



**DEVOPS
WORLD**
by CloudBees

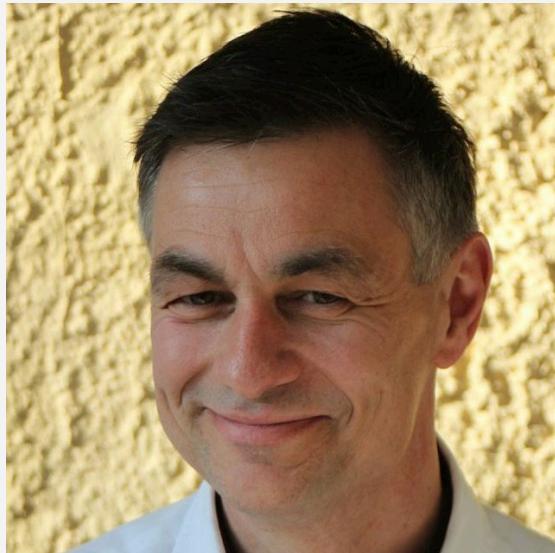
COMMUNITY

Visualizing Git Forensics Data in a Jenkins Plugin

Ullrich Hafner

UNIVERSITY OF APPLIED SCIENCES MUNICH

About Me



Prof. Dr. Ullrich Hafner

Professor for Software Engineering
University of Applied Sciences Munich

- Jenkins Committer for 15 Years
 - Warnings Next Generation Plugin
 - UI Plugins (Bootstrap, jQuery, ECharts, ...)
 - Auto-Grading Plugin (for student assignments)
 - Forensics API and Git Forensics Plugins
- Professor for Software Engineering
 - Teaching with Jenkins
 - CI/CD with Jenkins
 - Jenkins as real world application
 - Research with Jenkins
 - How to improve code quality and software development processes with Jenkins?

COMMUNITY

Visualizing Git Forensics Data in a Jenkins Plugin

Background Information

Forensics in Software Development

- Adam Thornhill combined in his book "*Your Code as a Crime Scene*" (2015)
 - forensic psychology
 - software evolution
- Proposed a tool that mines a source code repository to answer questions like:
 - Which sections of the code will have the most defects?
 - Which part of the code matters most for maintenance?
 - How is code quality influenced by the team structure?
 - How does the team velocity evolve over the time?
- Features of Adam Thornhill's tool *Code Maat* at a glance:
 - input: analyze all commits of a source code repository (Git, Mercurial, etc.) with a command line tool
 - output: several reports (as plain CSV data)

Integrating the architecture tool box in Jenkins

- *Code Maat* is **one** part of a software architect's toolbox – like
 - SonarQube
 - JArchitect
 - IntelliJ dependency analysis
 - etc.
- Advantage: 

 - a dedicated tool for a specific task

- Disadvantage: 

 - if toolbox is not visible for the development team then the results most likely will be ignored

- Architecture and developer tools should be integrated into development workflow

Recording of forensic data during a Jenkins build

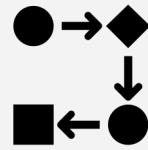
- Jenkins Git Forensics Plugin mines a Git repository during a build (incrementally)
 - analyze the commits of the current build
 - read the repository statistics from previous builds
 - merge results and update the statistics
- Visualization of results
 - statistics summary of the current build
 - trend chart with the statistics of a given range of builds
 - data table showing a summary for all files of a projects
 - detail view showing the commits for a selected file

Which version control information is available in Jenkins?

- Single files
 - creation time
 - last modification time
 - commits count
 - different authors count
 - lines of code (from the commit details)
 - size (from the file system)
 - code churn (changed lines since created)
- Files trend
 - total number of files
 - LOC of the project



- Single commits
 - timestamp
 - author
 - changed files
 - deleted and added lines
 - coupling with other files
- Commit trend
 - totals
 - frequency
 - size



Correlation and integration with other Jenkins Plugin

- Git forensics data is valuable in a standalone way
 - identify architectural problems early
- Additional benefit when integrated with other software metrics
 - warnings in source code (Warnings NG Plugin)
 - code coverage (Code Coverage API Plugin, PIT Mutation Coverage Plugin)
 - number of test (JUnit Plugin)
 - code health metrics like complexity (Metrics Aggregation Plugin)
- Idea: combine forensic data with software metrics
 - show only warnings in files that change frequently
 - flag code coverage problems only for files with multiple authors
 - identify design problems of files with high complexity and large code churn

COMMUNITY

Visualizing Git Forensics Data in a Jenkins Plugin

Plugin Demo

Build Results



Commit Diff Statistics: git <https://github.com/jenkinsci/analysis-model.git>

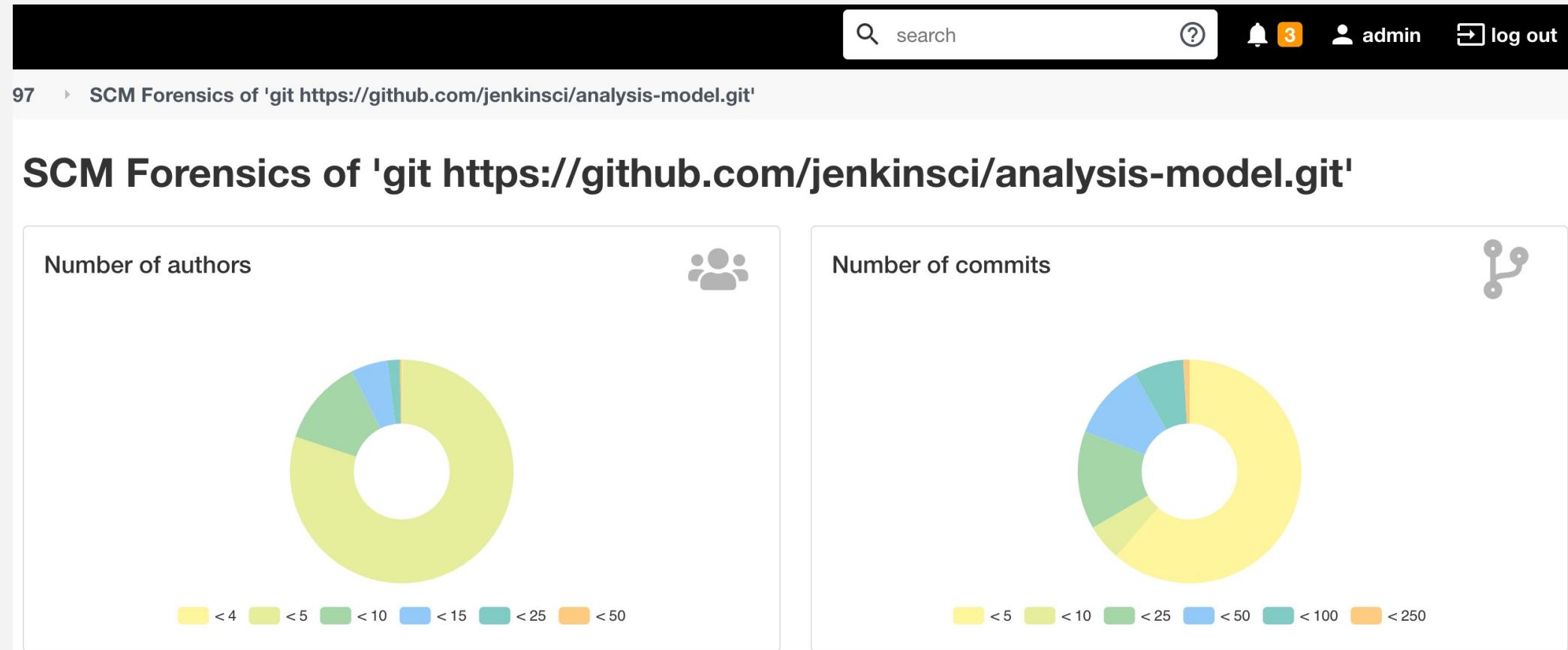
- Commits: 16 - compared to previous build
- Changed files: 24
- Changed lines: 1302 added, 684 deleted



SCM Forensics: git <https://github.com/jenkinsci/analysis-model.git>

- **776 repository files** (total lines of code: 152072, total churn: 546790)
- New commits: 16 (from 2 authors in 24 files)
- Changed lines: 1302 added, 684 deleted
- Miner runtime: 1 seconds

Project Details – Summary Charts



Project Details – Files Table

Details

Show 10 entries

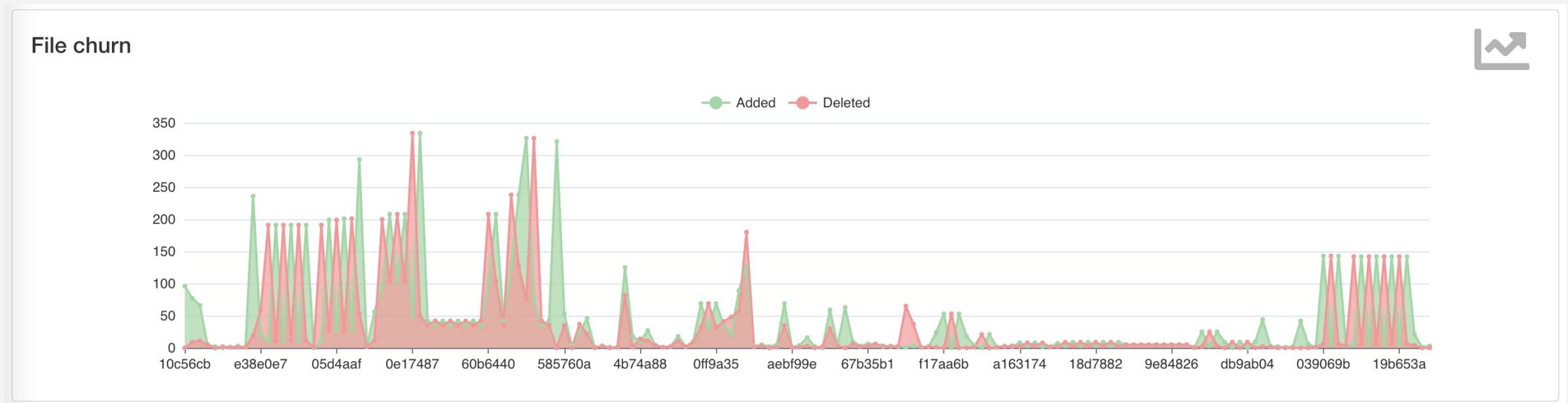
Search: java src/main

File	#Authors	#Commits	Last Commit	Added	#LoC	Code Churn
src/main/java/edu/hm/hafner/analysis/Report.java	21	165	8 months ago	3 years ago	1381	13053
src/main/java/edu/hm/hafner/analysis/Issue.java	19	148	10 months ago	3 years ago	890	8410
src/main/java/edu/hm/hafner/analysis/parser/fxcop/FxCopParser.java	6	51	2 years ago	3 years ago	197	5285
src/main/java/edu/hm/hafner/analysis/IssueBuilder.java	15	114	10 months ago	3 years ago	517	3625
src/main/java/edu/hm/hafner/analysis/parser/DrMemoryParser.java	7	45	2 years ago	3 years ago	149	2599
src/main/java/edu/hm/hafner/analysis/parser/GnuFortranParser.java	10	44	2 years ago	3 years ago	117	1899
src/main/java/edu/hm/hafner/analysis/parser/EclipseParser.java	8	60	2 years ago	3 years ago	100	1754
src/main/java/edu/hm/hafner/analysis/parser/FindBugsParser.java	3	53	10 months ago	3 years ago	360	1690
src/main/java/edu/hm/hafner/analysis/parser/MavenConsoleParser.java	10	70	1 year ago	3 years ago	124	1524
src/main/java/edu/hm/hafner/analysis/FileReaderFactory.java	12	46	10 months ago	2 years ago	112	1376

Showing 1 to 10 of 191 entries (filtered from 776 total entries)

[1](#) [2](#) [3](#) [4](#) [5](#) ... [20](#)

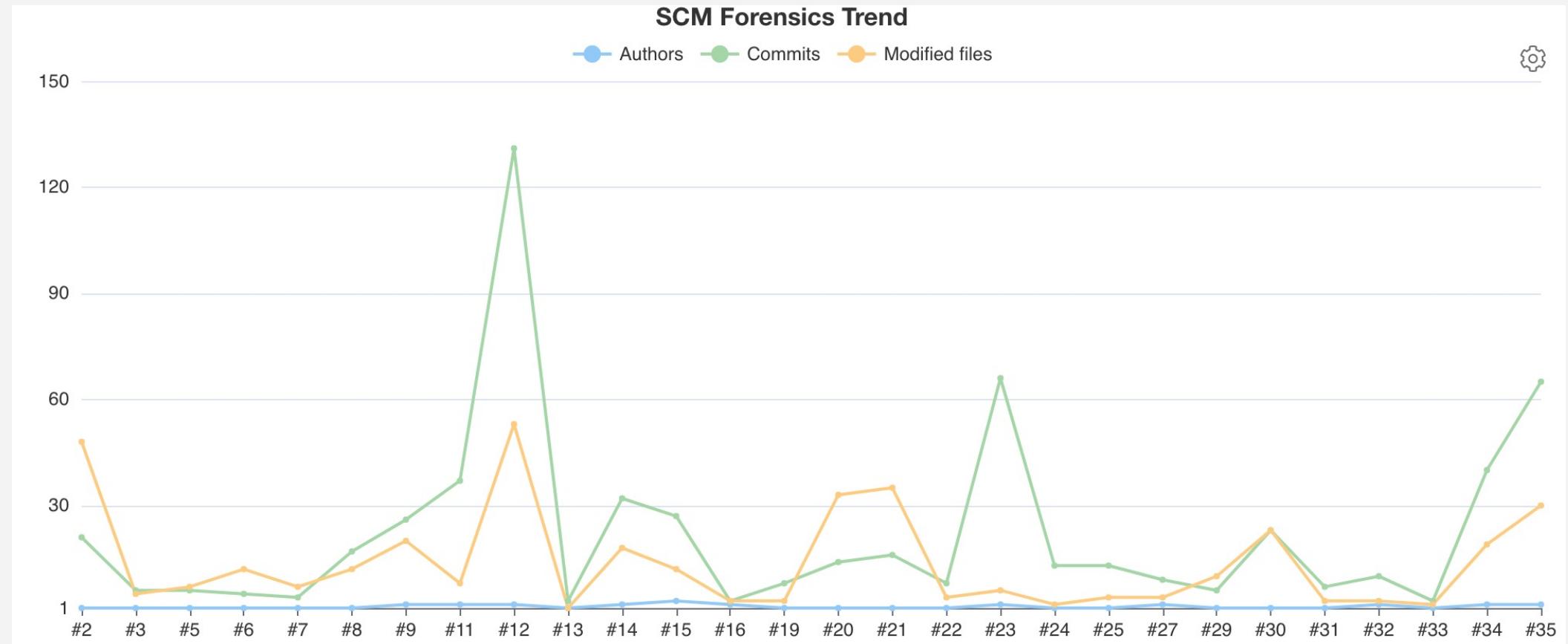
File Details – File Churn Chart



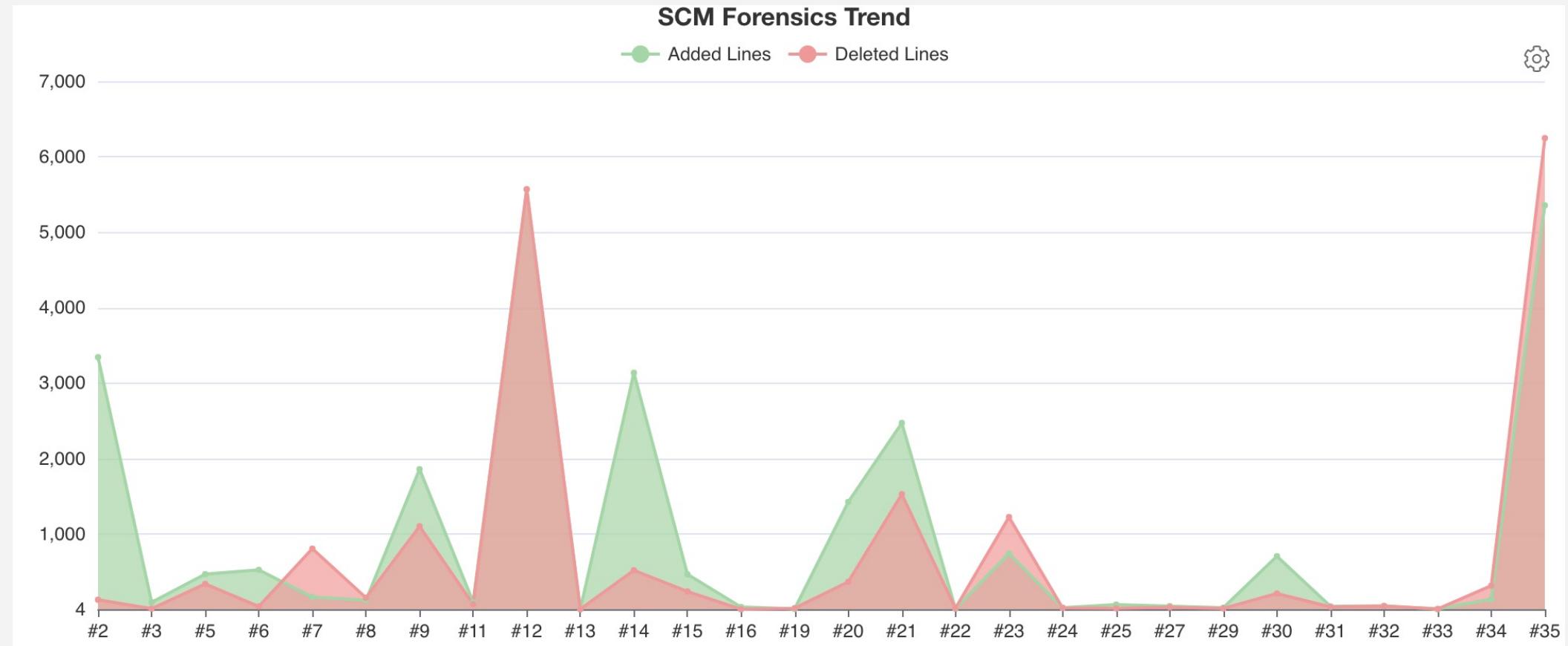
File Details – Commit Details Table

Details			
Show	10	entries	Search: ullric
Commit	Author	Added Lines	Deleted Lines
fee9c36	ullrich.hafner@gmail.com	191	11
fb44390	ullrich.hafner@gmail.com	9	0
f9b3146	ullrich.hafner@gmail.com	7	2
f4c9e3c	ullrich.hafner@gmail.com	25	2
ee3c99a	ullrich.hafner@gmail.com	21	4
e96eeba	ullrich.hafner@gmail.com	1	0
e806aa0	ullrich.hafner@gmail.com	21	48
e39049e	ullrich.hafner@gmail.com	1	1
e38e0e7	ullrich.hafner@gmail.com	21	58
dedaa88	ullrich.hafner@gmail.com	3	8
Showing 1 to 10 of 119 entries (filtered from 165 total entries)			
1 2 3 4 5 ... 12			

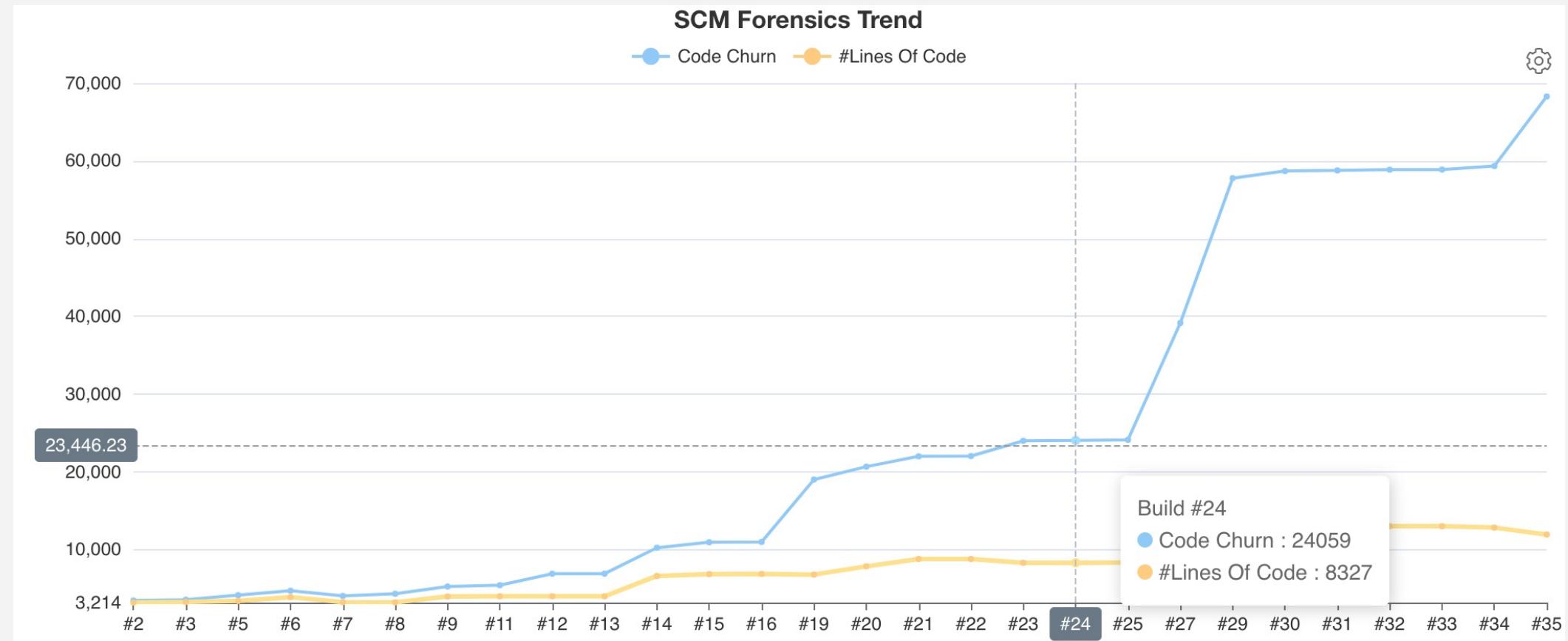
Project Trend Charts – Authors, Commits, Modified Files



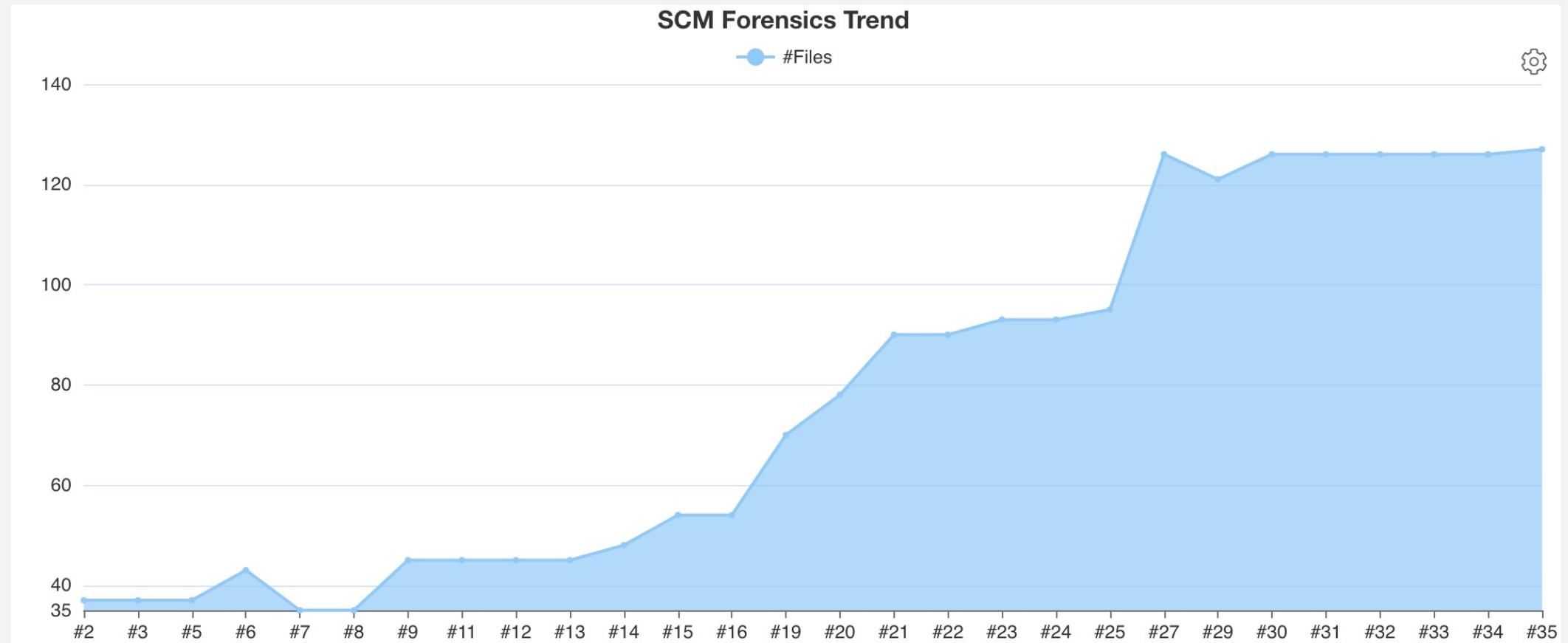
Project Trend Charts – Deleted vs. Added Lines of Code



Project Trend Charts – Lines of Code and Code Churn



Project Trend Charts – Total Number Of Files



Integration of Forensics in the Warnings Plugin

Details

Packages Files Issues SCM Blames **SCM Forensics**

Show 10 entries Search:

Details	File	Age	#Authors	#Commits	Last Commit	Added	#LoC	Code Churn
+	JavacParserTest.java:146	159	26	120	10 months ago	3 years ago	253	4267
+	MsBuildParserTest.java:715	159	24	120	1 year ago	3 years ago	923	27075
+	MsBuildParserTest.java:822	159	24	120	1 year ago	3 years ago	923	27075
+	MsBuildParserTest.java:727	159	24	120	1 year ago	3 years ago	923	27075
+	MsBuildParserTest.java:834	159	24	120	1 year ago	3 years ago	923	27075
+	Issue.java:252	159	19	154	3 months ago	3 years ago	936	8514
+	Issue.java:312	159	19	154	3 months ago	3 years ago	936	8514
+	DoxygenParserTest.java:123	159	16	73	5 months ago	3 years ago	315	13275
+	DoxygenParserTest.java:285	159	16	73	5 months ago	3 years ago	315	13275
+	DoxygenParserTest.java:116	159	16	73	5 months ago	3 years ago	315	13275

Showing 1 to 10 of 194 entries

1 2 3 4 5 ... 20

Integration of Forensics in the Warnings Plugin

Details

Packages Files Issues SCM Blames **SCM Forensics**

Show 10 entries Search: ullr

Details	File	Age	Author	Email	Commit	Added
+	PhpParserTest.java:50	159	Ulli Hafner	ullrich.hafner@gmail.com	106ef58	5 years ago
+	PhpParserTest.java:50	159	Ulli Hafner	ullrich.hafner@gmail.com	106ef58	5 years ago
+	Gcc4LinkerParserTest.java:109	159	Ulli Hafner	ullrich.hafner@gmail.com	10af865	3 years ago
+	ReportTest.java:417	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	FindBugsParserTest.java:62	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	AbstractParserTest.java:64	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	ReportTest.java:420	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	FindBugsParserTest.java:65	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	Gcc4CompilerParserTest.java:321	159	Ulli Hafner	ullrich.hafner@gmail.com	13ab4b5	1 year ago
+	ParsersTest.java:25	159	Ulli Hafner	ullrich.hafner@gmail.com	29badc2	4 months ago

Showing 1 to 10 of 149 entries (filtered from 194 total entries)

1 2 3 4 5 ... 15



Thank you!

Ullrich Hafner

UNIVERSITY OF APPLIED SCIENCES MUNICH