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Alambic: An Open-Source Platform for Software Engineering Data Management

The Case of Embedded Software Development

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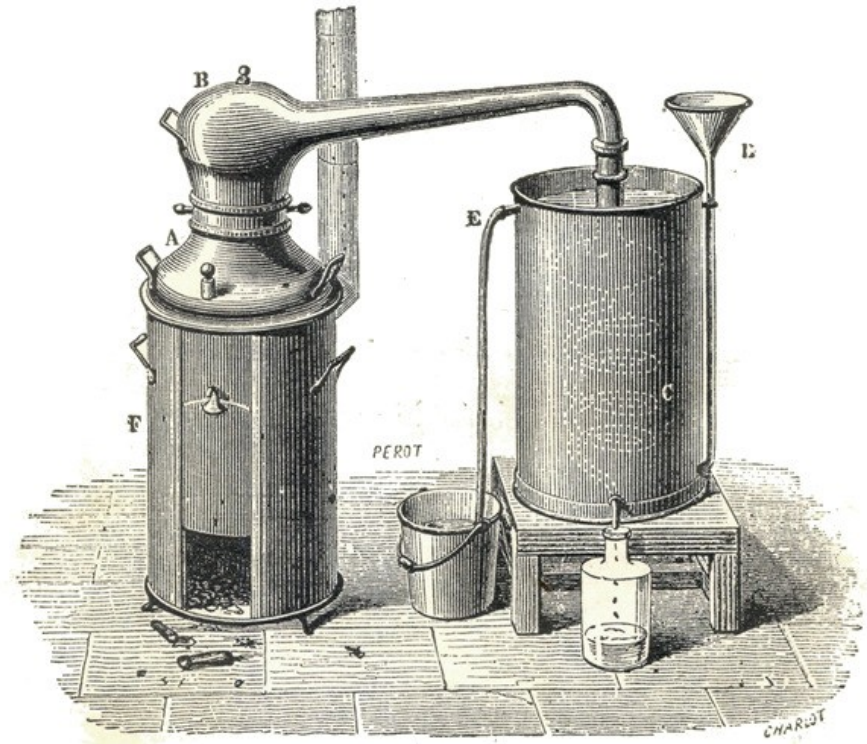🏠 http://castalia.solutions

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Plan

- Software quality, open data, and Alambic

- Alambic

  - Introduction: why Alambic

  - Architecture

  - Plugins: MetricsGrimoire, Hudson CI, PMD, Stack Overflow

- Use Cases

  - The PolarSys dashboard

  - The Eclipse forge

- Alambic 3.0 – one step forward

- Conclusion & Perspectives

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Software quality, open data and Alambic

Software quality has different meanings for different contexts :

- Open-source projects (e.g. includes community attributes),

- Embedded software (e.g. stresses reliability and testability),

- Desktop software (e.g. stresses usability and maintainability).

► Defining a **quality model** helps people realise what quality is in their context, and how to measure and improve it.

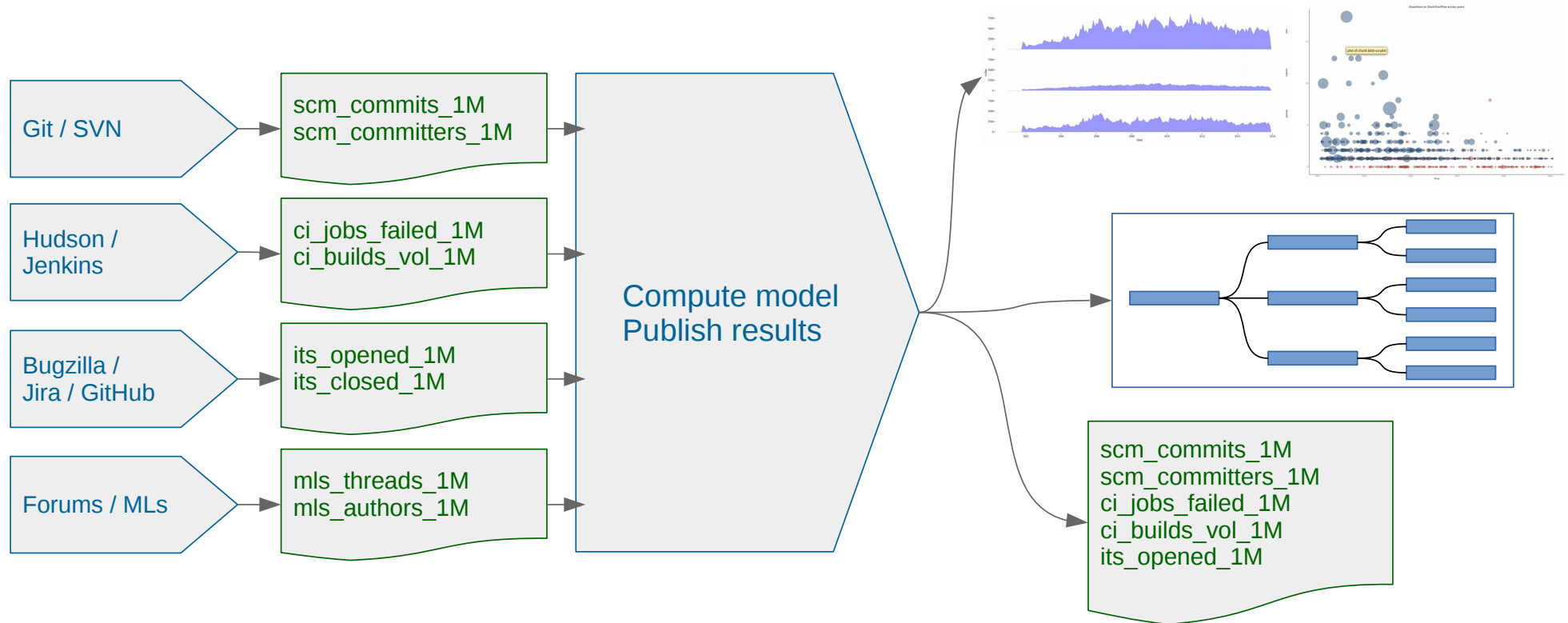**Transparency** (open data) is a key feature of software development.

- For open-source projects,

- For proprietary projects – Agile methodology explicitly promotes it.

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Alambic – Introduction

Why Alambic?

- A fairly big amount of data is generated along the development process, including requirements, code, issues, builds, delivery, support, and more...

- Alambic automatically retrieves, curates, and organises information from these data sources and presents it to the user in a unified vision:

  - Dedicated plugins can run checks, actions, and reports.

  - Visualisations show various aspects of the project behaviour.

  - Recommendations are proposed to improve practices and quality.

- All data is made available in a neat format (JSON, CSV) so data enthusiasts can easily play with it, and use external tools for reporting, visualisation, data mining, post-processing..

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Alambic – Architecture

Git / SVN → scm_commits_1M / scm_committers_1M →

Hudson / Jenkins → ci_jobs_failed_1M / ci_builds_vol_1M →

Bugzilla / Jira / GitHub → its_opened_1M / its_closed_1M →

Forums / MLs → mls_threads_1M / mls_authors_1M →

Compute model
Publish results

→

scm_commits_1M
scm_committers_1M
ci_jobs_failed_1M
ci_builds_vol_1M
its_opened_1M

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Alambic outputs

Alambic provides:

- A dashboard to browse all information online.

- Downloads for metrics, attributes, recommendations (JSON, CSV).

- Exportable figures: PNG/SVG, HTML snippets, interactive plots.

- Visualisations: quality model, data, history, specific data sources analysis.

Alambic 3.0

- PDF reports.

- Plotly graphics for online editing.

scm_commits_1M
scm_committers_1M
ci_jobs_failed_1M
ci_builds_vol_1M

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Alambic plugins – Hudson CI engine

This plugin connects to a Hudson CI instance and provides

- Metrics
  number of jobs, jobs failed/successful/unstable,
  builds failure rate..

- Figures
  builds history, jobs results

- Data
  builds, jobs (JSON, CSV)

- Recommendations.
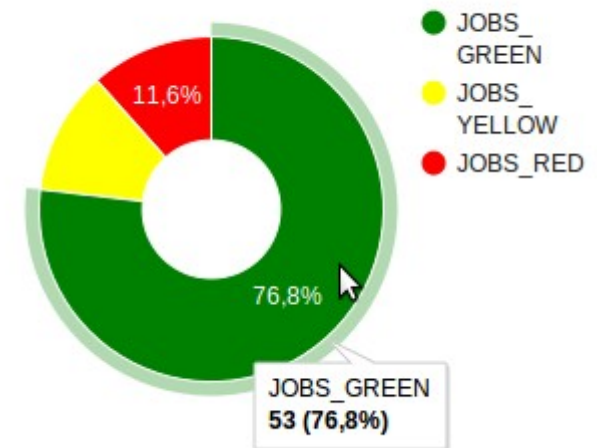
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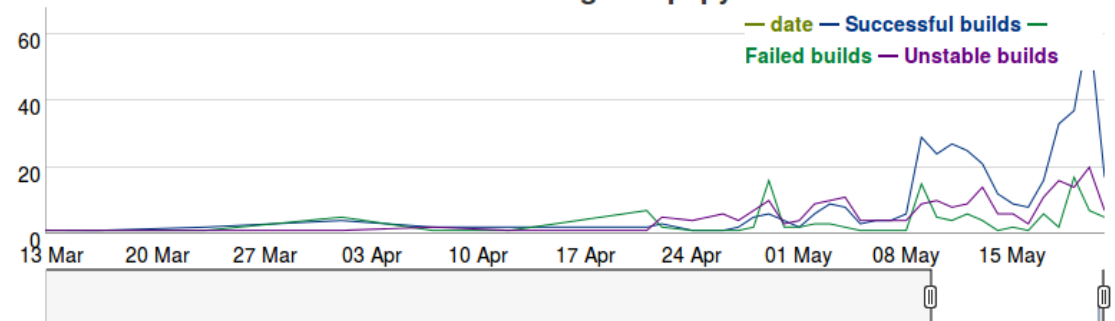
Alambic plugins: Eclipse ITS, SCM, MLS

A set of plugins to retrieve information from the Eclipse dashboard [EDA].

Community metrics are computed using Bitergia's MetricsGrimoire [BMG], a generic tool to analyse software development repositories and tools metadata.

- **Issue Tracking System** (ITS)

    - Metrics: its_closed_7, its_closed_30, its_closed_365, its_bugs_closed, its_bugs_changed, …

    - Figures, visualisation

    - Recommendations

[EDA] http://dashboard.eclipse.org

[BMG] https://metricsgrimoire.github.io

Number of changed bugs for technology.hudson
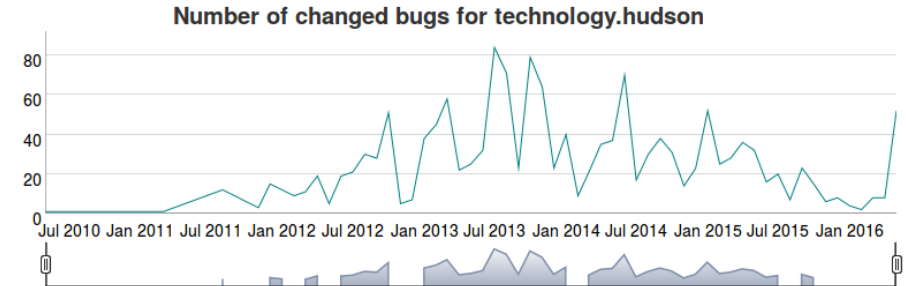
Alambic plugins: Eclipse ITS, SCM, MLS

A set of plugins for community metrics.

- **Software Configuration Management** (SCM)

    - Metrics: scm_commits_7, scm_commits_30, scm_commits_365, scm_authors_7, scm_committers, scm_files, …

    - Figures, visualisation

    - Recommendations

- **Mailing Lists** (MLS)

    - Metrics: mls_senders_7, mls_senders_30, mls_senders_365, mls_sent_7, mls_threads, mls_senders_response, …

    - Figures, visualisation

    - Recommendations

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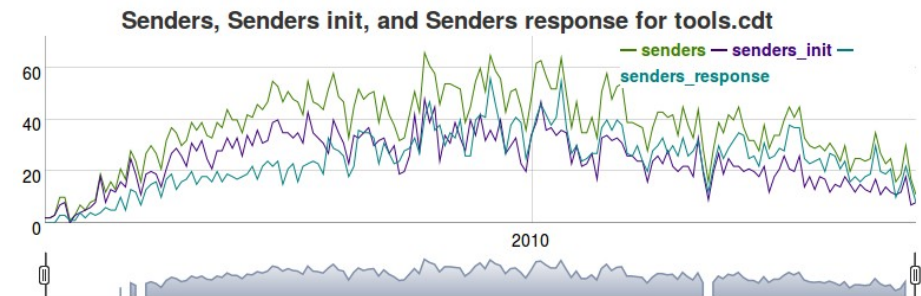
Alambic plugins – PMD Analysis & Configuration

A plugin to help users understand the output of PMD and configure the tool.

- PMD Analysis

    - Get a summary of violations found by PMD

    - Identify the most important violations to resolve.

- PMD Configuration:

    - Use only most important rules, with fewer violations.

    - Target *conscious* zero-default.

Rules checked

- P1 OK
- P2 OK
- P3 OK
- P4 OK
- P1 NOK
- P2 NOK
- P3 NOK
- P4 NOK

12.6%
6.9%
69%

Mnemo
DoubleCheckedLocking
AbstractClassWithoutAnyMethod
BrokenNullCheck
AvoidBranchingStatementAsLastInLoop
BooleanInstantiation

High-priority rules with a low number of violations
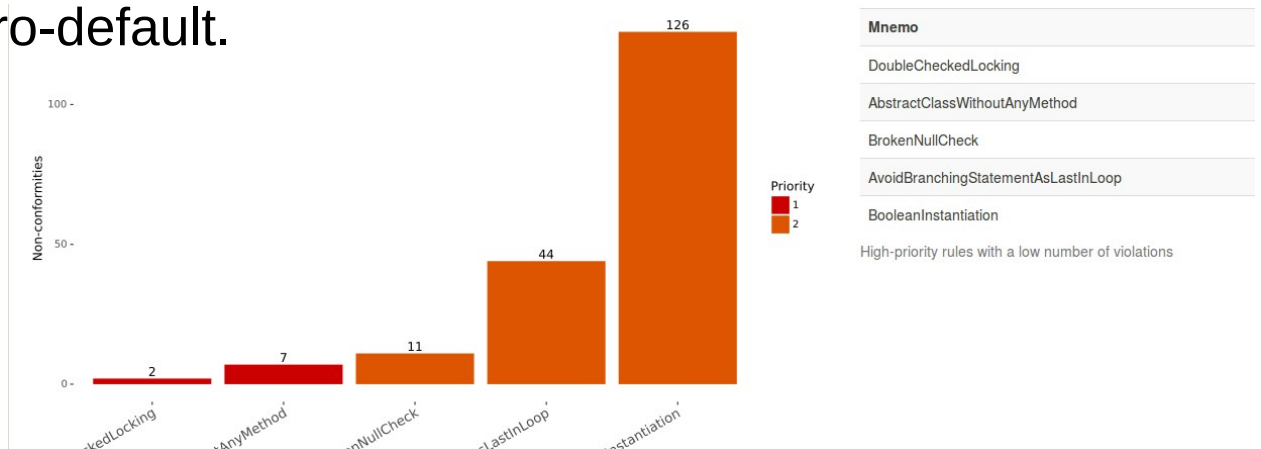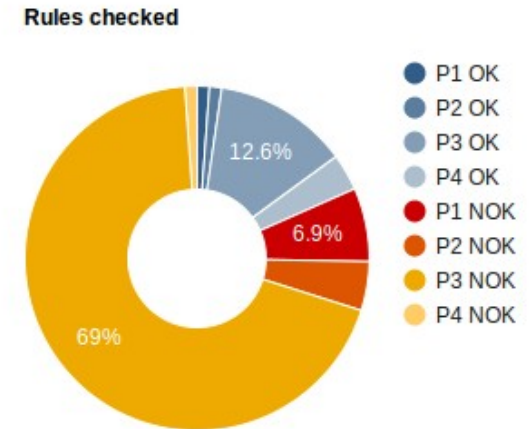
Use Cases: The PolarSys dashboard

PolarSys is an Eclipse Industry Working Group that provides an open-source tool chain for embedded systems.

A maturity assessment task force was initiated to ensure the overall consistency of projects regarding quality:

- Define a quality model with specific quality concerns

- Define means to measure quality attributes

- Define presentation of data (dashboard)
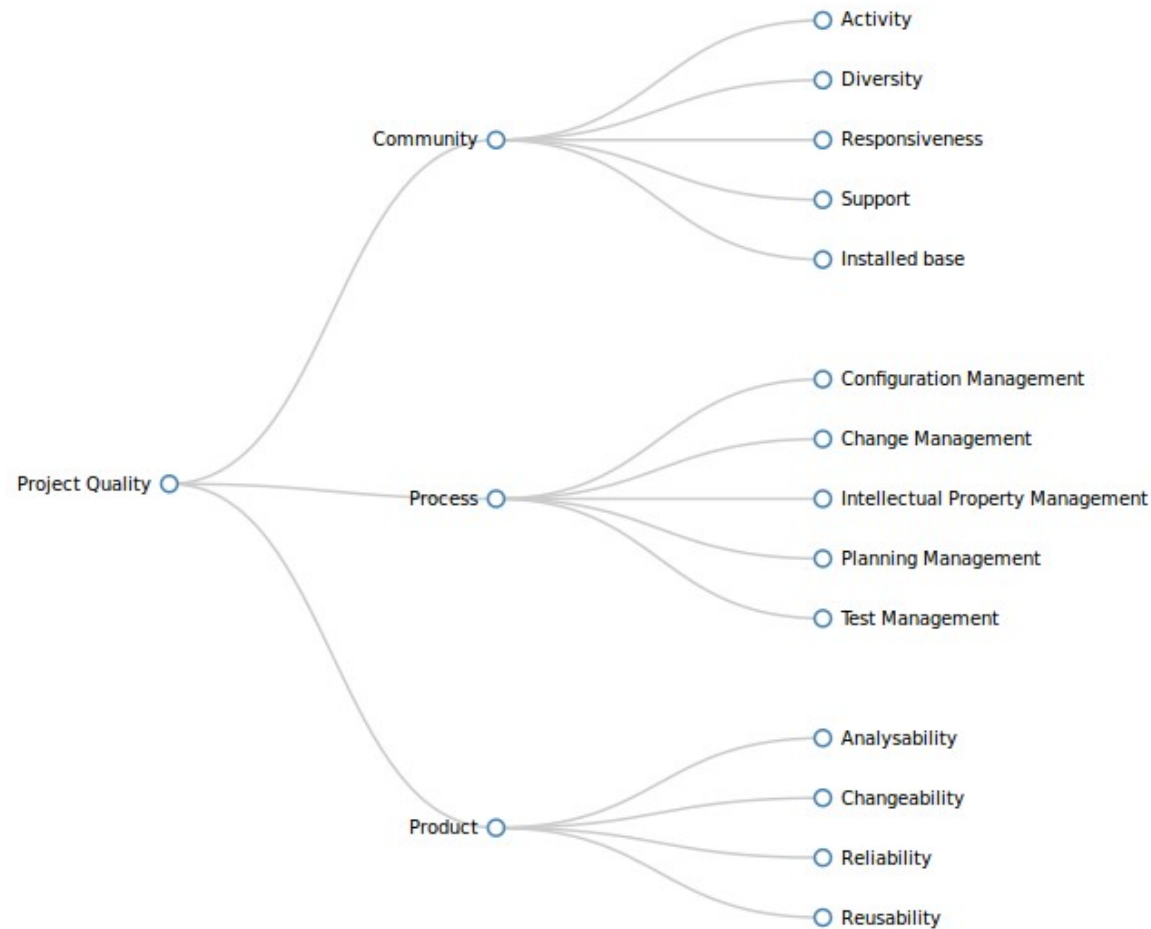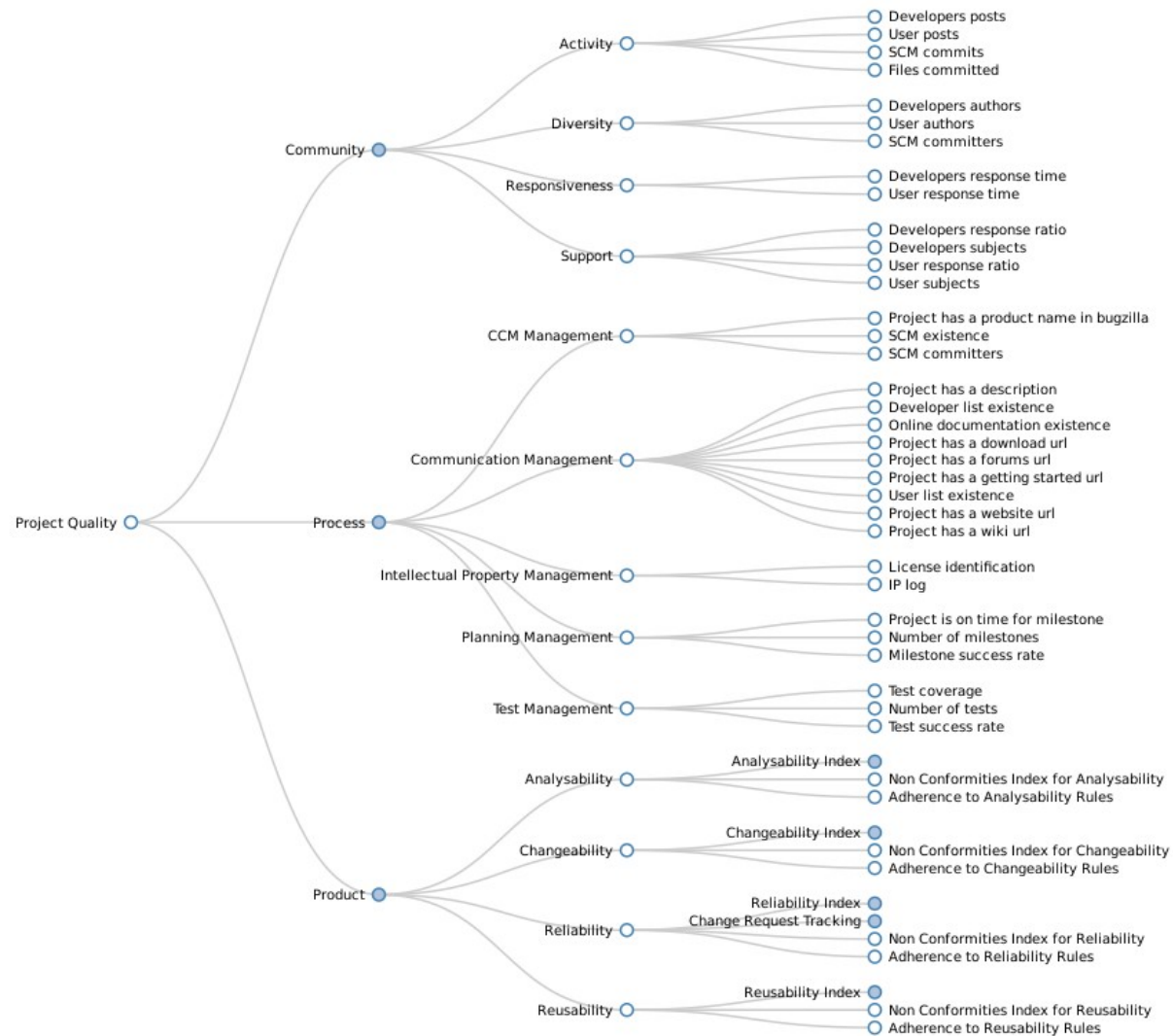
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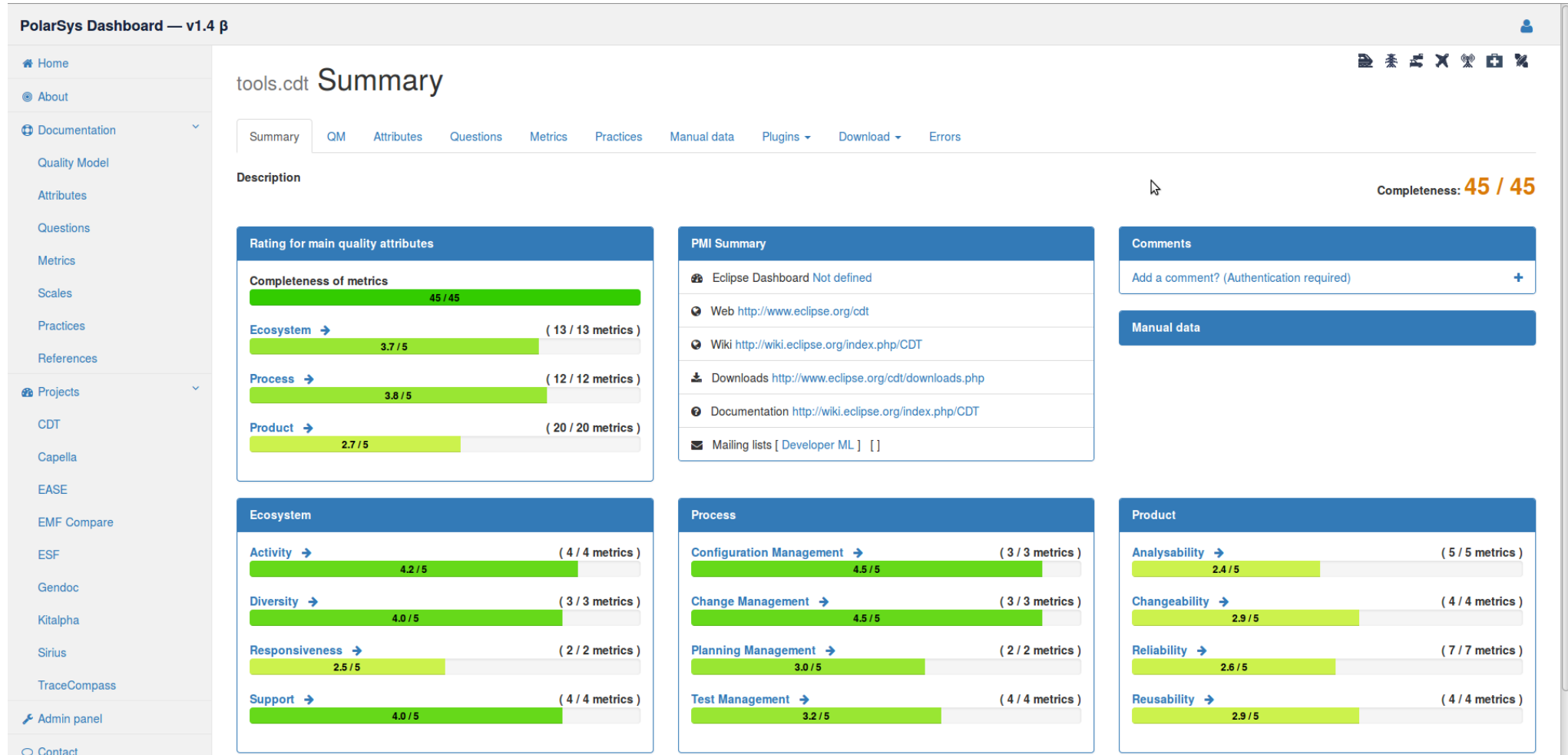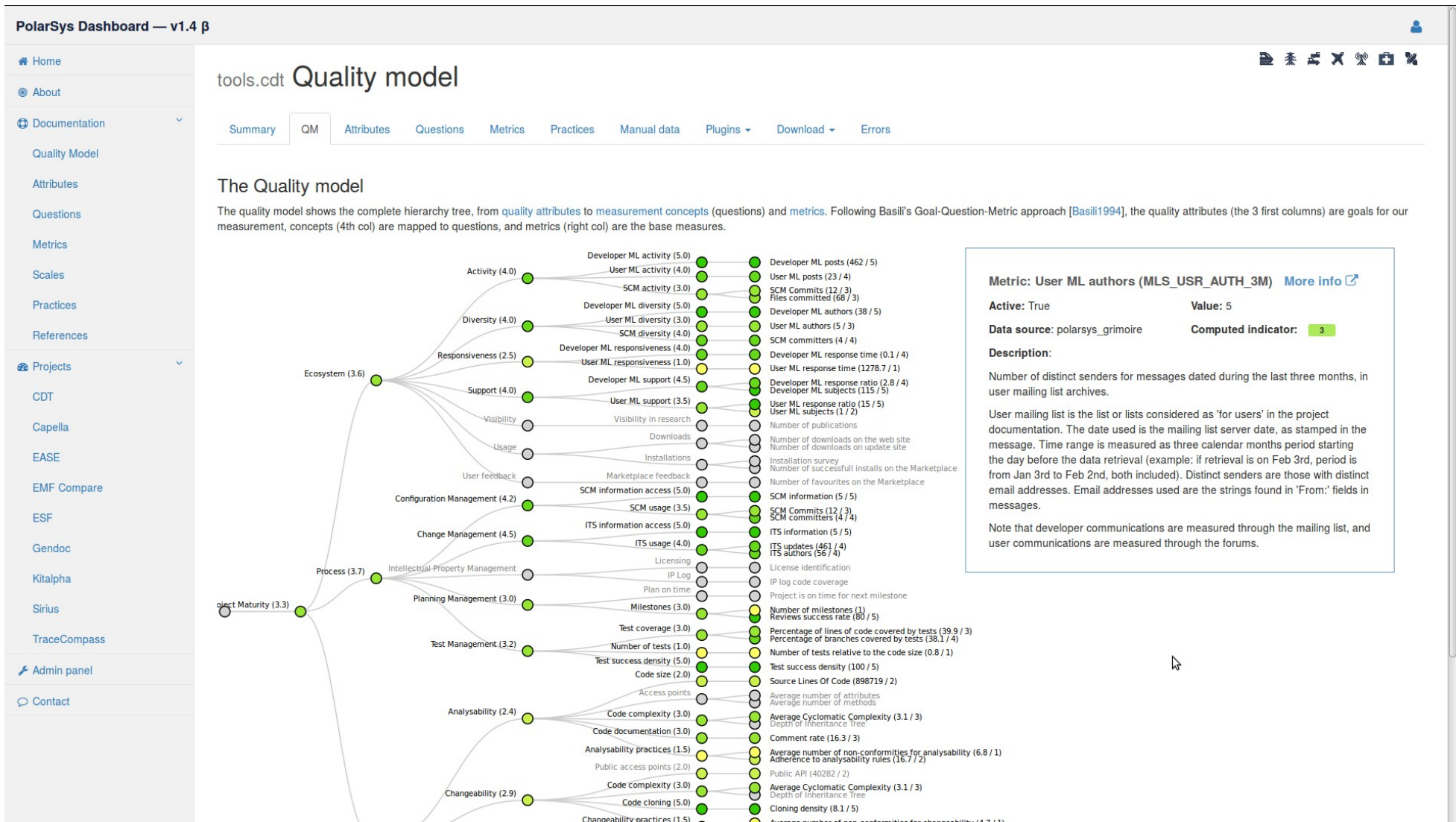
Use Cases: The Eclipse forge

Use the Eclipse Foundation's infrastructure to retrieve information from the various data sources and tools of the Eclipse forge:

- The PMI for project details (description, web site, downloads, etc.)

- Issue tracking (Bugzilla)

- Configuration Management (Git)

- Communication: Mailing lists and forums

- Hudson CI, PMD..

Also use external sources:

- Stack Overflow questions about the project

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Use Cases: The Eclipse forge

Use Cases: The Eclipse forge

Alambic 3.0

Alambic 3.0 adds many features:

- Architecture / Use Cases

    - More data-centric, positionned as a central data management platform.

    - Address new use cases: DevOps, system engineering.

    - Address new forges: GitHub, Apache..

- Plugins

    - New types of plugins: post and global triggers for reports

    - Wizards to create new projects: Eclipse PMI, GitHub, Apache

    - Tools: easily use external tools (e.g. R for analysis and reporting)

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Conclusion & Perspective

Alambic project:

- Home:
  http://alambic.castalia.camp

- Source, issues, documentation:
  http://bitbucket.org/BorisBaldassari/alambic

Check the live instances:

- Polarsys dashboard: http://dashboard.polarsys.org

- Eclipse forge dashbaord: http://eclipse.castalia.camp

Check the full article! →

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