Developing high-quality software is tough. ECLAIR is designed to help development, QA, and safety teams reach their quality goals.

ECLAIR Qualification Kits

ECLAIR qualification kits provide crucial help to safety teams in charge of qualifying the tool following the prescriptions of functional safety standards. The kits contain documents, test suites, procedures and automation facilities that can be used by the customer to obtain all the confidence-building evidence that is required to make a solid argument justifying the use of ECLAIR in safety-related projects.

1 Highlights

- Direct, explicit support for several functional safety standards: CENELEC EN 50128 (railway), ECSS-Q-ST-80C (space), IEC 61508 (industrial), IEC 62304 (medical), ISO 26262 (automotive), RTCA DO-178C/DO-330 (aerospace).

- Support for MISRA coding standards: MISRA-C:2004, MISRA C:2012, MISRA C++:2008.

- Support for HIS and other source code metrics.

- Validated BUGSENG test suites allow for thorough validation of ECLAIR textual output formats.

- Validated BUGSENG test suites take into account the implementation-defined aspects of C/C++.

- Support for totally independent validation via the Solid Sands MISRA-C:2004 and MISRA C:2012 test suites.

- Built-in antitampering features.

- Users can add their own test cases.

- Users can easily customize the documentation provided.

- *Test Automation Unit* supplied in source form to allow for inspection.

- Detailed reports allow running any test outside and completely independently from the qualification kit.

- Licensed for single projects or for multiple projects.

- No stress: generous number of hours of consultancy services are included to facilitate the qualification process.

2 Documents Provided

The following documents, which are explicitly mapped to the requirements of EN 50128, ECSS-Q-ST-80C, IEC 61508, IEC 62304, ISO 26262 and DO-178C/DO-330, are part of the qualification kits:

ECLAIR Qualification Kit User's Manual Contains detailed information about the use of the qualification kit including a mapping to the supported functional safety-standards.

ECLAIR Safety Manual Contains all you need to know on the use of ECLAIR for the development of safety-related systems.

ECLAIR Test Automation Unit Manual Contains detailed information on the installation, verification and use of the Test Automation Unit.

ECLAIR Development Process Contains a high-level description of the processes used at BUGSENG for the development of ECLAIR.

ECLAIR Release Notes Contains information on ECLAIR releases since ECLAIR 2.3 along with matching releases of the ECLAIR Qualification Kits, where available.

ECLAIR Defect Report Contains information about known ECLAIR defects that may impact functional safety, along with instructions on how to obtain information on additional defects possibly discovered after the release of the qualification kit.

ECLAIR Qualification Report A template document that the user can easily integrate with test results that have been obtained by running the *Test Automation Unit* on the test suites, possibly along with any information supplementary to the *ECLAIR Safety Manual*.

3 BUGSENG Test Suites

BUGSENG test suites for MISRA-C:2004, MISRA C:2012 and MISRA C++:2008 contain thousands of test cases developed by BUGSENG over a decade. They have been designed to cover ordinary as well as corner cases and cases where the presence/absence of MISRA guideline violations depends on particular combination of the implementation-defined aspects of the language.

4 Solid Sands Test Suites

Solid Sands, the makers of the renowned *SuperTest* compiler test and validation suite for C and C++ compilers, also produces test suites for MISRA-C:2004 and MISRA C:2012. Solid Sands MISRA suites contain two types of tests:

1. The *t-tests* are meant to fully conform with the MISRA guidelines and should not trigger any diagnostics in the MISRA checking software; this class of tests is useful to catch the presence of unwanted false positives.

2. The *x-tests* have been designed to contain a violation of each specific MISRA guidelines; these are helpful to prove the correctness and comprehensiveness of the ECLAIR tool to an accredited certification body.

The ECLAIR qualification kits for MISRA-C:2004 and MISRA C:2012 have been designed to allow for plugging in the Solid Sands MISRA suites, thereby enabling totally independent validation.

5 Test Automation Unit

The *Test Automation Unit* (TAU) is written in *Lua*, a scripting language whose interpreter is characterized by small memory footprint and high speed. The TAU is supplied in source code, thereby allowing for easy inspection and independent assessment. Nonetheless, the TAU produces, along with the results obtained for each test case, the exact sequence of commands that allow reproducing the test without using any component of the qualification kit apart from the test case source code. Among the data produced by the TAU is a summary that can be directly included in the *ECLAIR Qualification Report*.

6 The Bigger Picture

ECLAIR is very flexible and highly configurable. It can support your software development workflow and environment, whatever they are.

ECLAIR is fit for use in mission- and safety-critical software projects: it has been designed from the outset so as to exclude configuration errors that would undermine the significance of the obtained results.

ECLAIR is developed in a rigorous way and carefully checked with extensive internal test suites (tens of thousands of test cases) and industry-standard validation suites.

ECLAIR is based on solid scientific research results and on the best practices of software development.

ECLAIR's unique features and BUGSENG's strong commitment to the customer, allow for a smooth transition to ECLAIR from any other tool.

BUGSENG's quality system has been certified by TÜV Italia (TÜV SÜD Group) to comply with the requirements of UNI EN ISO 9001:2015 for the "Design, development, maintenance and support of tools for software verification and validation" (IAF 33).

BUGSENG is an Arm's Functional Safety Partner. Arm's Functional Safety Partnership Program promotes partners who can reliably support their customers with industry leading functional safety products and services.

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no compromises,
no excuses:
software verification done right**