SQUORING Technologies

Software Quality The Eclipse Way And Beyond

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- Eclipse Quality Requirements
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Introduction – Who?

Polarsys is an Eclipse Industry Working Group (IWG) with the following goals:

- Provide Very Long Term Support – up to 10 and 75 years.
- Provide certification to ease the tools qualification in complex certification processes.
- Develop the ecosystem of Eclipse tools for Critical Embedded Systems.

Maisqual is a research initiative focusing on data mining techniques in software engineering. It is a joint project between the **SequeL INRIA** laboratory and **SQuORING Technologies**.

Introduction – Why?

- Eclipse projects are meant to be used in bundles: **the whole stack is as strong as its weakest part**.
- There is **no automatic, objective and unified quality evaluation** for Eclipse projects.

- So Polarsys has launched a task force to
  - **discuss Maturity (or Quality) Assessment**,
  - **Identify quality requirements**, both for Eclipse and Polarsys,
  - Provide means to **assess project's quality**.

Introduction – How?

The Maturity Assessment Working Group intends to:

- **Propose a generic Eclipse quality model** conforming to the *Eclipse way of life*.
- **Define and enforce quality requirements** for projects entering the Polarsys umbrella.

- Thus the quality assessment process should be:
  - **Fully automated** for reliable measurement,
  - **Cristal-clear** so people understand it,
  - **Usable**, and used, for **Quality Improvement**.

Introduction – When?

The first polarsys release is our deadline in next September.

This is an on-going work!

Hence:

- Things may change – your feedback is welcome!
- We are currently working on a prototype, only partial results are available for now.

Quality in Software Engineering

Many definitions...

Software quality may have different meanings for different actors.

Most often seen definitions include: [Kan2003]

- “Conformance to requirements” in a contract (Crosby),
- “Fitness for use” for the customer (Deming, Feigenbaum),
- “Maintainability” for the manufacturer,
- “Maturity” in critical embedded systems,

Or even: “I recognise it when I see it.”

Quality Models and Standards

Many standards have grown to define or measure quality in software engineering.

Product quality

- McCall, Boehm, FURPS
- ISO 9126,
- ISO SQuaRE (250xx series),
- HIS, ECSS

Process quality

- ISO 15504, ISO 9001
- CMM

Open source Quality Models

There are quality models dedicated to open source software projects:

- Open Source Maturity Model (OSMM Cap Gemini & OSMM Navica)
- OpenBRR, QSOS, QualOSS, Qualipso...

But...

- Open source projects show a huge variety of different constraints and contexts.
- Many of these quality models have been criticised (e.g. for community assessment, or automatic data retrieval), and none of them received a wide acceptance from users and projects.

Eclipse
Quality Requirements

Eclipse Quality Requirements

- There is **no single definition of quality** on the Eclipse website.
- But some recommendations and quality concerns can be gathered when crawling through the wiki and project pages.

Finally:

- **Product quality** only has a few **guidelines**, while
- **Process** and **Community** concerns are better defined through **required rules** and **guidelines**.

Eclipse Product Quality

- **Reliability** – as ISO 9126's definition of Maturity.
- **Maintainability**, further decomposed in:
  - **Reusability**
    degree to which an asset can be used in more than one system, or in building other assets
  - **Analysability**
    degree of effectiveness and efficiency to assess the impact of an intended change
  - **Changeability**
    degree to which a product or system can be effectively and efficiently modified without introducing defects or degrading existing quality

Eclipse process – phases

An Eclipse project lifecycle has 3 major phases:

1. **Proposal**
2. **Incubating**
    - IP due diligence,
    - Developing the communities,
    - Regular milestones,
    - Interim releases,
    - Specific branding.

Eclipse process – phases

3. **Mature**
   - Predictability of outputs,
   - Nurturing the communities,
   - Release reviews.

We consider the **incubating and mature phases** for process-related concerns and improvement.

Eclipse Communities

Community is a fundamental of the Eclipse way

- **Developers** (contributors and committers)
- **Users** (end-users and adopters)

Concerns about community are

- **Diversity** of committers: different thoughts, avoid to rely entirely on one company or organisation.
- Project **activity**: the amount of work done in a given period of time.
- **Community support**: ability to answer to help requests.

Data Providers for Metrics

Data Providers – Mailing lists

Data providers have been developed to get information on:

- **Mailing lists / forums:**
  - number of posts,
  - number of authors,
  - number of distinct threads,
  - number of answers,
  - median time to answer.

Metrics are computed for last week, last month, and last 3 months.

Data Providers – SCM

SCM (Subversion) metadata:

- number of commits (File & Application levels),
- number of committers (File & Application levels),
- number of committed files (Application level),
- ratio of fix-related commits (File & Application levels).

Metrics are computed for last week, last month, and last 3 months.

Data Providers – Process

The Eclipse foundation has initiated a repository to **automatically retrieve process information**:

- number of milestones,
- number of reviews,
- number of themes (work item categories),
- number of requirements (Bugzilla change requests),
- IP logs.

Still a lot more to do!

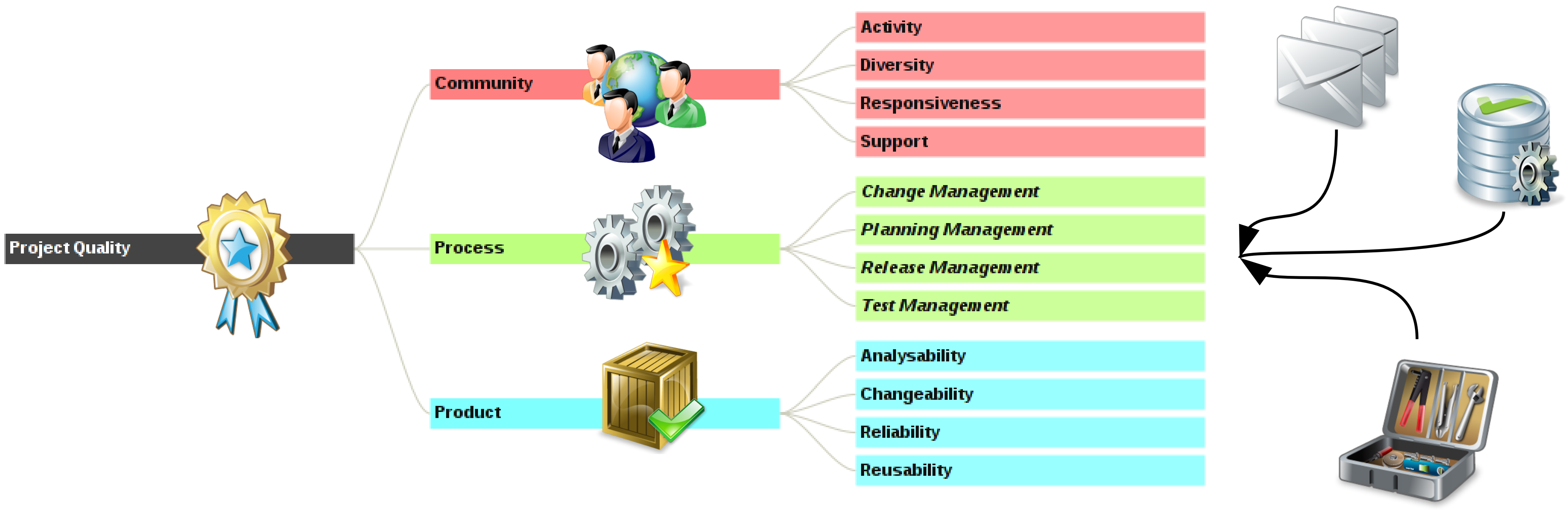
Eclipse
Quality Model

Eclipse Quality Model

We propose a quality model **tailored to Eclipse quality requirements**:

- Includes **Product**, **Process** and **Community** quality characteristics.
- Offers a **fully automatic analysis**, which should be in the future working right out-of-the-box for new projects.
- **Retrieves data from various repositories**:
  - Source code,
  - Mailing lists and forums,
  - SCM,
  - Process.

Eclipse Quality Model



Product Quality

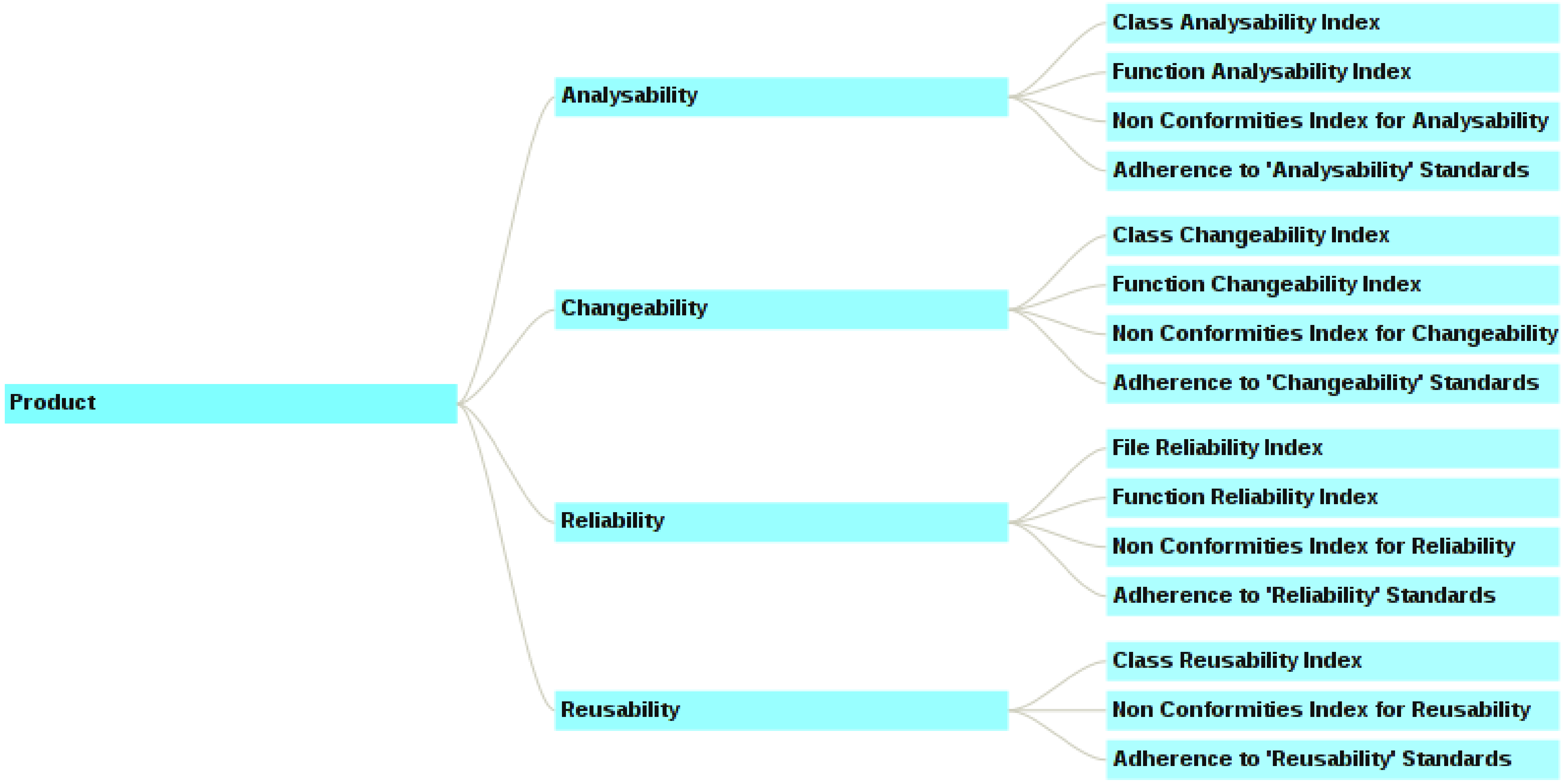
Product-related information consists of:

- **Intrinsic measures**: e.g. McCabe, Halstead metrics, nesting level..
- **Bad practices**: e.g. missing default, no assignment in conditions..
- **Cloning information**.

This information is gathered with:

- **Custom scripts**, adapted to the Eclipse repositories.
- **SQuORE** and **Checkstyle** tools.
- **Other tools** may be used as input (PMD, FindBugs, Sonar...)

Product Quality


Product
Analysability
Class Analysability Index
Function Analysability Index
Non Conformities Index for Analysability
Adherence to 'Analysability' Standards
Changeability
Class Changeability Index
Function Changeability Index
Non Conformities Index for Changeability
Adherence to 'Changeability' Standards
Reliability
File Reliability Index
Function Reliability Index
Non Conformities Index for Reliability
Adherence to 'Reliability' Standards
Reusability
Class Reusability Index
Non Conformities Index for Reusability
Adherence to 'Reusability' Standards

Process Quality

Process assessment is a difficult part:

- Metrics common to all project's processes are difficult to establish.
- Certification has specific constraints that need to be further established.

Sub-characteristics identified until now are:

- **Change** Management
- **Release** Management
- **Planning** Management
- **Test** Management

Community Quality

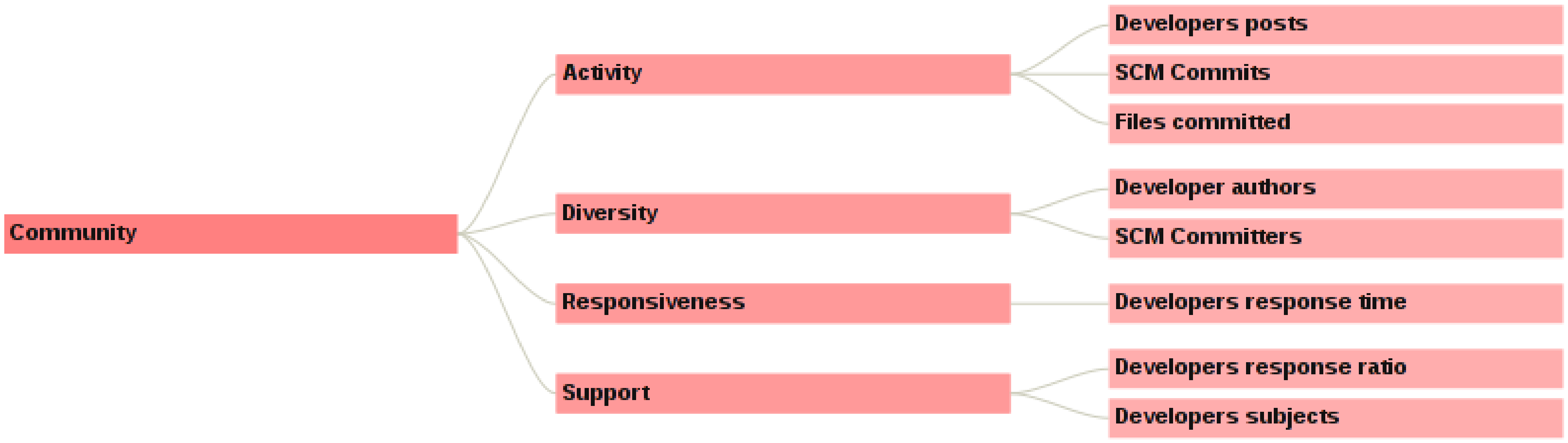
Community is decomposed into 4 sub-characteristics:

- **Activity** is the amount of work achieved in a period of time:
  - Number of commits,
  - Number of files committed,
  - Volume of mails exchanged.
- **Diversity** is the amount of different actors (developers and users):
  - Number of committers,
  - Number of authors in mailing lists.

Community Quality

- **Responsiveness** is how fast people can get answers:
  - Median time to first response in mailing list.
- **Support** is the amount of information received for requests:
  - Mailing list response ratio,
  - Number of different threads.

Community Quality



Presenting analysis results

For maximum efficiency, we will:

- Publish the detailed quality model, from quality characteristics and sub-characteristics to metrics used.
- Provide pragmatic advice for quality improvement and good practices adoption.
- Publish the results in a centralised dashboard: developers and users should have all relevant information at a glance.

Conclusion

Conclusion

This is only the beginning of the journey. We still need to:

- **Discuss and get a general agreement on quality requirements** with Eclipse and Polarsys actors.
- **Add more data sources**, e.g. bug tracking system, website and download statistics...
- **Improve the quality model**, most notably on the process part.

Quality is everyone's concern and responsibility.

Thank you for your interest!

More information on:
http://maisqual.squoring.com/wiki/index.php/Eclipse
http://polarsys.org/wiki/index.php/MaturityAssessmentWG

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- Eclipse Development resources:
  http://wiki.eclipse.org/Development_Resources
- Polarsys official website:
  http://www.polarsys.org
- Maisqual research project:
  http://maisqual.squoring.com