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Baseline criteria for achieving software quality within the European research ecosystem

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Releasing the "A set of Common Software Quality Assurance Baseline Criteria for Research Projects" document (hereby referred to as "SQA baseline criteria") resulted from the need of filling up an uncovered gap in the European research software engineering ecosystem. This document sets a Software Quality Assurance (SQA) plan that maintains a pragmatic set of requirements, best practices and recommendations to drive an adequate development, timely delivery and reliable operation of the produced software assets within a research software development project.

The SQA baseline criteria covers the basic practices of making the source code open and accessible, pointing to the relevant open-source licenses and code hosting platforms. In what relates to source code management, it provides specific guidance in the usage of a change-based approach, by means of a version control system (VCS), that relies on a branching model to handle the addition of incoming new features or bug fixes, separating development and stable versions. Every relevant change in the code must be tested to avoid disruptions in the supported major branches or releases.

By following the aforementioned change-based approach, the SQA baseline criteria emphasizes the idea of acting at the early stages of the software lifecycle as the catalyst for maximizing the effectiveness of resolving issues (bugs, security flaws) with the lowest effort and cost. In this regard, the primary focus is put on the static analysis testing (such as unit/functional testing and vulnerability scanning), encouraging developers to have meaningful test cases that provide enough coverage of the system operation. At this stage, the readability and maintainability of the code are also essential quality requirements, achievable by making the source code compliant with a relevant programming language's style standard.

The documentation attached to the software is key to its adoption, and the SQA baseline criteria suggests that it be treated as code, through the use of markup languages and VCSs. Consequently, the documentation is versioned, with the capability of being rendered in multiple online documentation repositories. As the last requirement in the described change-based approach, a human-based review shall be performed in order to consider a set of aspects that cannot be assessed automatically, such as the change suitability or the understandability of the documentation.

The best practices at later stages include the interoperability assessment by the execution of integration tests that ensure the operation with external components, open standards and protocols. A further security analysis is also performed at this stage, by checking common security flaws, thus covering two of the fundamental pillars of the dynamic analysis of the software.

The SQA baseline criteria as here presented has been elaborated based on the first-hand experiences of several European-funded software development projects. It is actively maintained (currently on version 2.0), online available, and open to collaboration and discussion. The aim is to keep improving and extending the document in order to consolidate it as a reference point for future research projects that involve development of software.

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