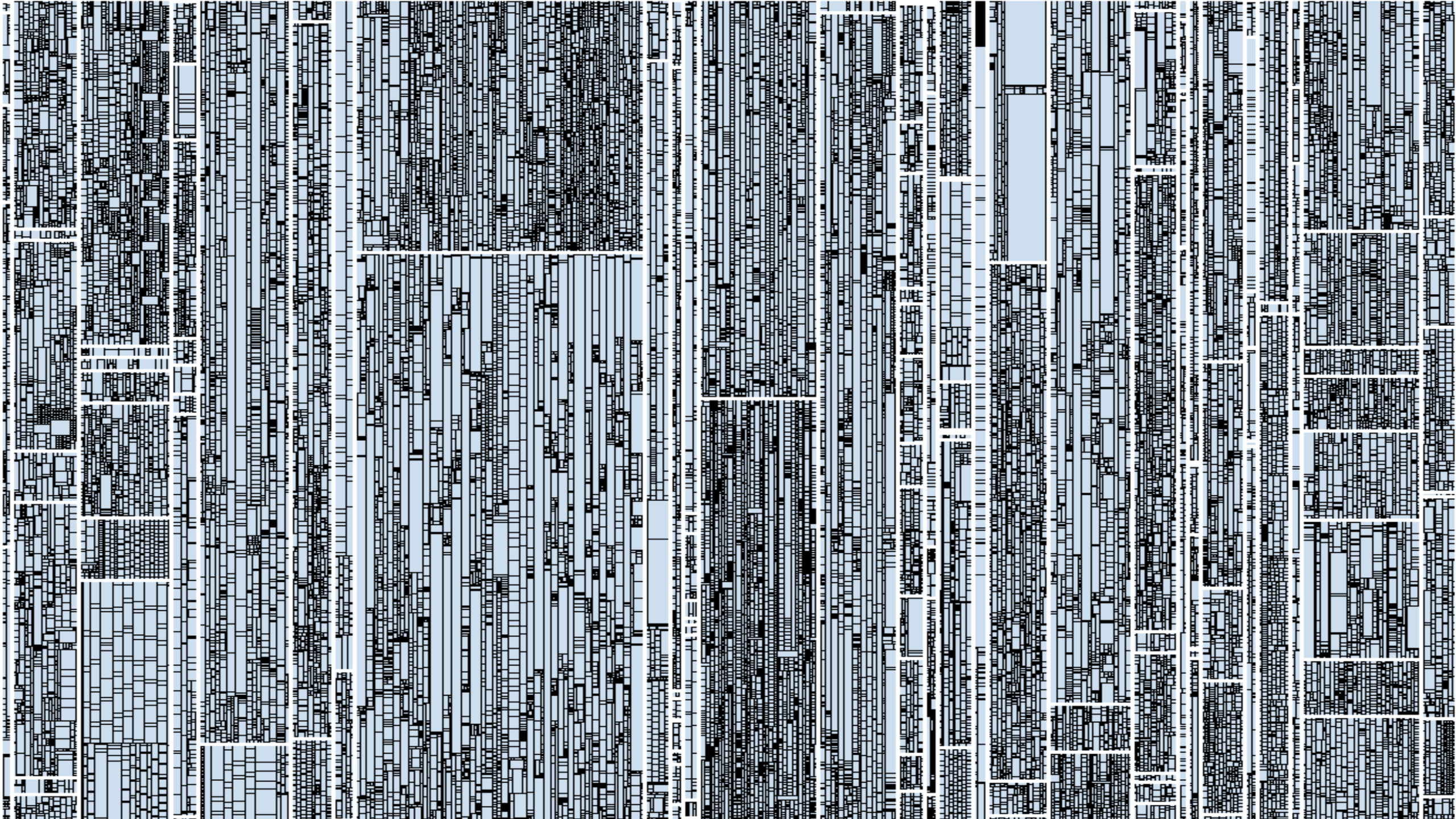
```

```

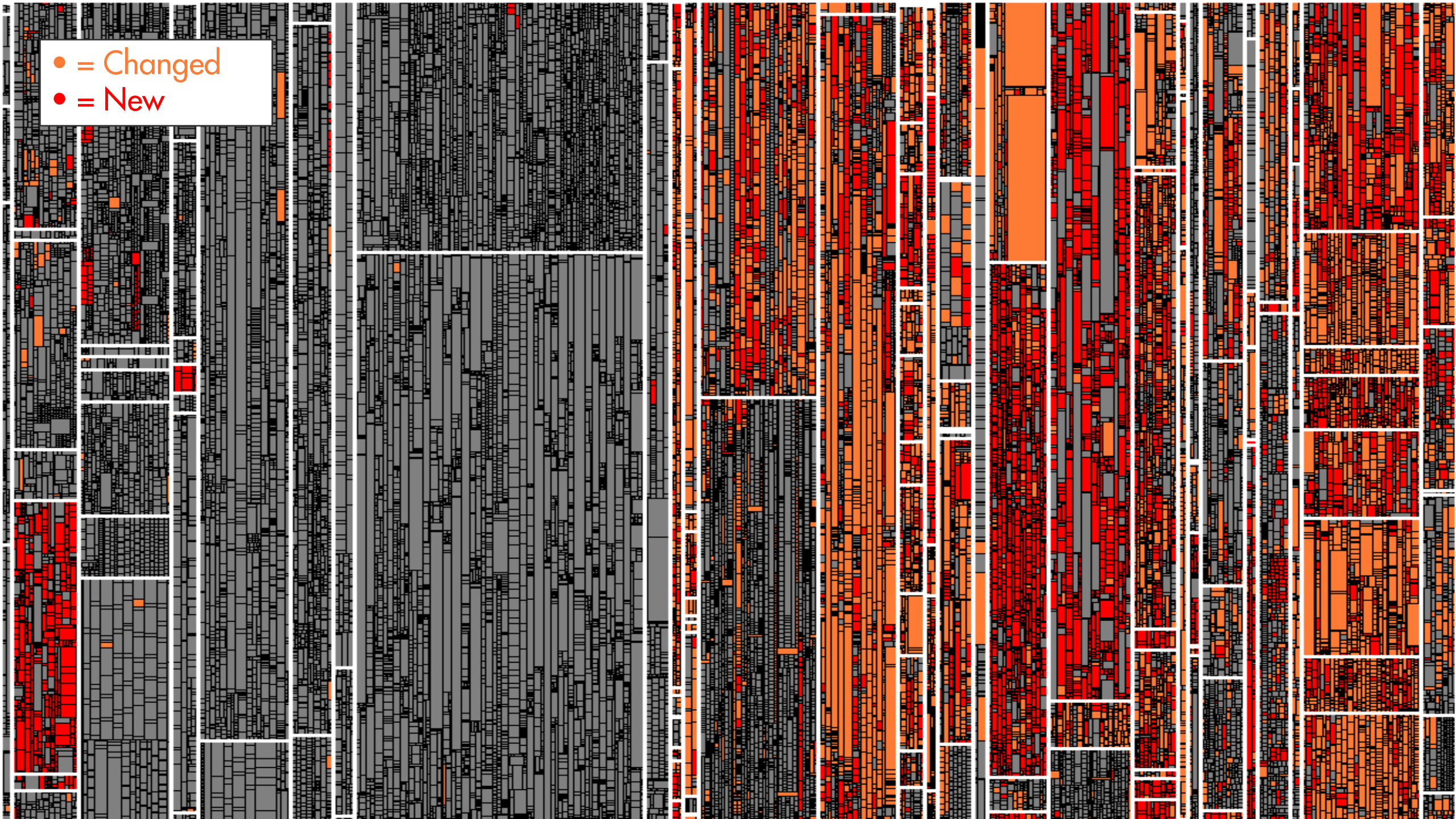
24
25
26 /* package */class NamespaceRenames {
27
28     /** Maps from old name fragment to new name fragment */
29     public Set<ImmutablePair<String, String>> namespaceRenames = new Has
30
31     // TODO (LH) Doc vs. method name : 'Compute' vs. 'find'
32     /**
33      * Computes a rename rule from an old and a new namespace name based
34      * type name correspondence. <code>
35      * For name1 = a.oldnamespace.b.c.D and name2 = a.newnamespace.b.c.D
36      * </code>
37      * */
38     // TODO (LH) Please reflect in identifier names that they refer to
39     // names
40     public static ImmutablePair<String, String> findRenameRule(String na
41         String name2, String separator) {
42
43         if (name1.equals(name2)) {
44             return null;
45         }
46
47         // TODO (LH) Looks like StringUtils is missing a 'longestCommon
48         String commonSuffix = reverse(StringUtils.longestCommonPrefix(
49             reverse(name1), reverse(name2)));
50         if (StringUtils.isEmpty(commonSuffix)) {
51             return null;
52         }
53
54         int separatorPosition = commonSuffix.indexOf(separator);
55         if (separatorPosition != -1) {
56             commonSuffix = commonSuffix.substring(separatorPosition);
57         }
58
59         // TODO (LH) Please reflect in identifier names that these are
60         // namespaces
61         String from = StringUtils.stripSuffix(commonSuffix, name1);
62         String to = StringUtils.stripSuffix(commonSuffix, name2);
63
64         return new ImmutablePair<String, String>(from, to);
65

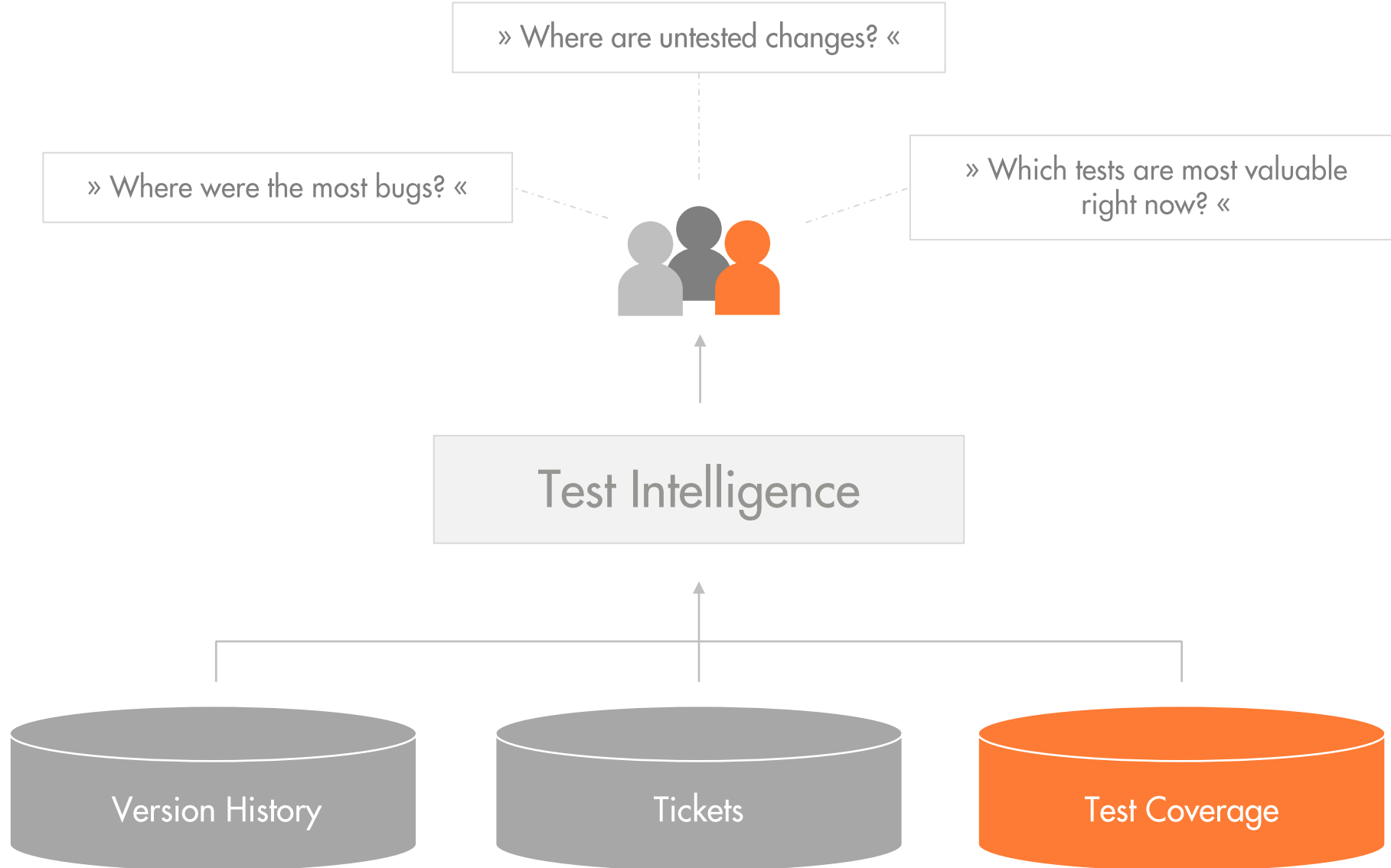
```



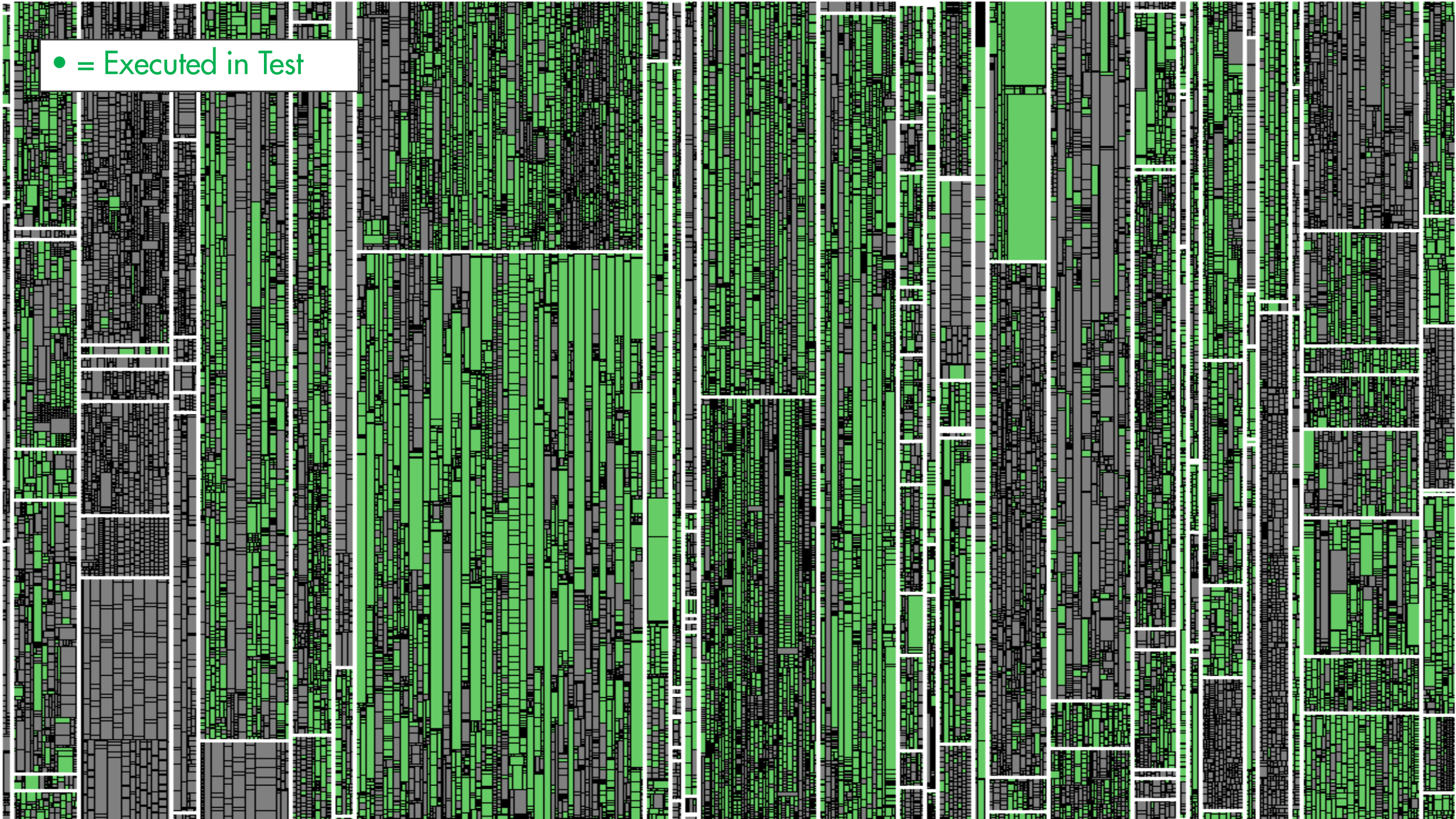
- = Changed
- = New

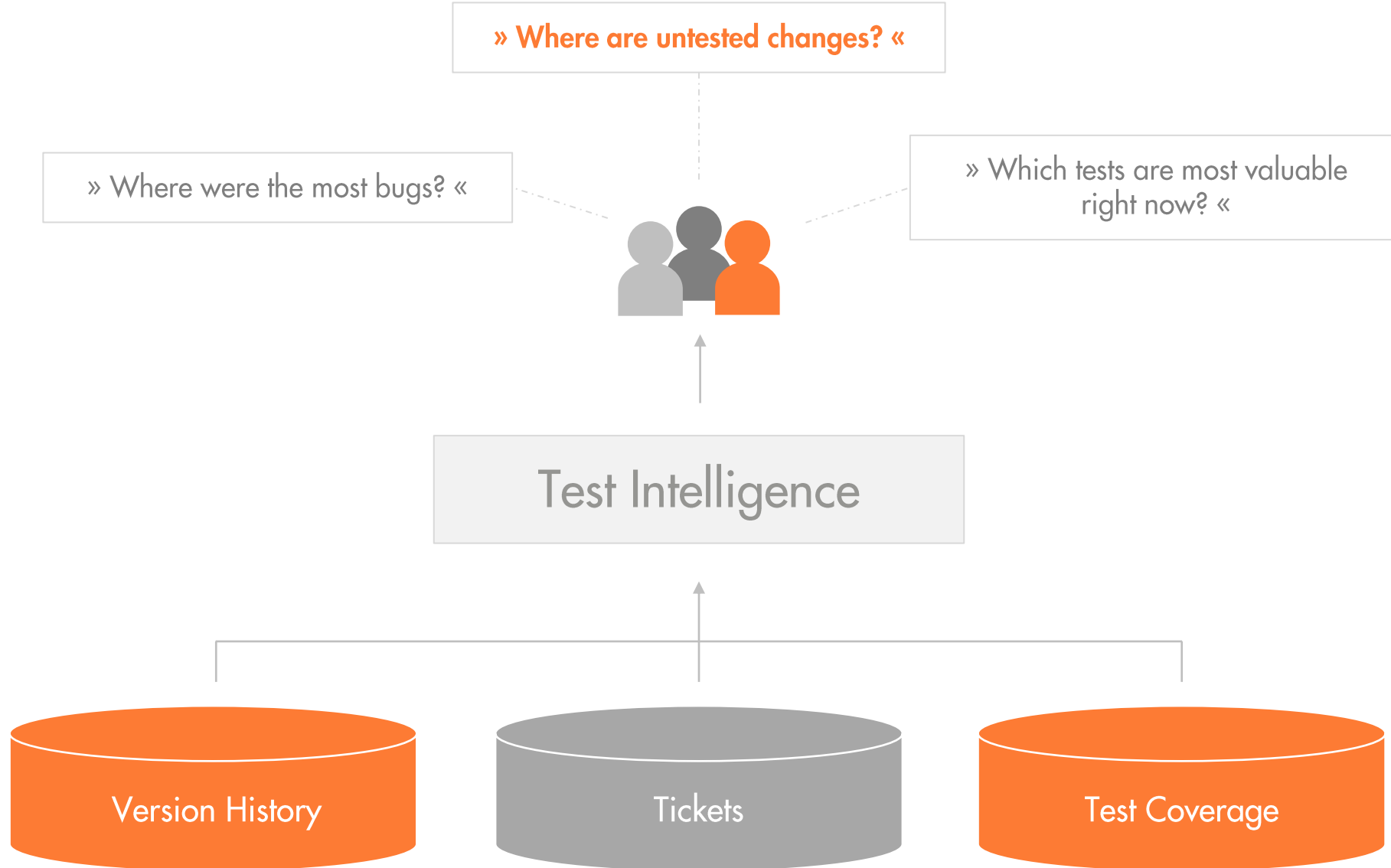




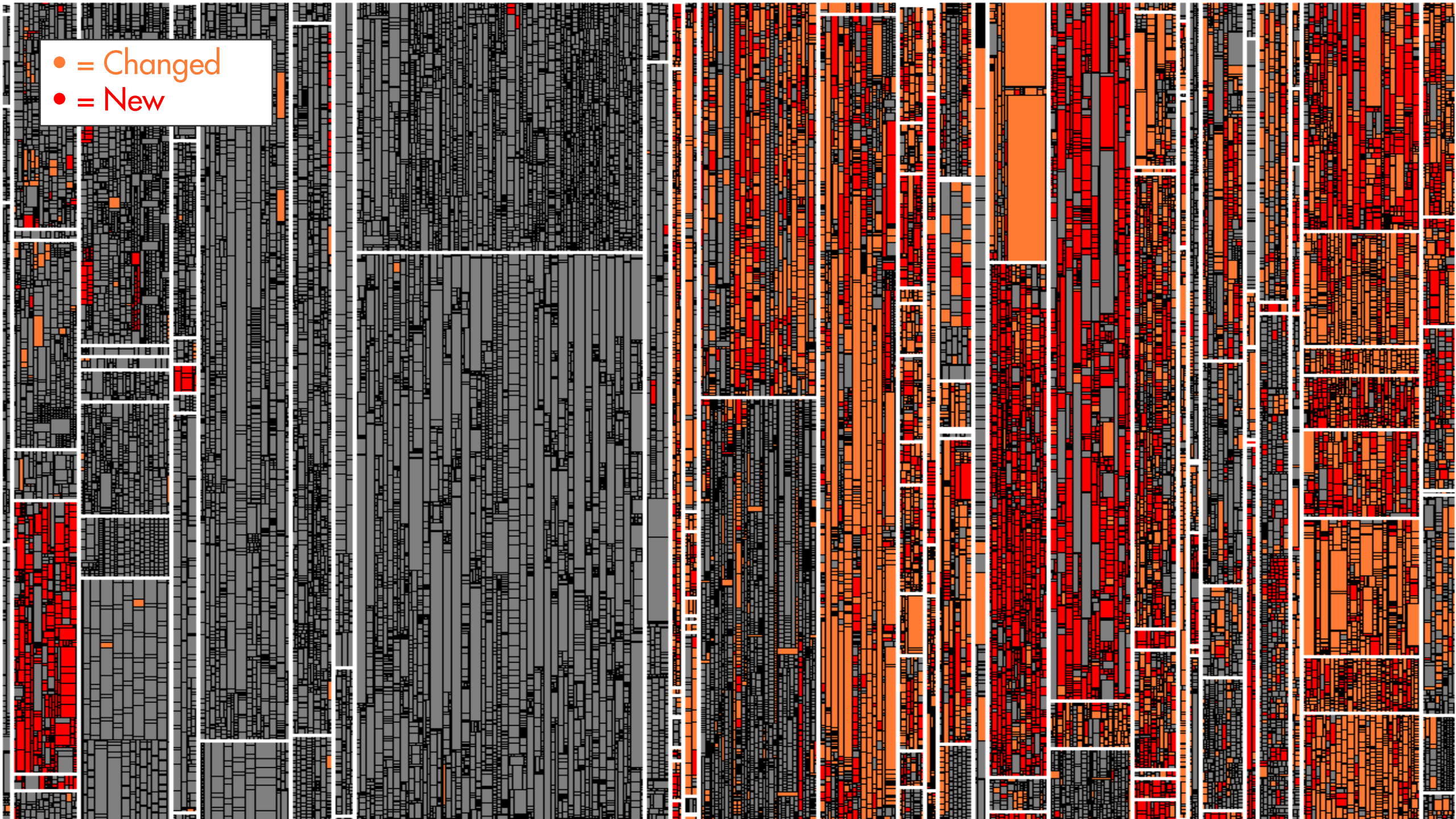
```
1  protected void calculateIndirectAmbiguities() {
2      Map<NucleotideCompound, List<NucleotideCompound>> equivalentMap = new HashMap<>>();
3
4      List<NucleotideCompound> ambiguousCompounds = new ArrayList<NucleotideCompound>();
5      for (NucleotideCompound compound : getAllCompounds()) {
6          if (!compound.isAmbiguous()) {
7              continue;
8          }
9          ambiguousCompounds.add(compound);
10     }
11
12     for (NucleotideCompound sourceCompound : ambiguousCompounds) {
13         Set<NucleotideCompound> sourceConstituents = sourceCompound.getConstituents();
14         for (NucleotideCompound targetCompound : ambiguousCompounds) {
15             Set<NucleotideCompound> targetConstituents = targetCompound.getConstituents();
16             if (targetConstituents.containsAll(sourceConstituents)) {
17                 NucleotideCompound lcSourceCompound = toLowerCase(sourceCompound);
18                 NucleotideCompound lcTargetCompound = toLowerCase(targetCompound);
19                 checkAdd(equivalentMap, sourceCompound, targetCompound);
20                 checkAdd(equivalentMap, sourceCompound, lcTargetCompound);
21                 checkAdd(equivalentMap, targetCompound, sourceCompound);
22                 checkAdd(equivalentMap, lcTargetCompound, sourceCompound);
23                 checkAdd(equivalentMap, lcSourceCompound, targetCompound);
24                 checkAdd(equivalentMap, lcSourceCompound, lcTargetCompound);
25             }
26         }
27     }
28
29     for (NucleotideCompound key : equivalentMap.keySet()) {
30         List<NucleotideCompound> vals = equivalentMap.get(key);
31         for (NucleotideCompound value : vals) {
32             addEquivalent((C) key, (C) value);
33             addEquivalent((C) value, (C) key);
34         }
35     }
36 }
```

● = Executed in Test



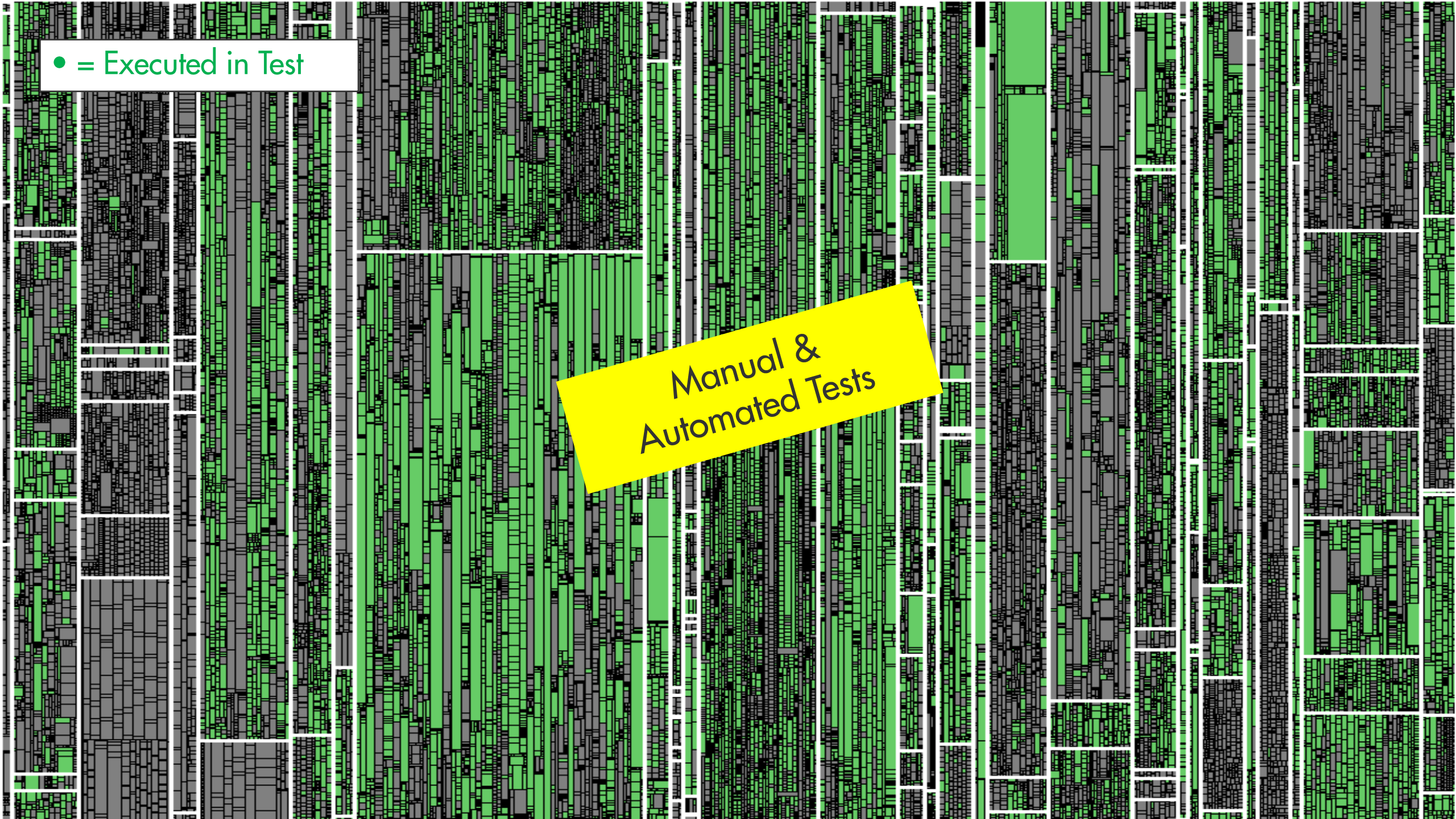


- = Changed
- = New

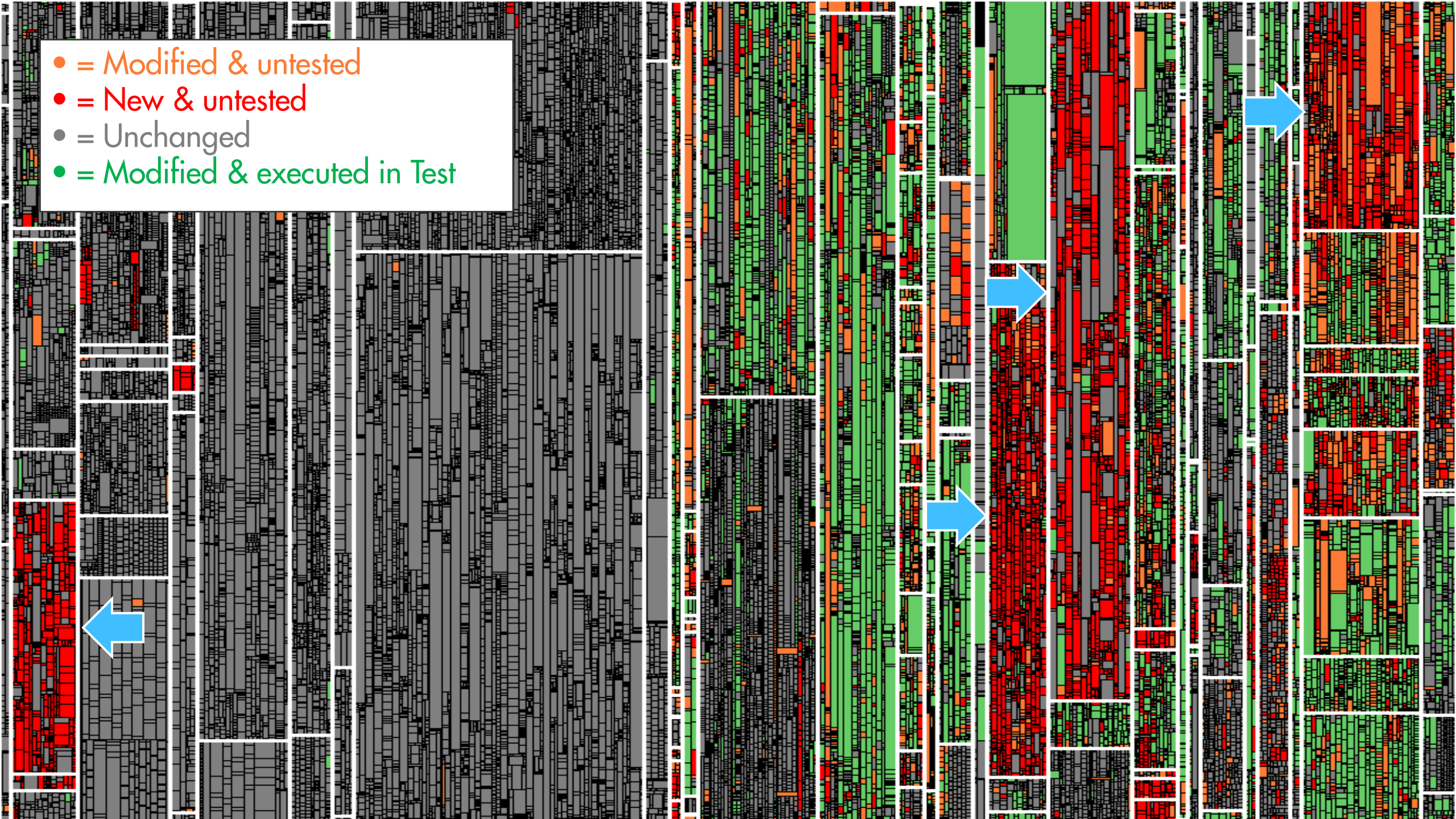


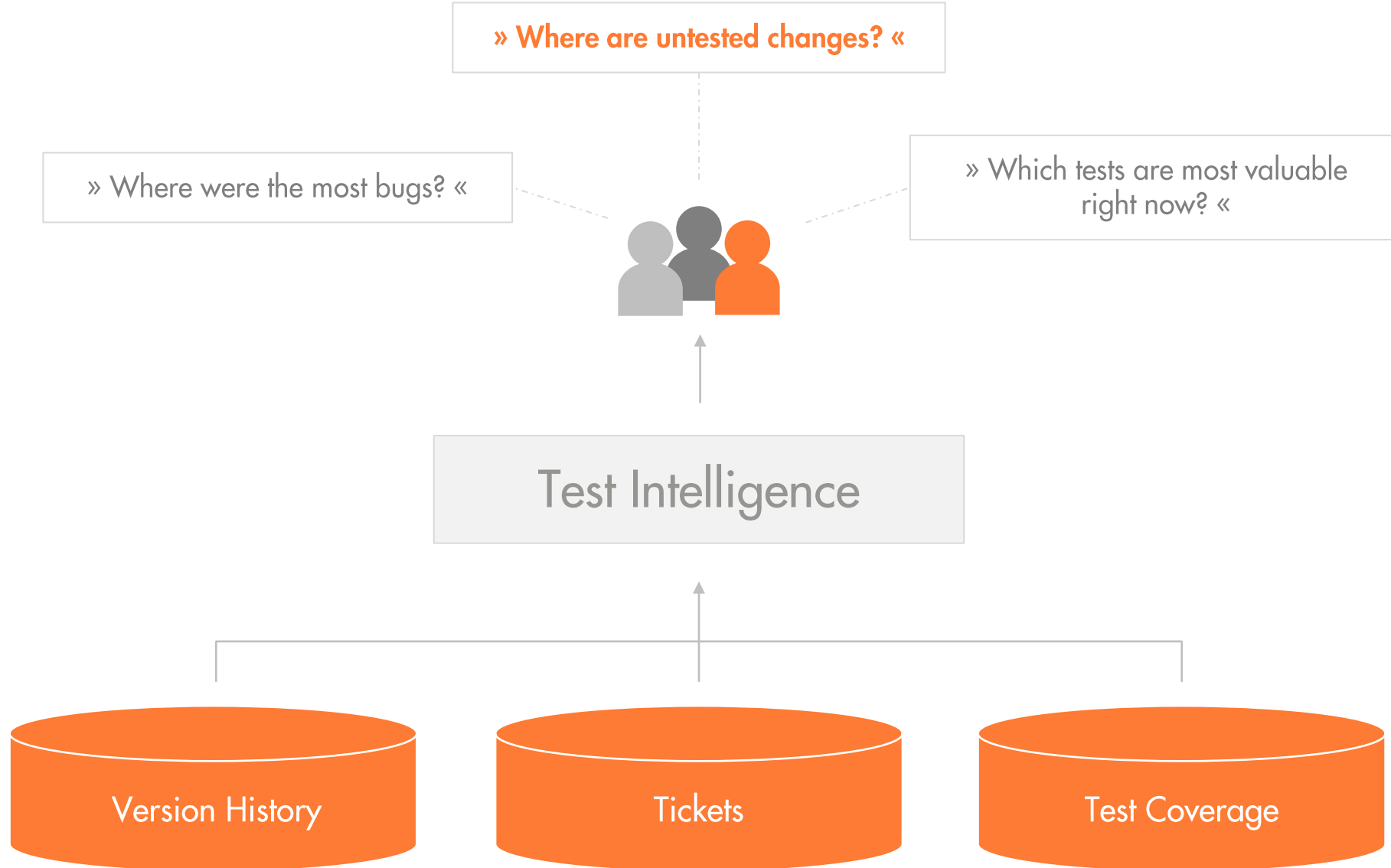
● = Executed in Test


















Manual &
Automated Tests







- = Modified & untested
- = New & untested
- = Unchanged
- = Modified & executed in Test







Issue # ▼	Subject	Done		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-12050	Tool for transferring findings blacklists and tasks	Done		50% 
🔗 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% 

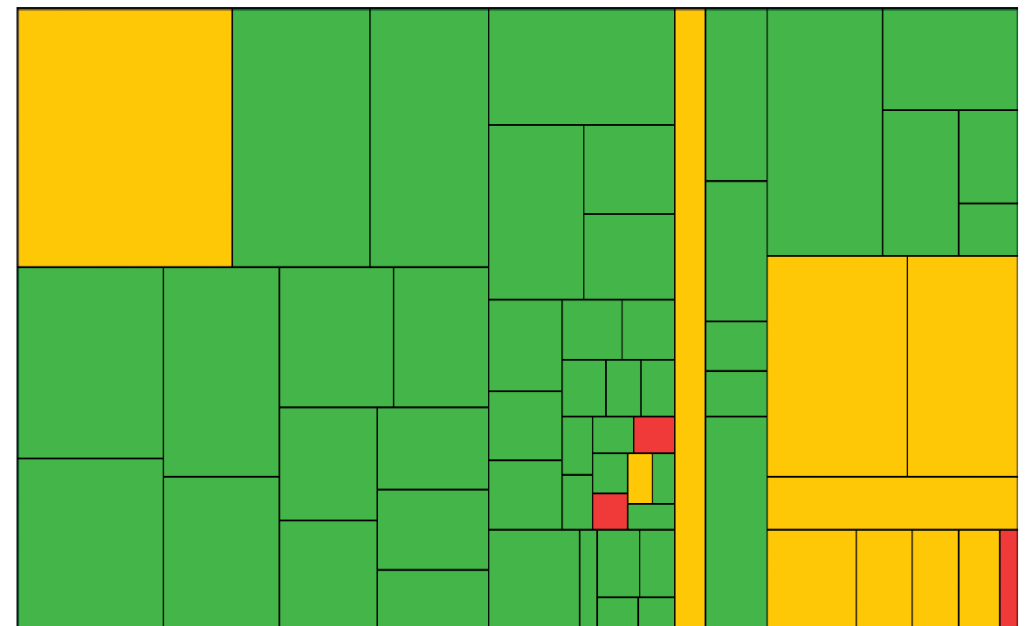
Done Issue TS-14733 - Remove Dataflow blocks

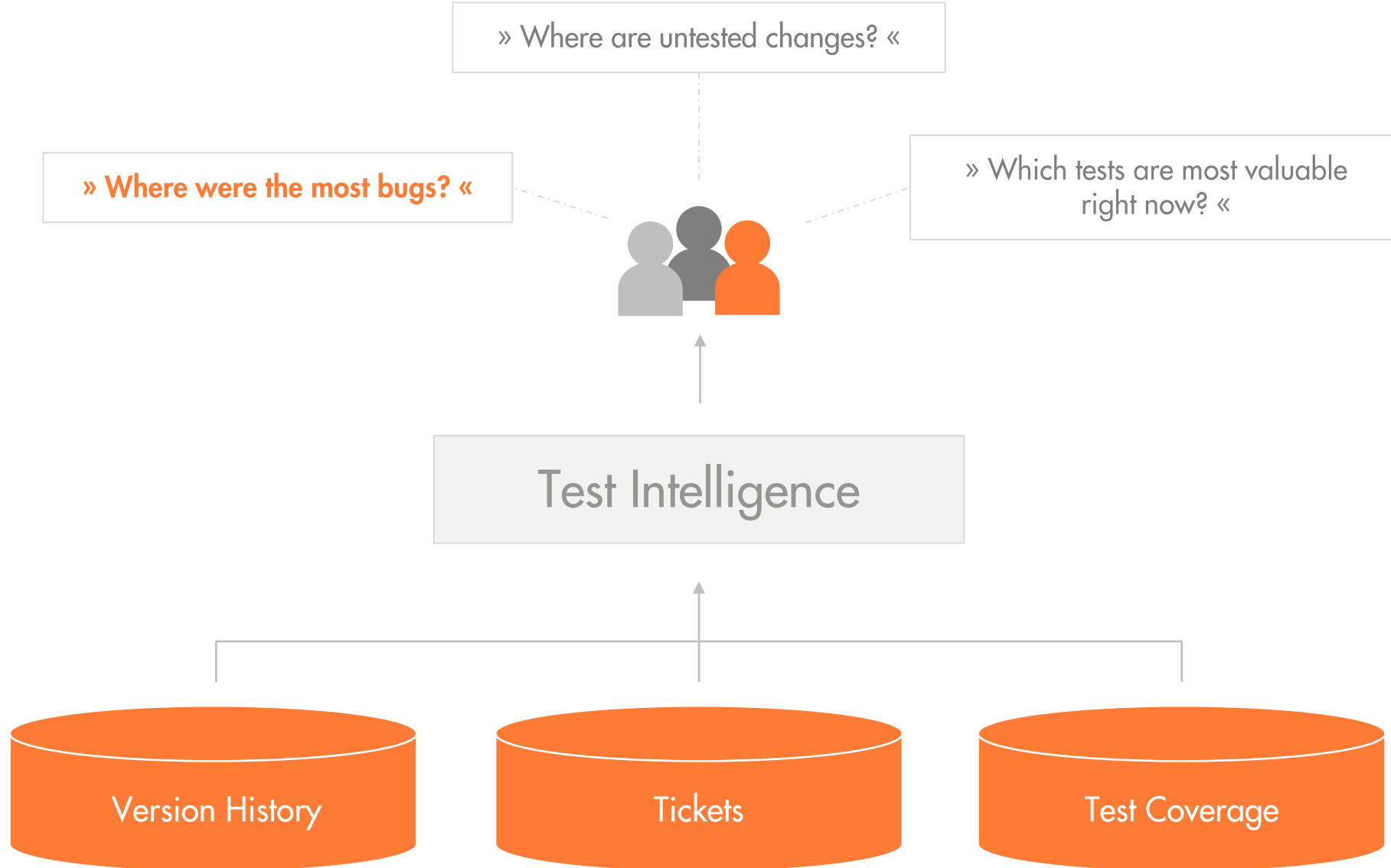
Creator:  (on Apr 06 2018 19:44) Last update: Aug 24 2018 09:32

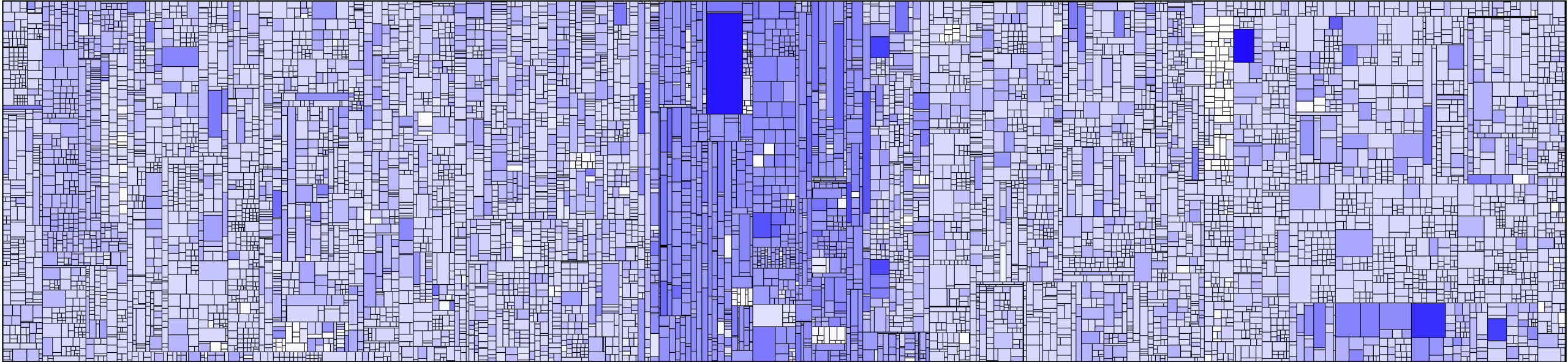
Assignee: 

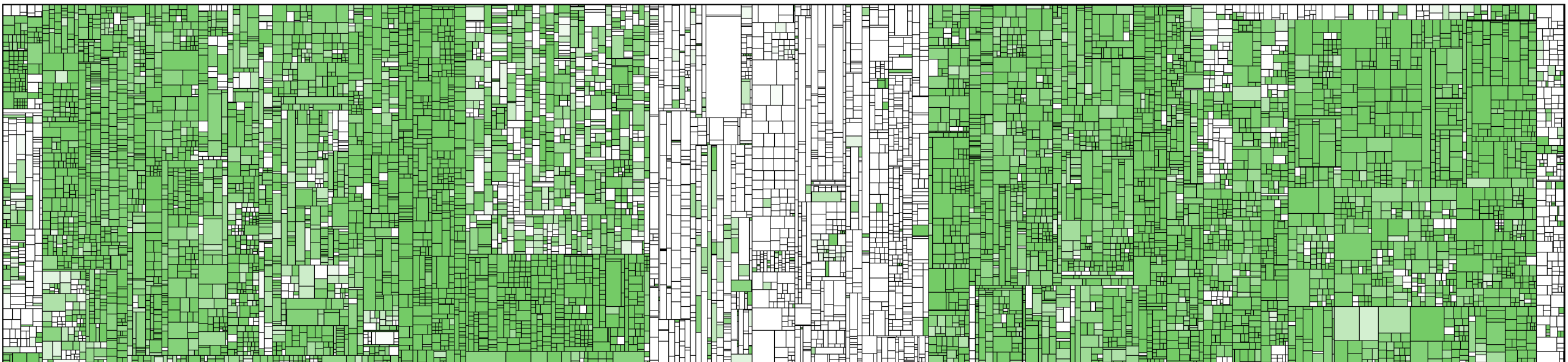
Project	Type	Priority	Resolution	Fix Version
TS	Maintenance	Normal	Green	Teamscale 4.5
Component	Labels	Affected Version	Customer	Customer Issue
Backend	Performance			
Epic Name	Freshdesk URL	Merge Request		
		https://git.cqse.eu/cqse/teamscale/3621		

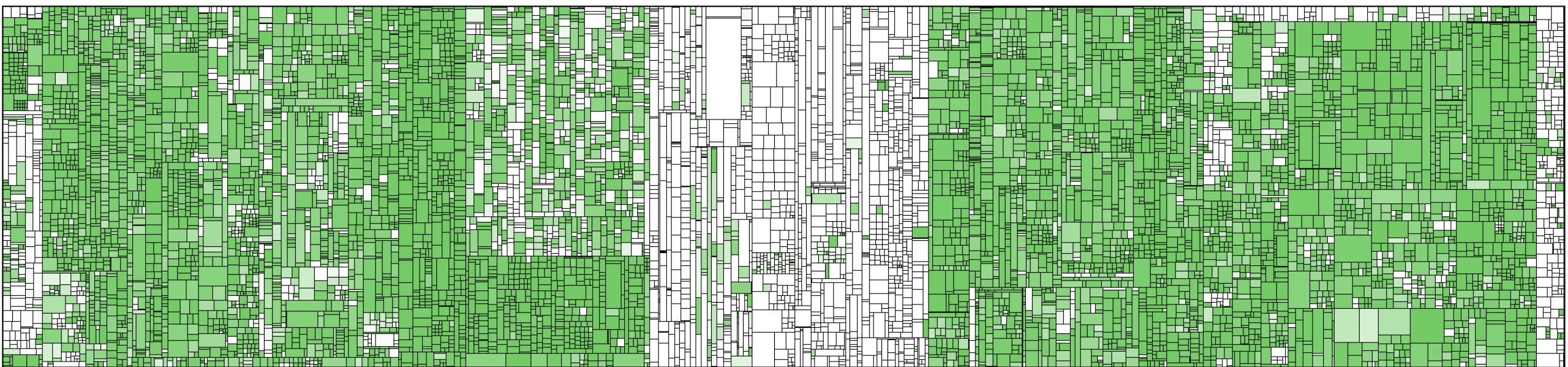
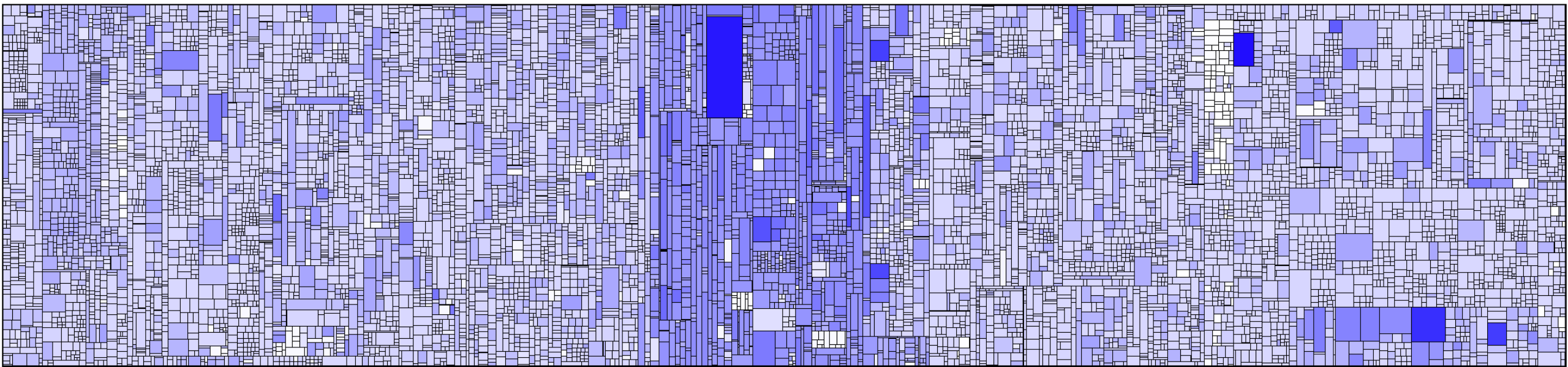
Aug 15 2018 12:37–Now | Test Gap: 22%

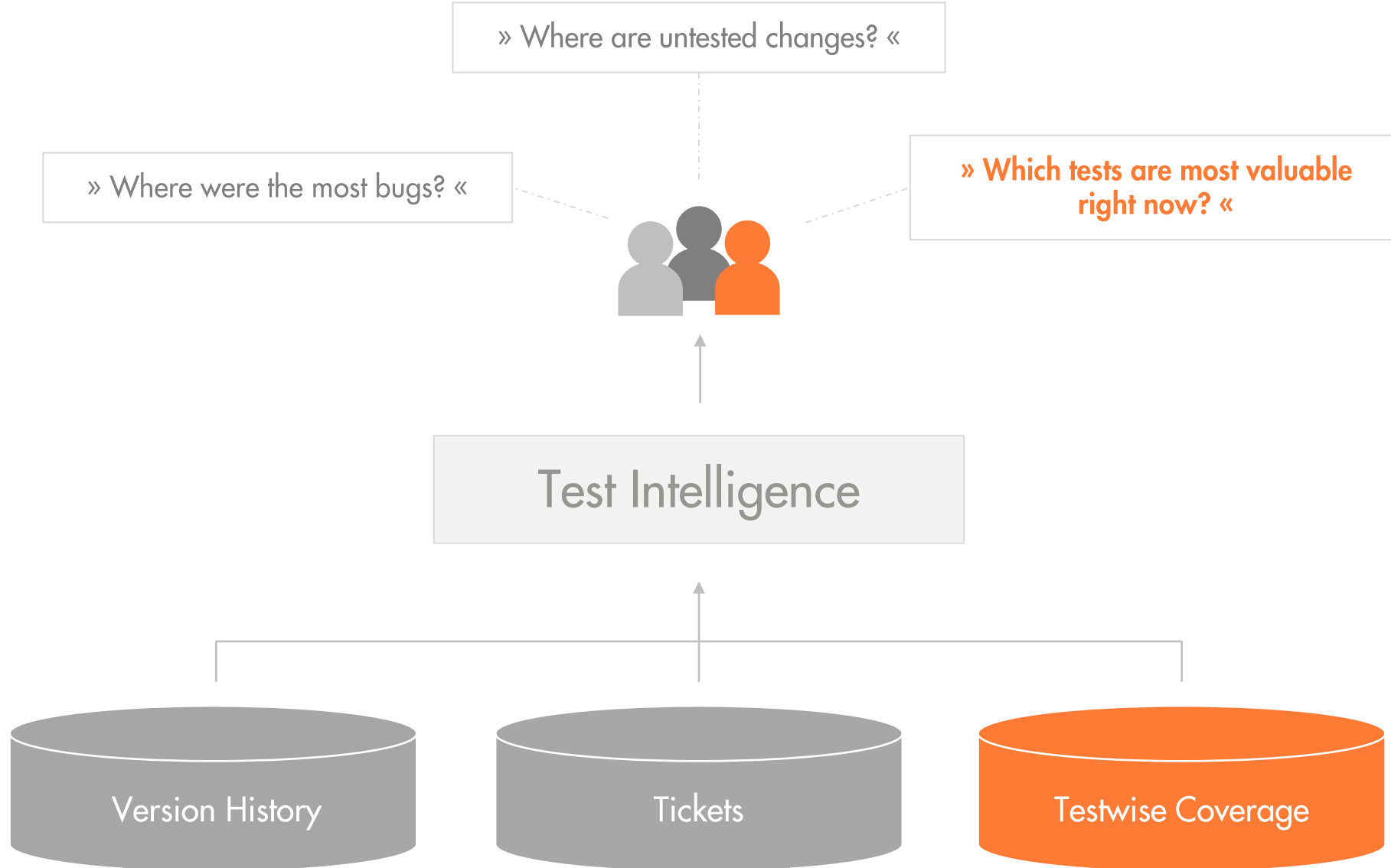


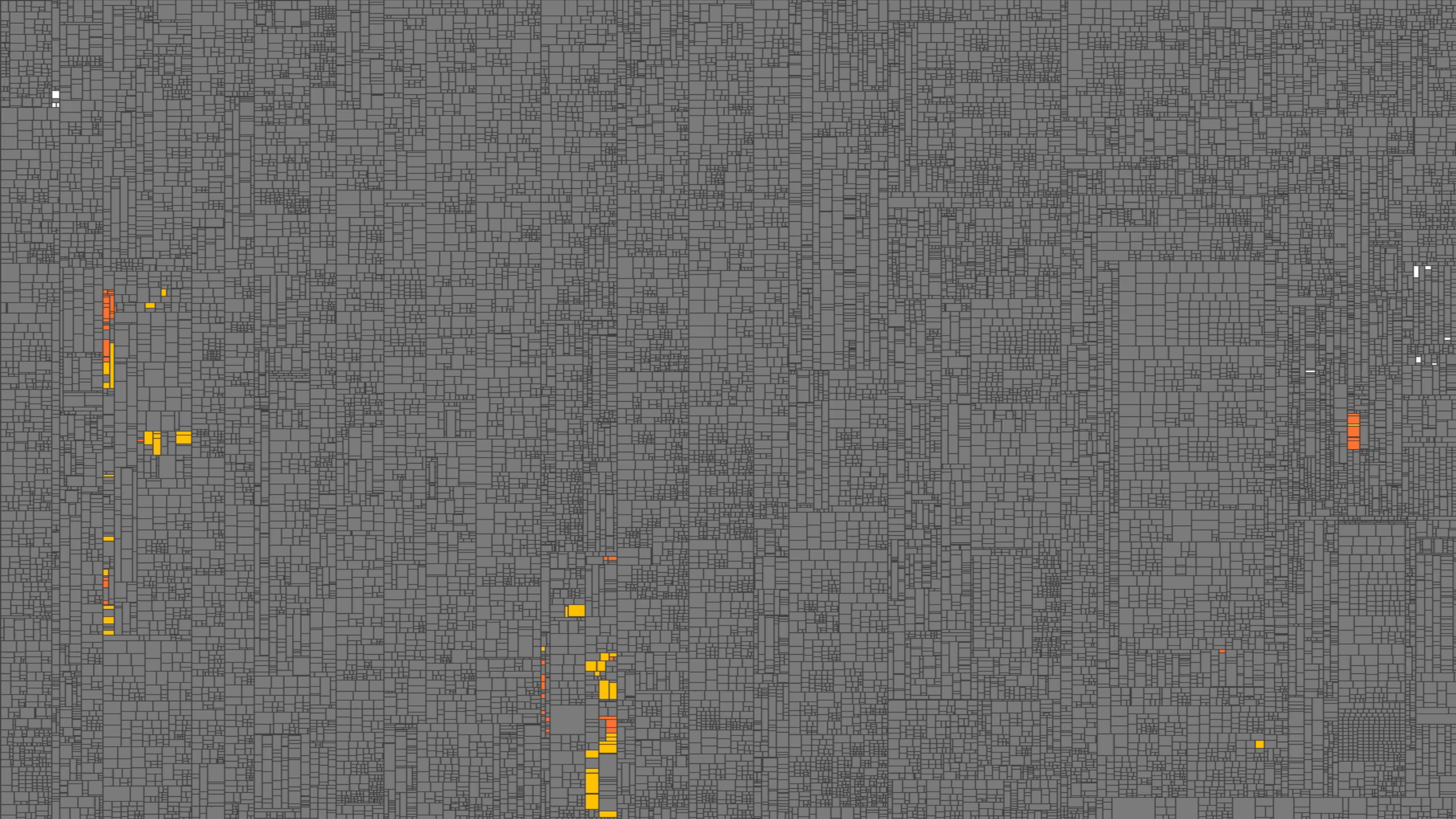


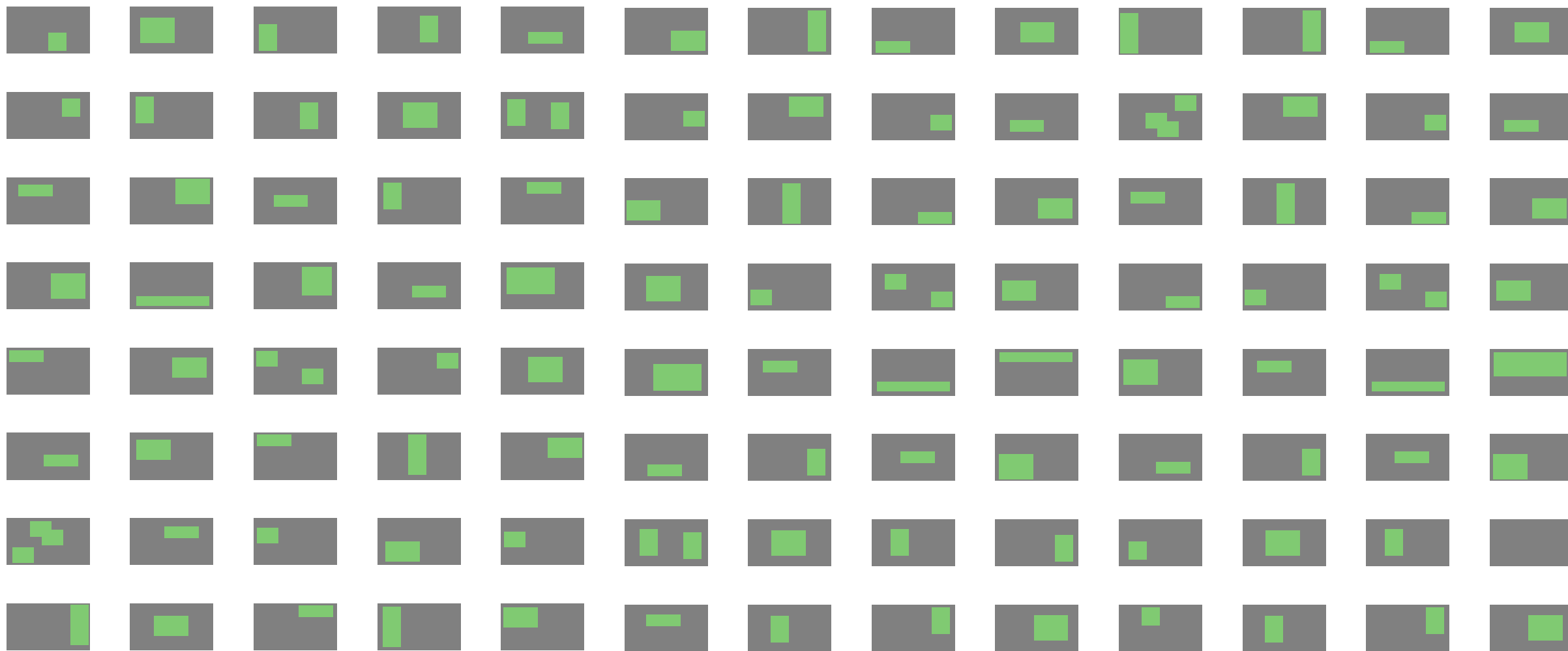








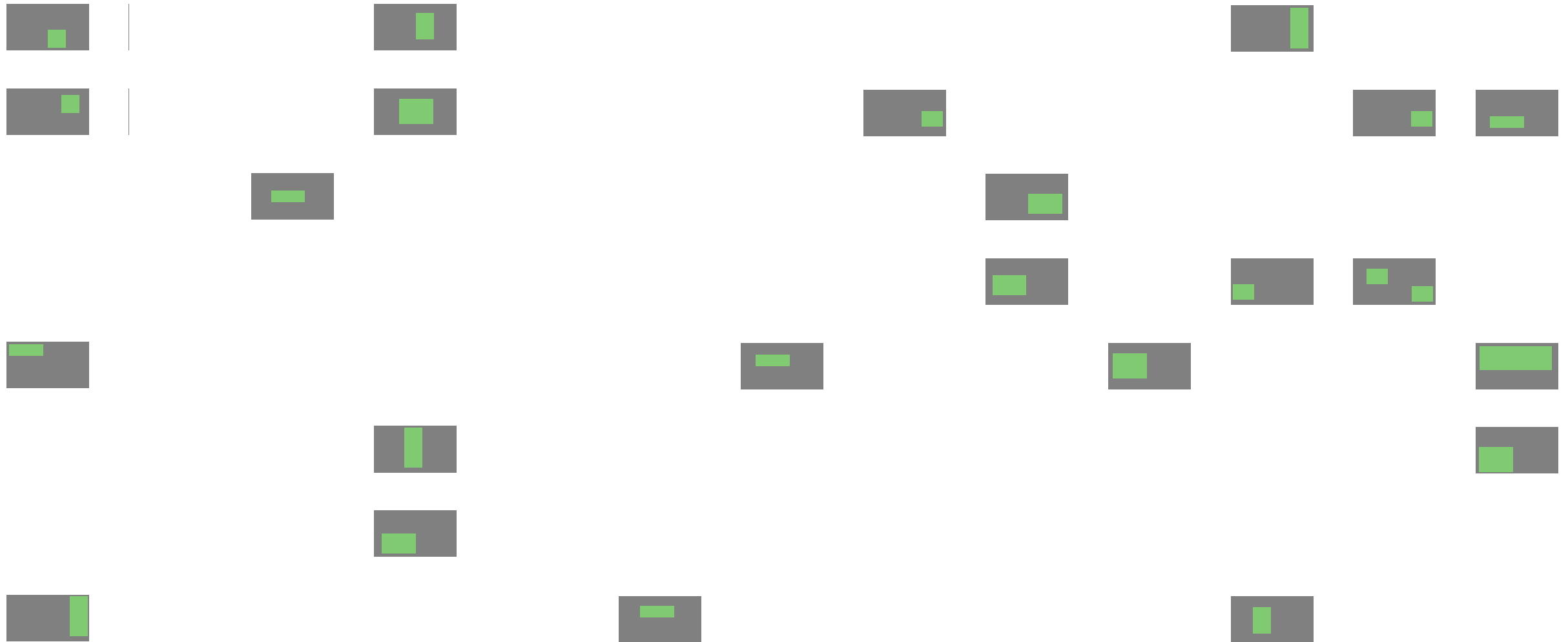




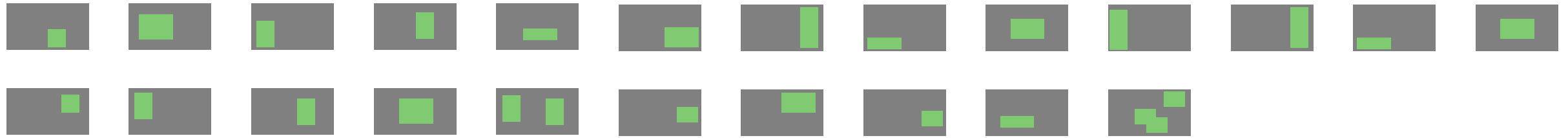
Step 1: Selection of Impacted Tests



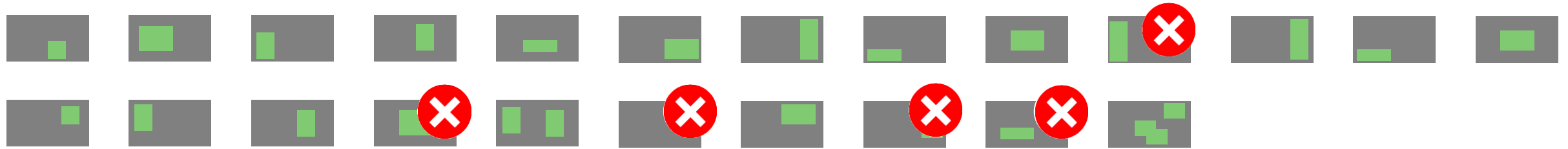
Step 1: Selection of Impacted Tests



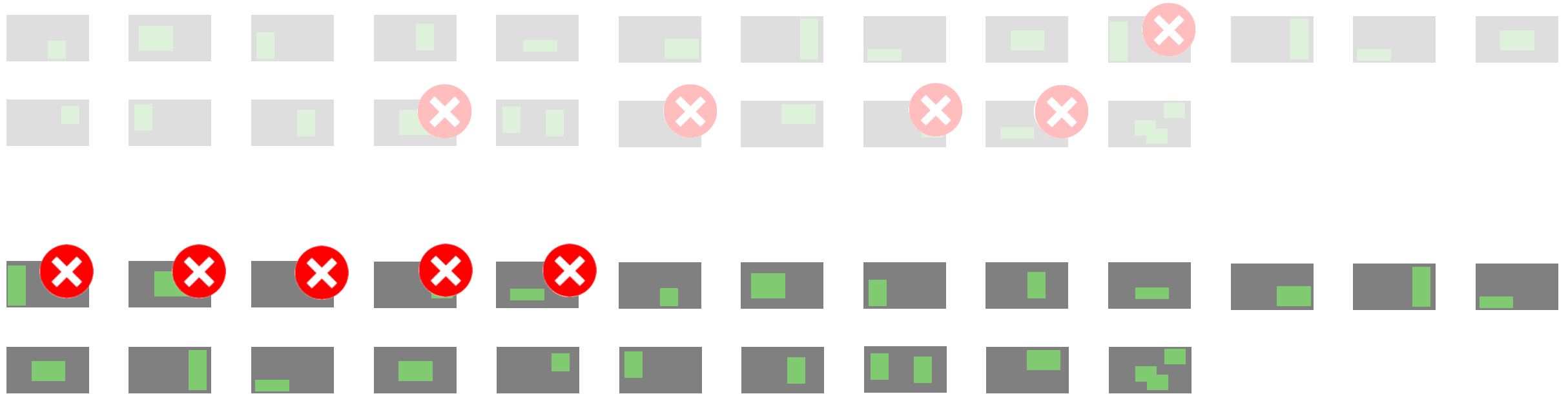
Step 1: Selection of Impacted Tests



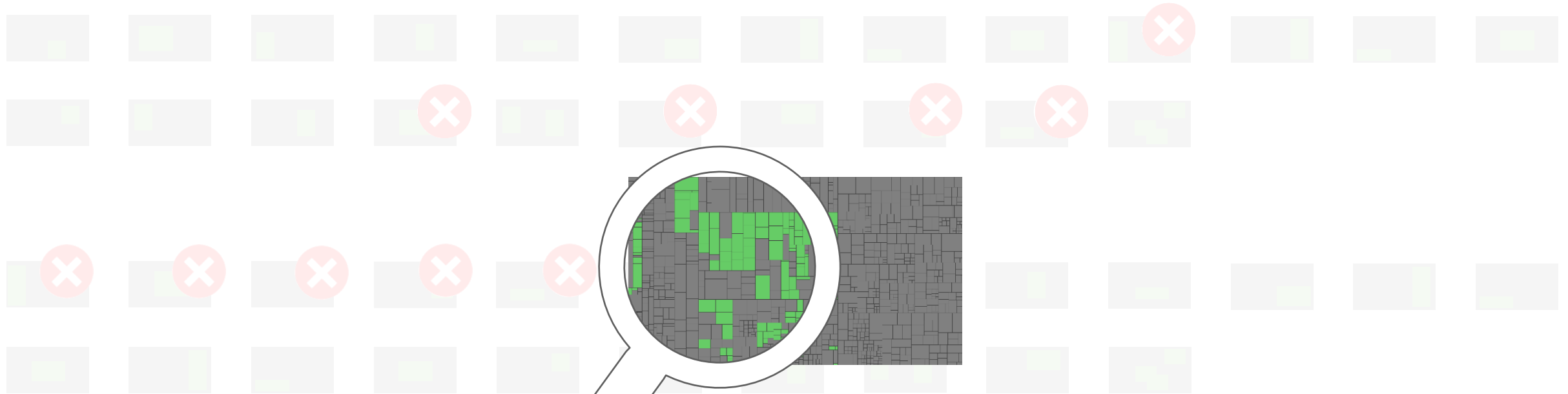
Step 2: Prioritization of Impacted Tests



Step 2: Prioritization of Impacted Tests



Step 2: Prioritization of Impacted Tests

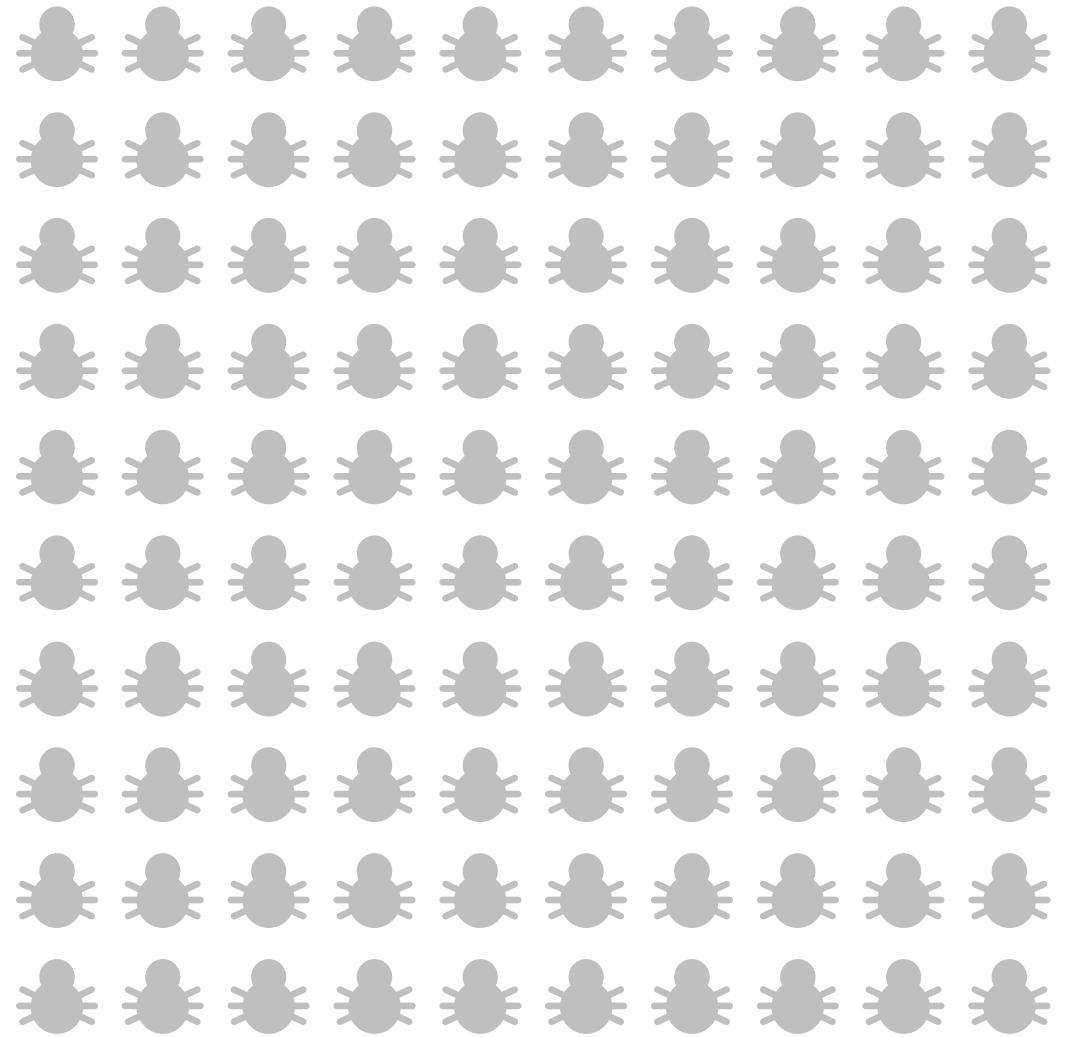
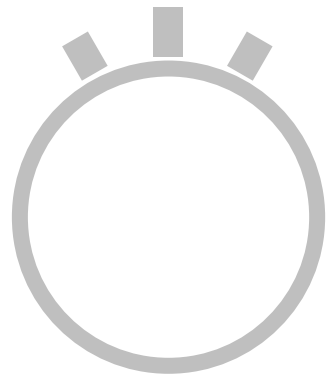


Change coverage

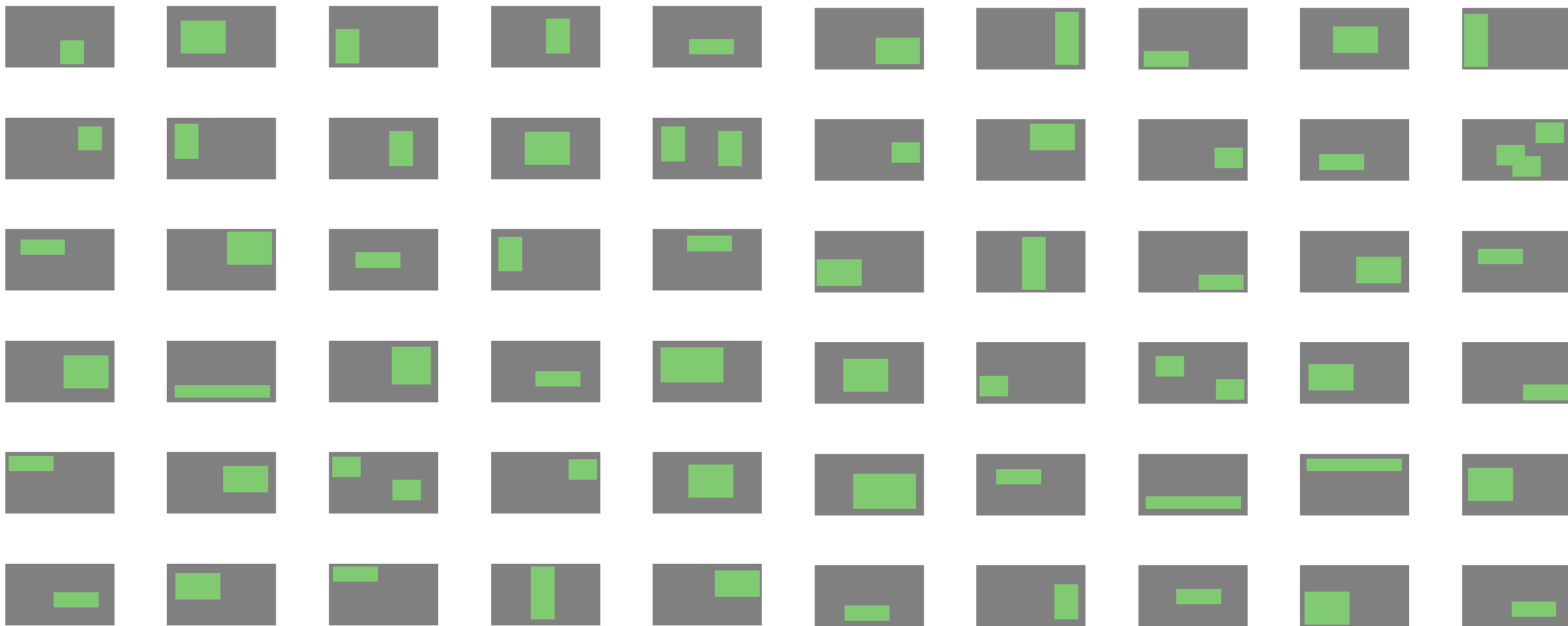
Execution time

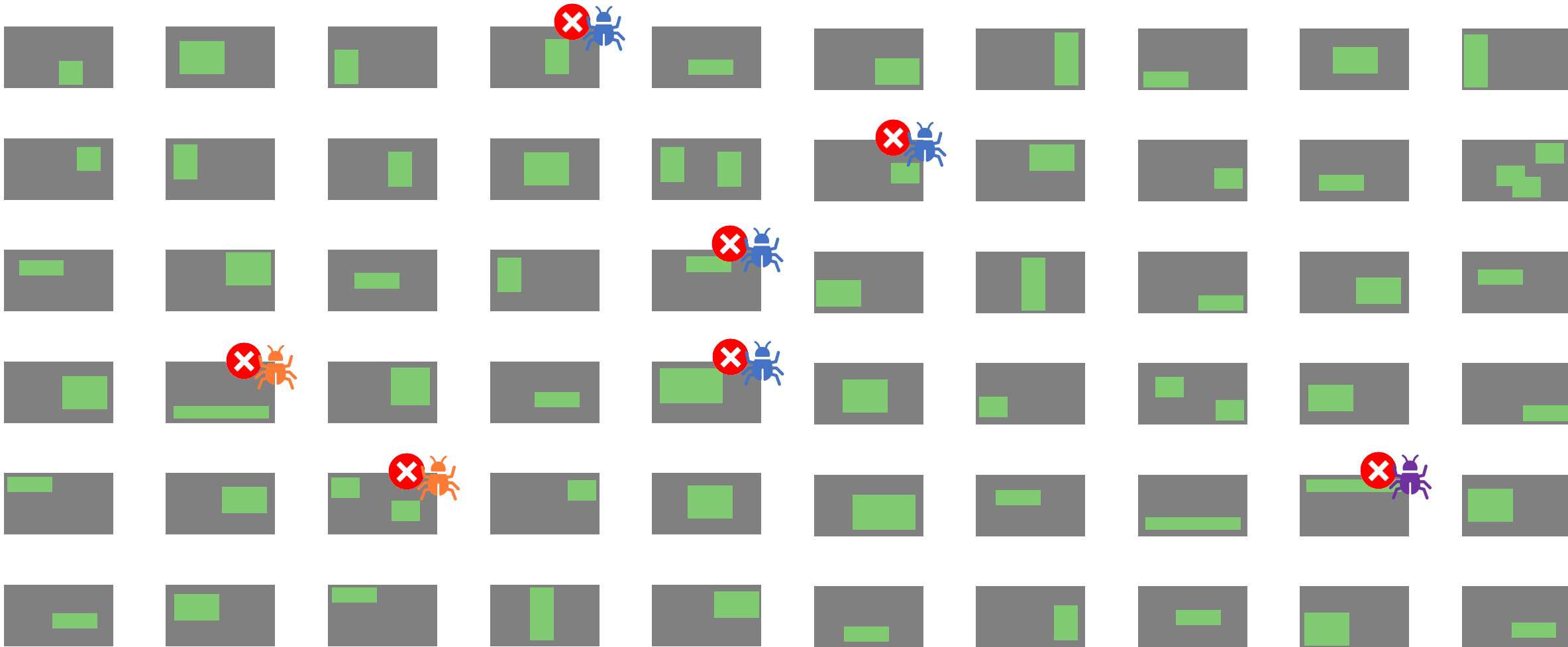
Step 2: Prioritization of Impacted Tests



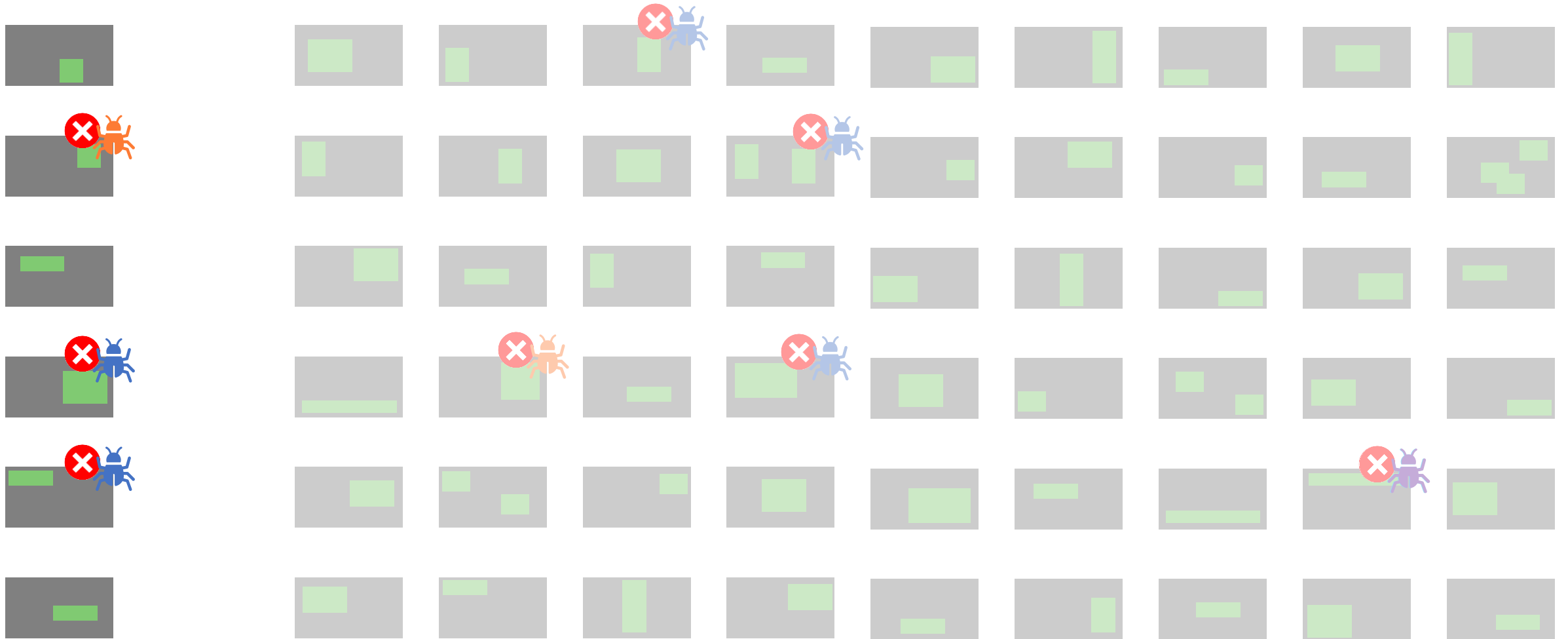


Isn't there a simpler option?





Pareto-Optimization



Sample Only the Active Layer/Mask

Untitled1 x Picture1.png x

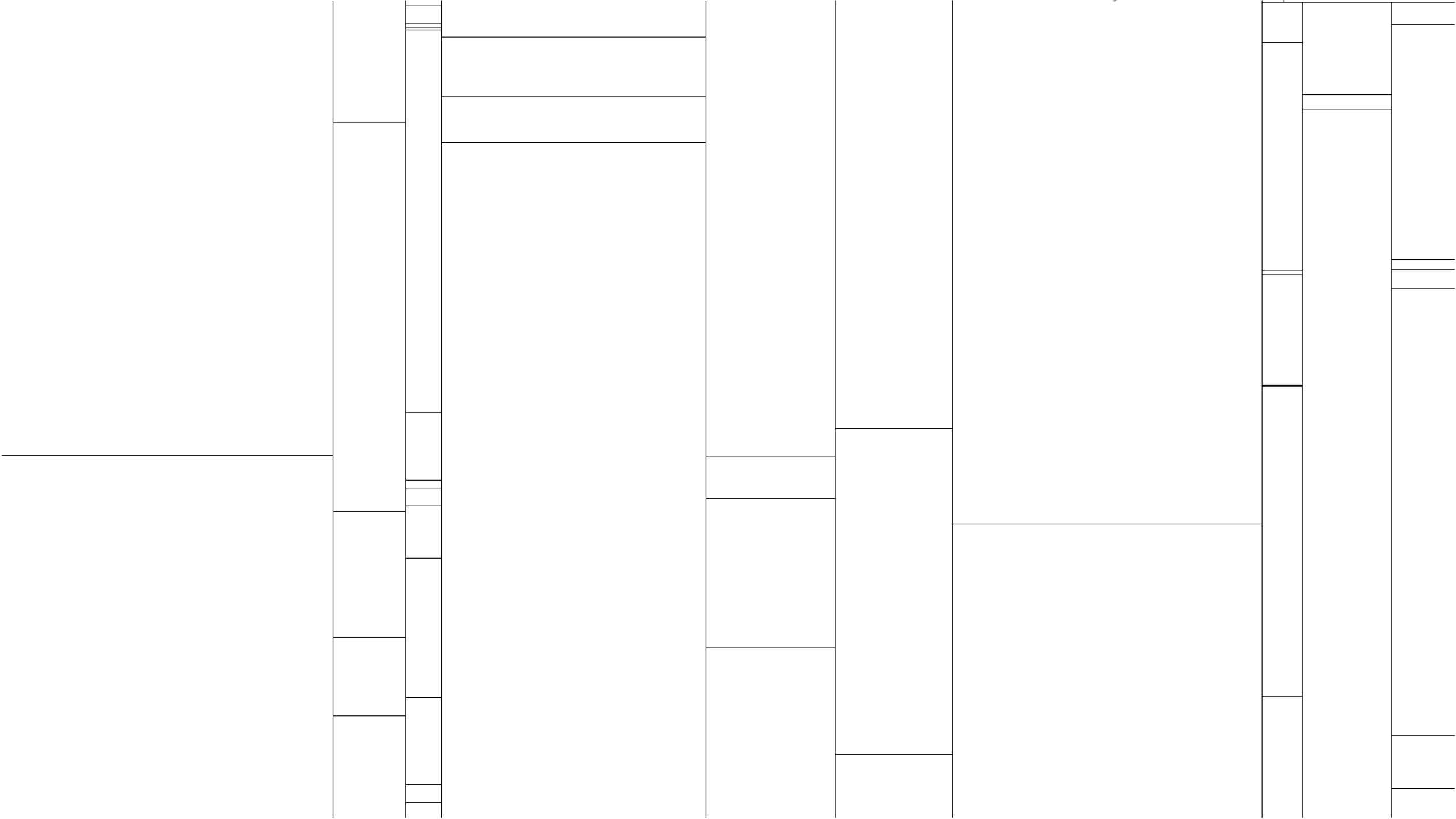


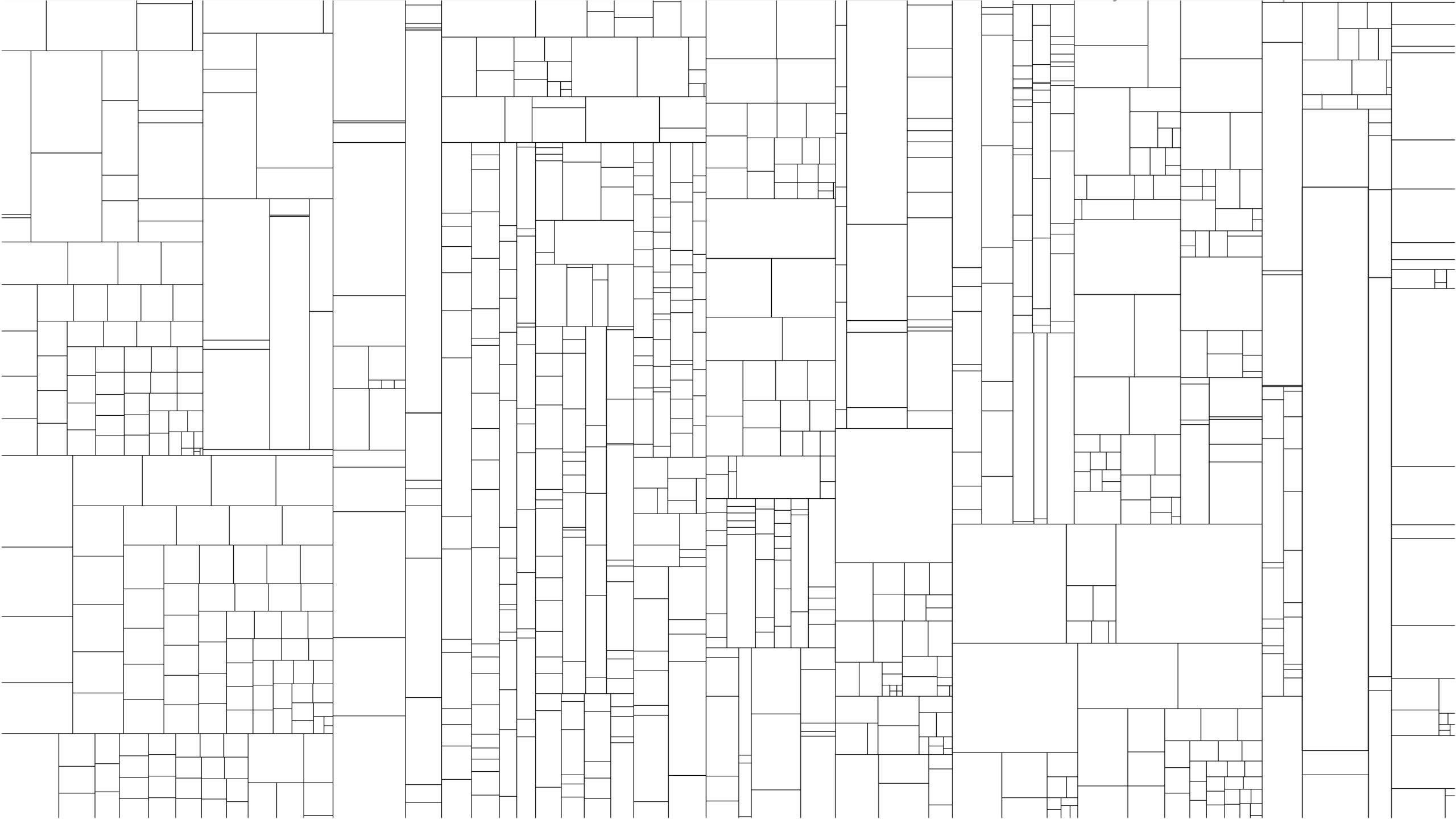
Layers

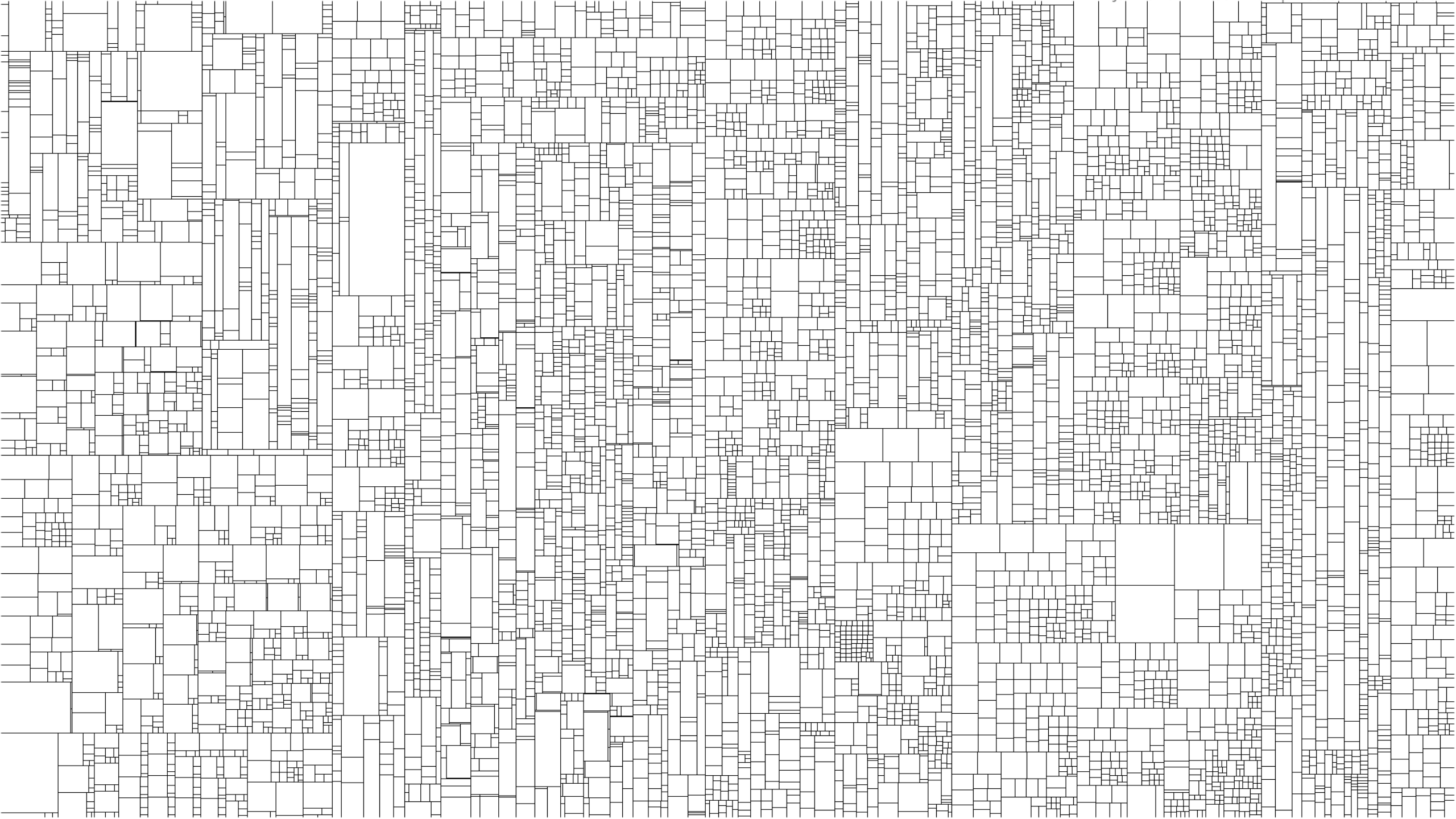
Opacity: 100 % Normal

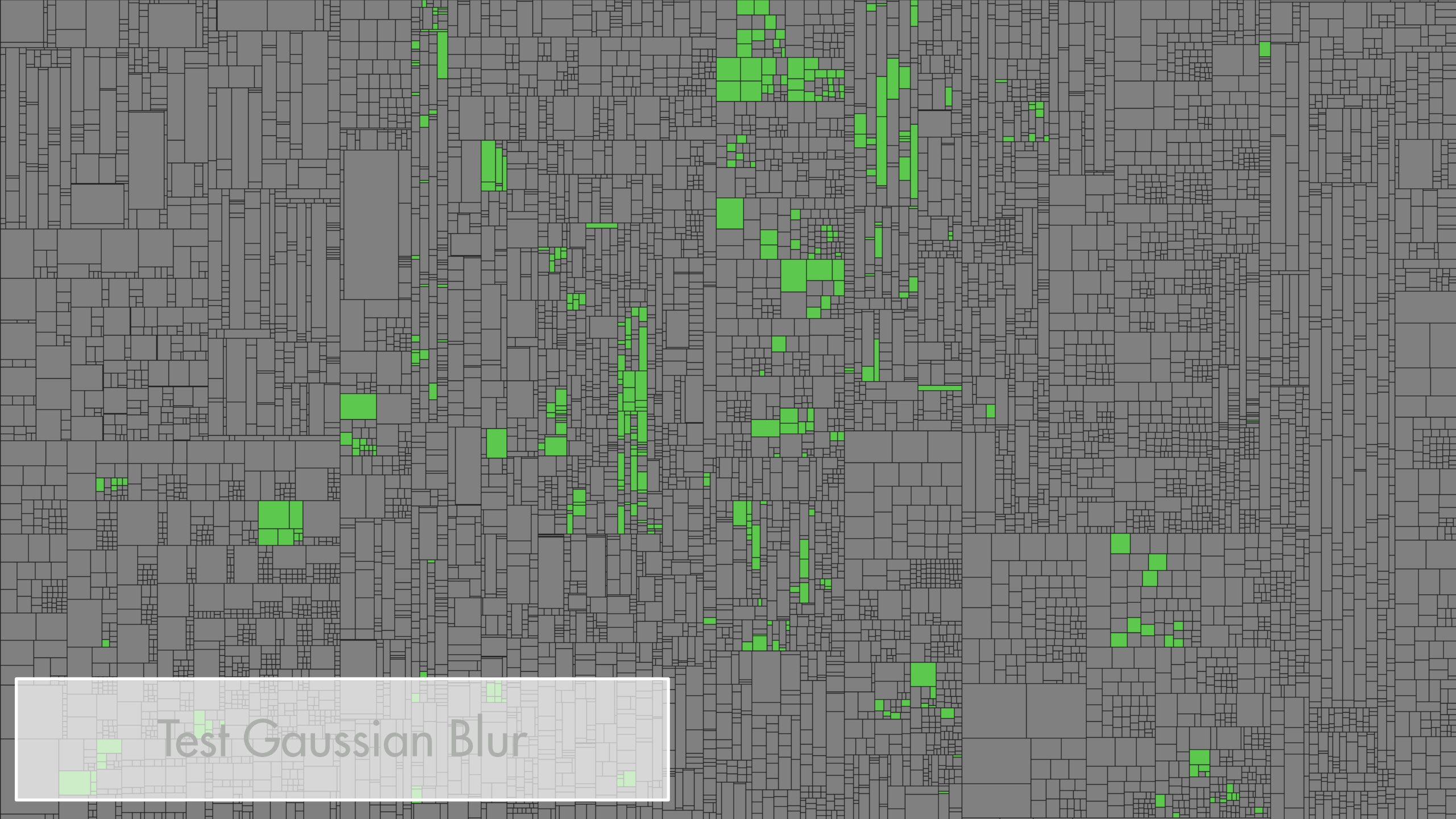
layer 1







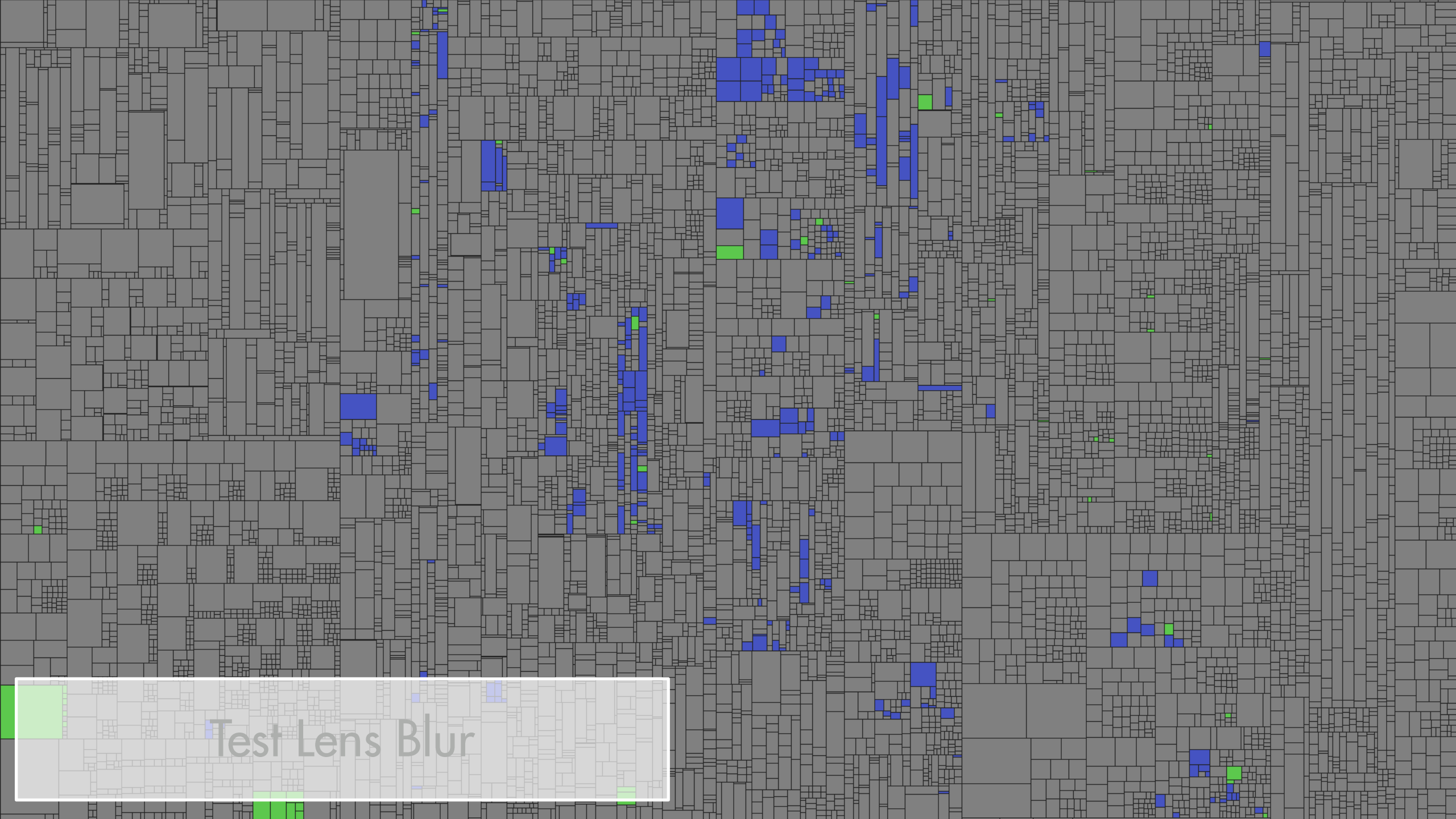




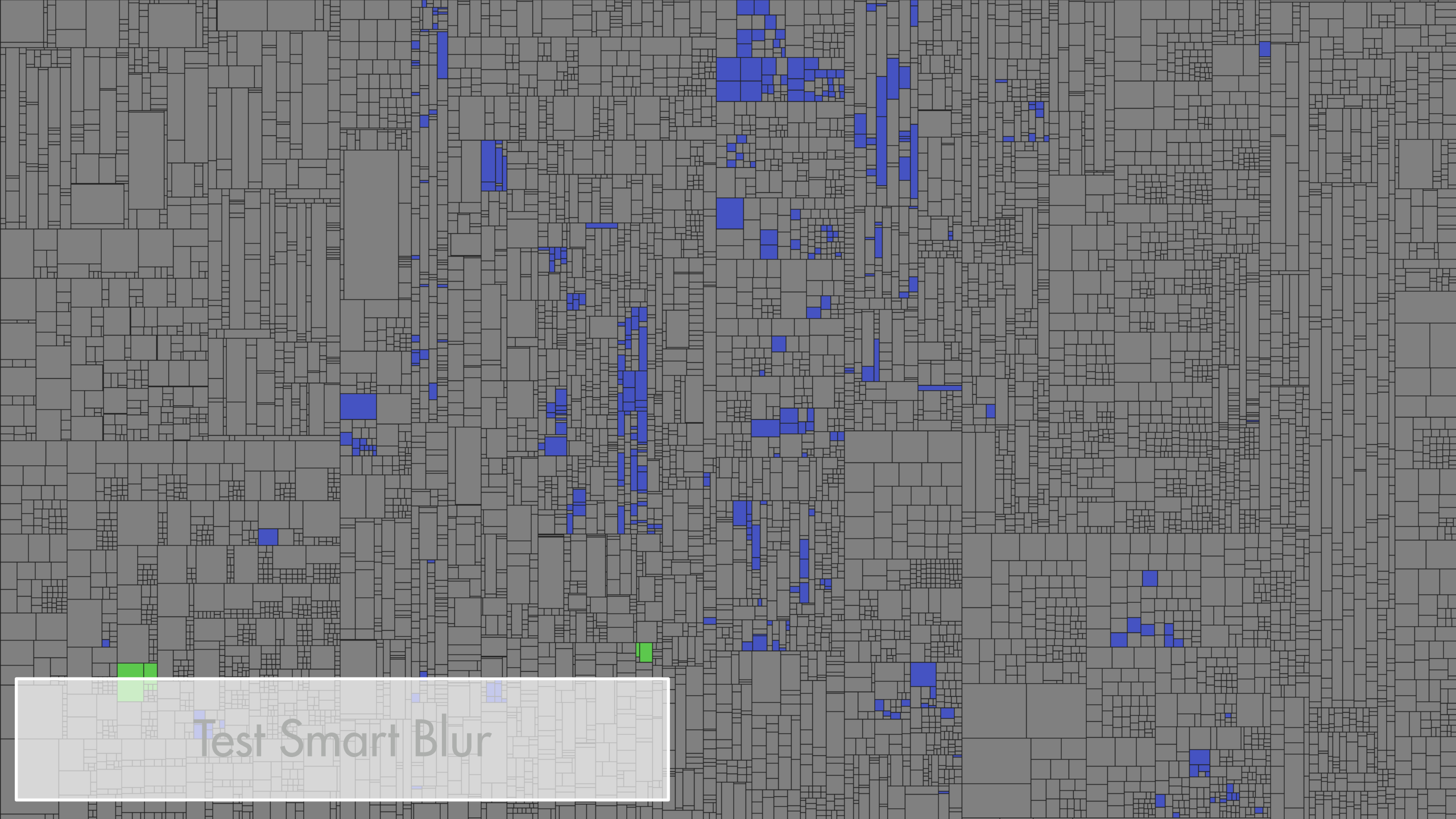
Test Gaussian Blur




Test Motion Blur



Test Lens Blur



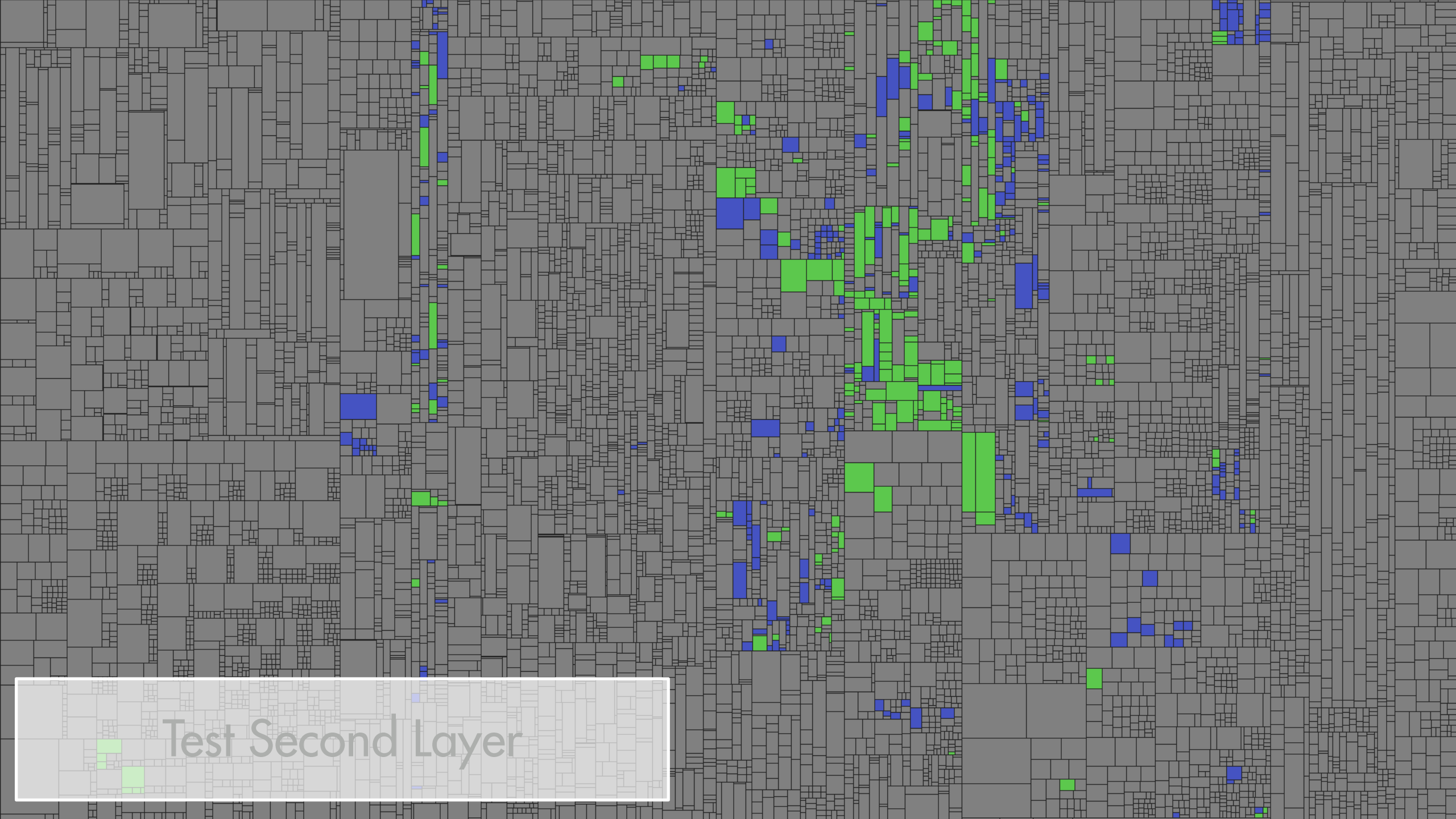
Test Smart Blur



Test Create and Modify
Selection



Test Change View Settings

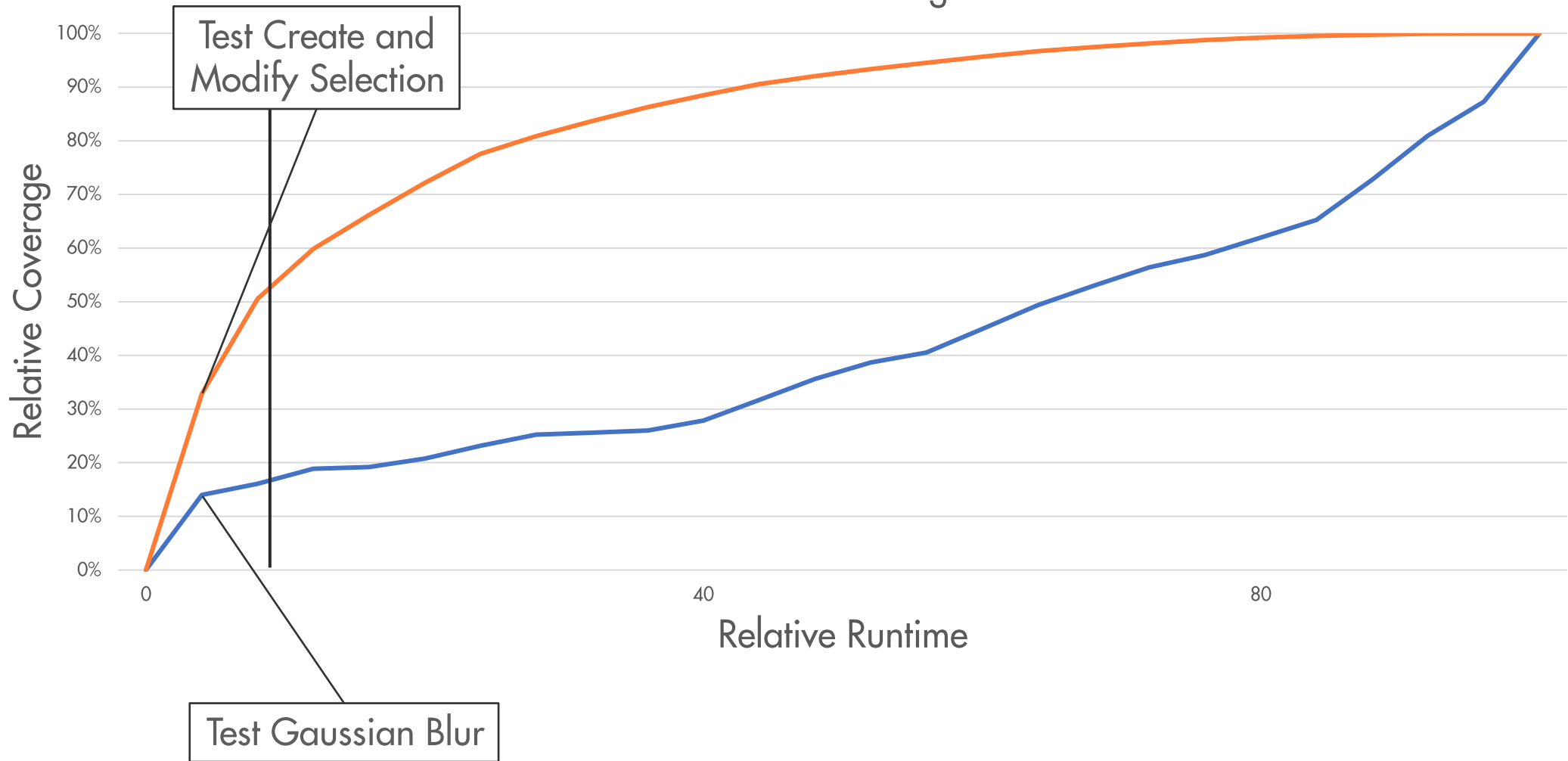


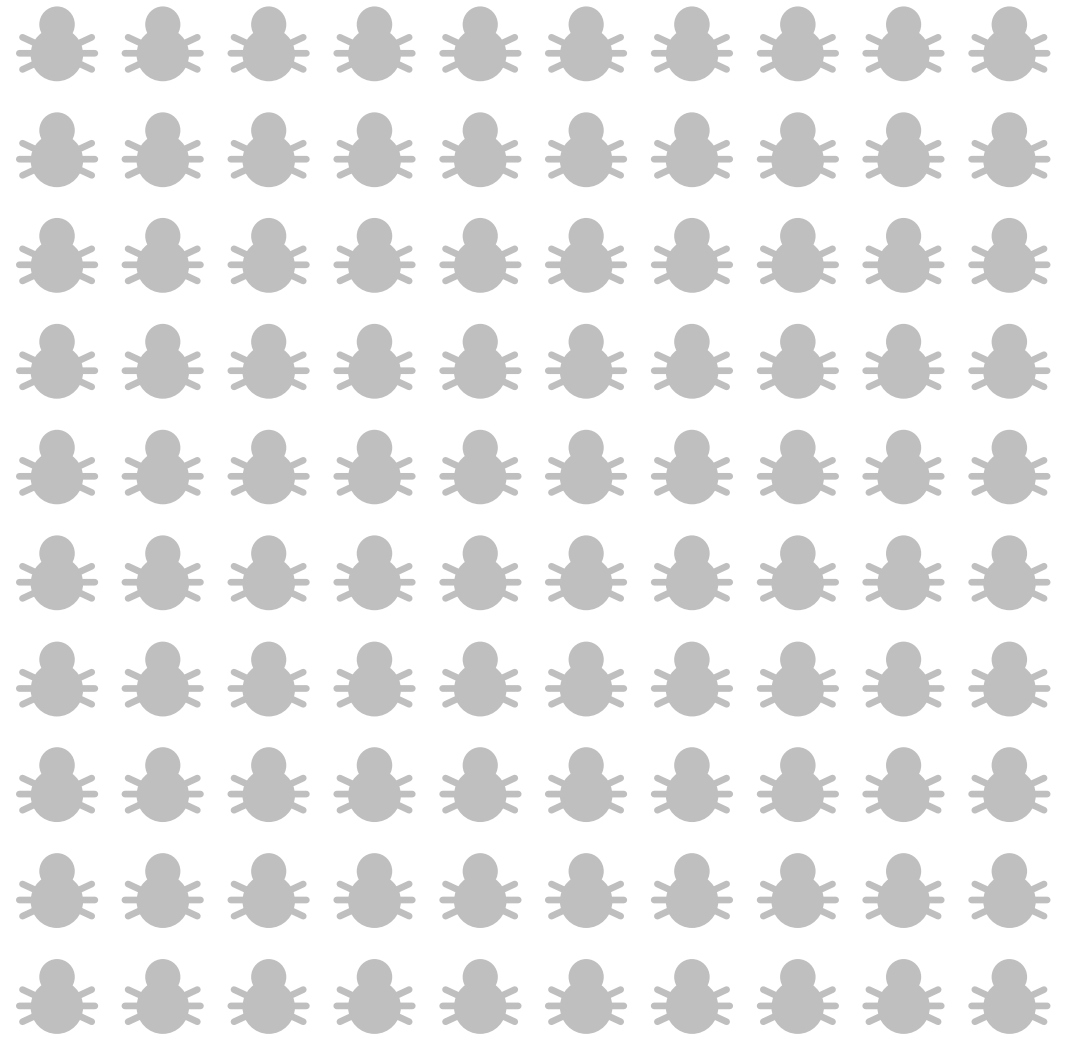
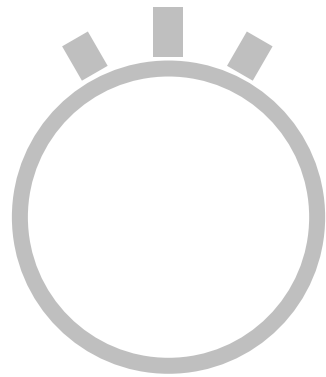
Test Second Layer

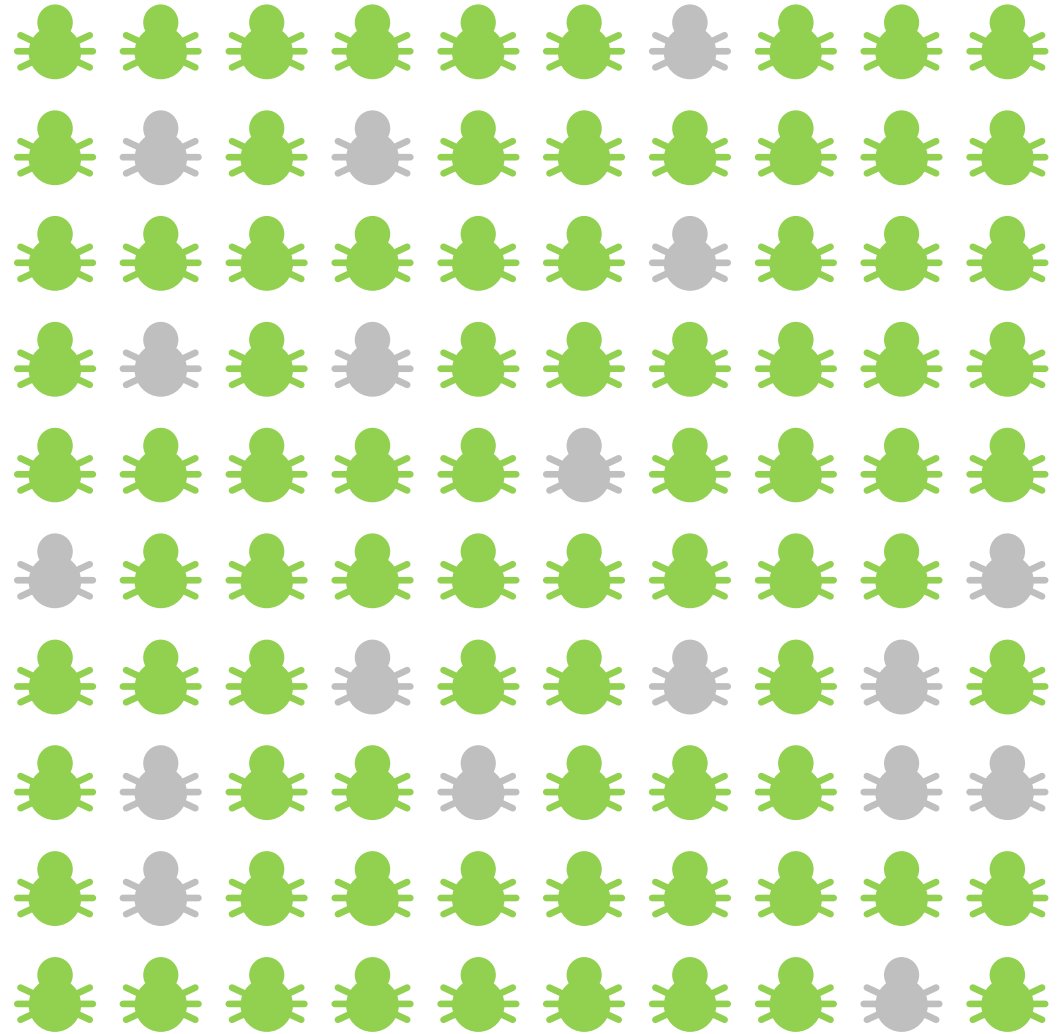
The image consists of a dense, overlapping grid of gray rectangles of various sizes and orientations. Scattered throughout this grid are several smaller rectangles in blue and green. The blue rectangles are more numerous and appear in various sizes and orientations, often forming small clusters. The green rectangles are fewer in number and tend to appear in more vertical or horizontal orientations. The overall effect is a complex, textured pattern of gray with occasional color accents.

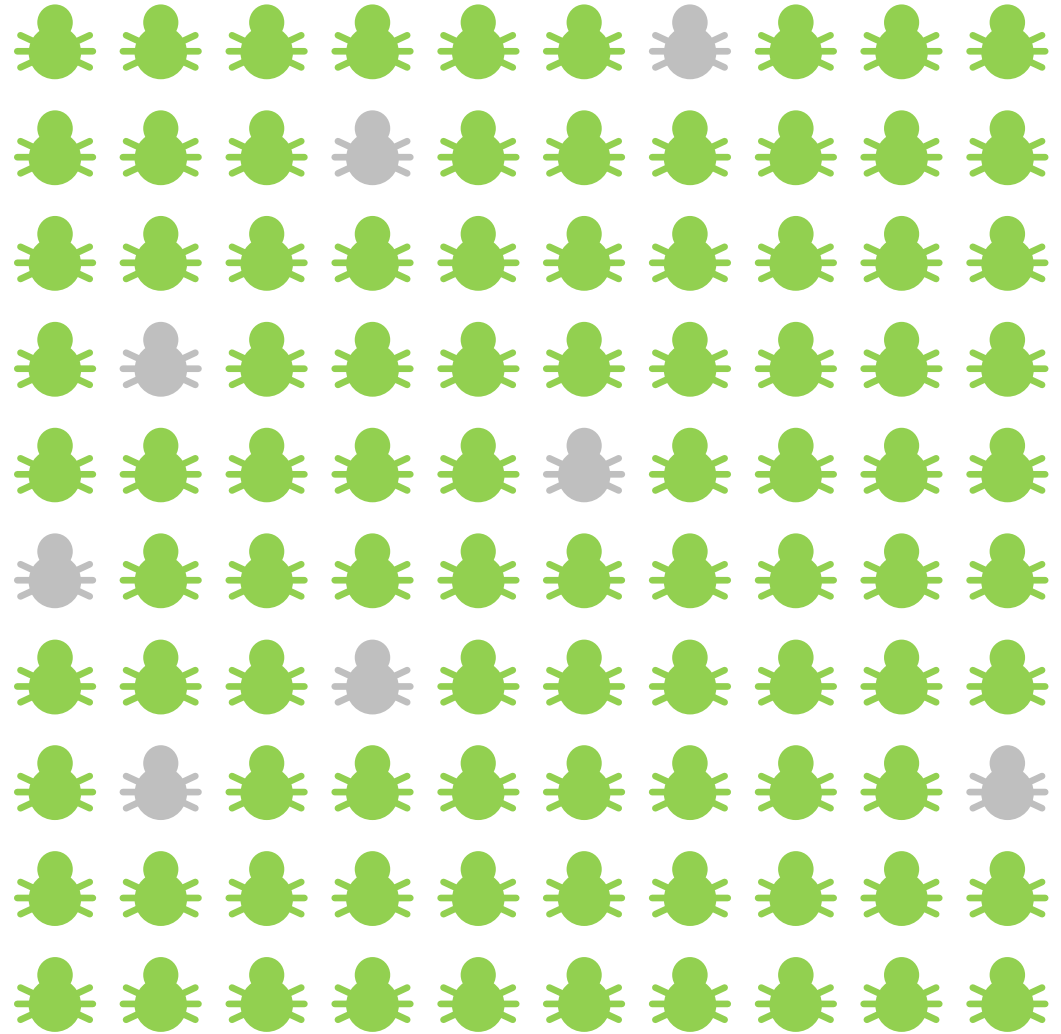
Test Save Image

Time vs Code Coverage









Dashboard

Activity

Findings

Metrics

Test Gaps

Files

Components

Issues

Unlinked Changes

Pareto Ranking

Quality Control

Architecture

Delta

Project Configuration

Pareto Ranking

Switch to query language

Show tests from:

Batch TestsNightly

GeVo TestsNightly

KettentestsNightly

Name

Duration

> 0s

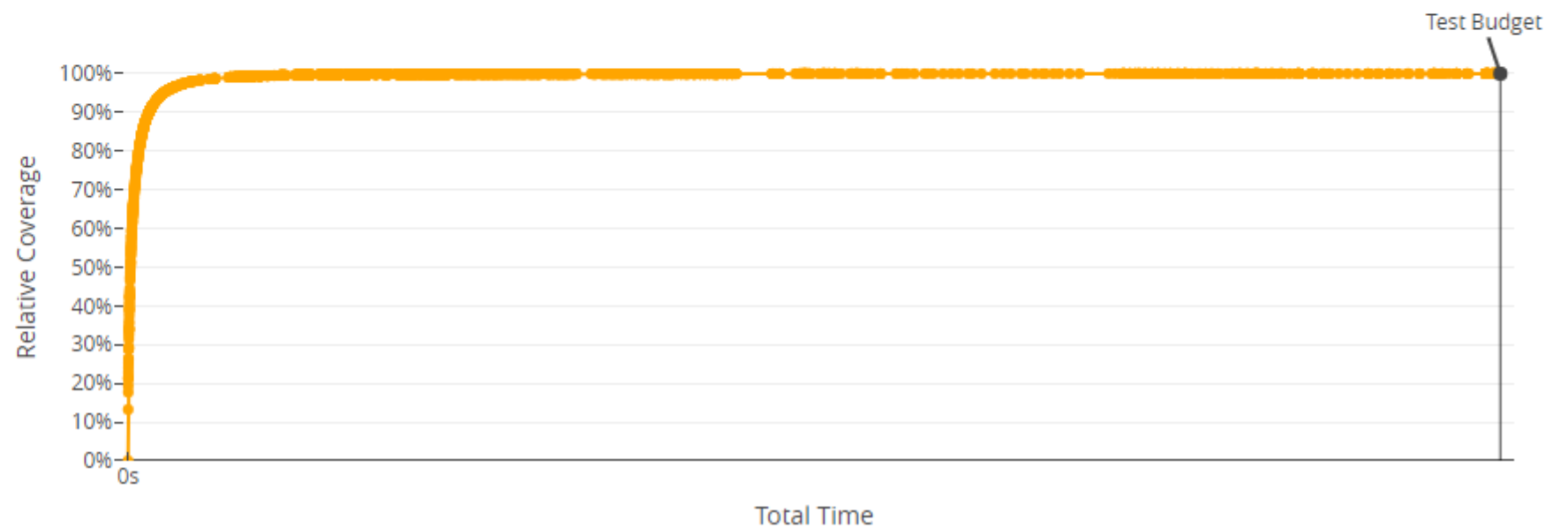
Result

All results

+ Save query

Compute Ranking

Pareto Ranking computes a subset of the selected tests that **maximises test coverage** for the given time budget.



Test-Impact-Analysis

Test selection **w.r.t. code changes**

90% of bugs found in 2% time

Requires continuous recording of coverage and tight integration with test automation framework.

Higher speedup & higher effort

Pareto-Optimization

Tests selection **independent of** code changes

90% of bugs found in 11% time

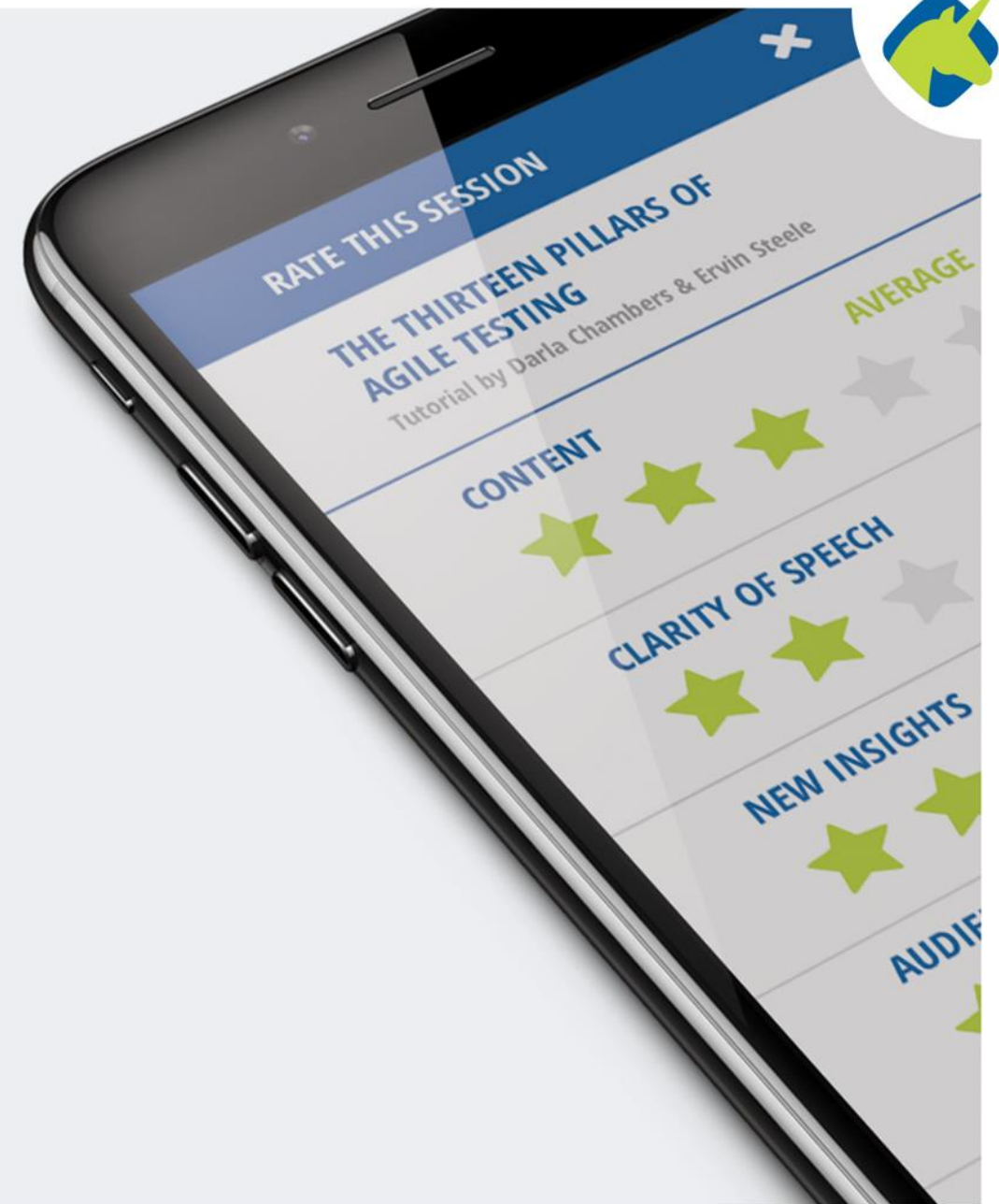
Record coverage once (per quarter)

Smaller effort & higher applicability



Thanks for your attention!
Feedback welcome!

Go to agiletestingdays.com/session-ratings
and give your rating!



Contact – Looking forward to discussions 😊



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