bugSeng

ABOUT

A Team of Experts
Industries
Our Partners

PRODUCTS

ECLAIR Suite
Tool Qualification
Tool Certification

SERVICES

Online Training
Consulting & Verification
Technical support

COMPANY

bug❍eng

Innovative SME established in 2010

Active scientific research with numerous publications in international journals and conference proceedings

Active standardization efforts in MISRA C/C++/SQM WG and ISO/IEC JTC1/SC22/WG14 (C Standardization Working Group)

WHAT WE DO

Software verification tools and services for automotive, industrial, railways, aerospace, medical, agriculture and forestry

MAIN PRODUCTS

eclair

2011 first commercial license
2013 first successful use in safety-related development

ECLAIR Software Verification Platform ®

Features

✔ Advanced static analysis for MISRA compliance
✔ Verification of architectural constraints (independence, freedom from interference, isolation, segregation)
✔ Requirements management
✔ Continuous compiler qualification
✔ Software composition and comprehension
✔ Automatic toolchain configuration
✔ Smooth use from native GUI, IDEs, command line, CI/CD systems (Jenkins, GitLab, GitHub)
✔ Bug finding

ECLAIR Qualification Kits for CENELEC EN 50128, EN 50657, EN 50716 (railway), ECSS-Q-ST-80C (space), IEC 61508 (industrial), IEC 62304, IEC 81001-5-1 (medical), RTCA DO-178C/DO-330 (aerospace), ISO 26262, ISO/SAE 21434 (automotive).

MAIN SERVICES

■ Advanced Training

■ MISRA compliance of legacy code

■ Library qualification

■ Technical consulting

CERTIFICATIONS

ECLAIR is qualifiable and certified by TÜV SÜD for use in safety-related development in compliance with: ISO 26262 up to ASIL D, IEC 61508 up to SIL 4, EN 50128 up to SIL 4, EN 50657 up to SIL 4, IEC 62304 up to Class C, ISO 25119 up to SRL 3, ISO 19014 up to MPLr e

BUGSENG is certified UNI EN ISO 9001:2015 since 2020

A TEAM OF EXPERTS

BUGSENG is a leading provider of solutions and services for software verification. The BUGSENG team is composed of highly skilled researchers and software engineers with 25+ years of experience in software verification, static analysis, language and coding standards including MISRA.

BUGSENG's *ECLAIR Software Verification Platform®* implements state-of-the-art software verification technology and best practices for the automatic verification of C and C++ programs in compliance with the most stringent standards in all industry sectors.

BUGSENG is also a renowned resource for advanced professional training and consulting services, helping industry leaders to improve their development processes and fully compy with functional-safety and cybersecurity standards.

Book a free MISRA strategy call

ECLAIR

eclair is a powerful platform for the automatic analysis and verification of C and C++ programs. It is suitable for light verification tasks that can be run right on the developer's desktop, as well as for tough analyses to be run in batch mode.

REPORT ACCURACY

ECLAIR reporting facilities have no equal in the market. Detailed reports are interactive and the quality of messages is extremely high (tracking of macro expansion and header file inclusion, view sources before and after preprocessing, dynamically select what you want to work on now or postpone for later, ...). "Summary reports can be produced in a variety of formats, including pure text, spreadsheet, Word (DOC) and OpenDocument (ODF) format." The quality of ECLAIR ODF reports is so high that they can be handed directly to the organization commissioning the project in order to demonstrate MISRA compliance.

SUPERIOR RELIABILITY

Analysis reports are strictly tied to the code that is eventually executed, i.e., ECLAIR analyzes the real thing, not something else. In fact, ECLAIR automatically interacts with the toolchain in order to obtain reliable results and save your time. Thanks to its ability to intercept all toolchain components (compilers, assemblers, librarians, linkers),

it supports all kinds of makefile-based, script-based or hybrid build systems. Most popular C/C++ compilers and cross compilers are supported, including ARM, CodeWarrior, Cosmic Software, CrossWorks, GCC and its derivatives, Green Hills, HighTec, IAR, Intel, Keil Software, MPLAB, Microsoft, QNX, Renesas Electronics, SOFTUNE, TASKING, Texas Instruments, Wind River, and clang/LLVM.

COMMAND LINE, GUI, IDE AND C.I. INTERFACES

With ECLAIR, everything can be done from the command line for automation and reproducibility, but a very easy-to use GUI is available for day-to-day work. The productivity attainable using ECLAIR when interfaced with IDEs leaves competitors far behind. In addition ECLAIR has great support for continuous integration systems such as Jenkins, GitHub and GitLab. See it for yourself! On https://eclairit.com you can see ECLAIR in action in a CI system on several open-source projects

BOTTOM LINE

It is easy to make the ECLAIR decision. It is relatively inexpensive to acquire, easy to integrate into the daily work life of developers, and produces vastly superior results that result in cost savings and improved productivity, as well as improved overall quality.

* All trademarks used in this document are recognized as such.

eclair

The most extensive coverage of BARR-C available on the market

B

- BARR-C:2018
- AUTOSAR C:2009
- HIS METRICS
- BUG FINDER
- DOZENS OF OUR SERVICES AND METRICS
- INDEPENDENCE CHECKER
- REQUIREMENTS MANAGEMENT TOOL

MC

MISRA C:2004
MISRA C:2012
MISRA C:2023
MISRA C:2025

MP

MISRA C++:2008
MISRA C++:2023

MCP

Combo package
MISRA C / C++

B package is bundled with all MISRA packages at no extra cost

Add-Ons

Expand the capabilities of your main ECLAIR package by adding valuable add-ons

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ECLAIR CerTran automatically produces one SuperTest configuration for each detected use case and uses the test and validation suite to qualify the compiler for all of them.

CodeScout

New add-on ECLAIR CodeScout automatically tells you the exact portion of C/C++ libraries you are using, avoiding extra and unnecessary qualification work.

TOOL QUALIFICATION

ECLAIR Qualification Kits provide direct, explicit support for the most common functional-safety standards:

DO-178-C/DO-330
ECSS-Q-ST-80C

ISO 26262
ISO/SAE 21434

IEC 62304

EN 50128
EN 50657
EN 50716

IEC 61508
IEC 81001–5–1

ISO 25119
ISO 19014

BUGSENG highly-qualified personnel join forces with customers' safety teams in taking care of ECLAIR qualification following the prescriptions of functional safety standards.

We will reproduce your ECLAIR operational environment and particular ECLAIR use case, and provide you with the corresponding ECLAIR Qualification Report along with all the required supporting evidence to justify the use of ECLAIR in your project.

QUALIFICATION KIT IS FOR YOU IF	QUALIFICATION SERVICE IS FOR YOU IF
ECLAIR qualification will be a recurring task for your company	ECLAIR qualification may be a one-time task for your company
You have both suitably qualified personnel and the time to perform the qualification in-house	You lack time or manpower (we can do the qualification for you in 10 working days)
You are willing to write the qualification report yourself (the qualification kit provides crucial guidance on how to do that properly)	You prefer not having to produce the qualification report yourself and would like us to do it properly for you
You want all the evidence of the qualification work to be in your hands, along with the ability to repeat the validation process at any time	You only need the qualification report and safety manual: all the remaining artifacts (including test cases) can remain with BUGSENG

ECLAIR FuSa Pack completes the ECLAIR functional safety ecosystem:
it facilitates and accelerates the development of functional-safety applications
in most industry sectors.

The ECLAIR FuSa Pack can be licensed for single projects or for multiple projects.

WHAT IS INCLUDED IN THE FUSA PACK

TÜV SÜD **certificate** according to:

- IEC 61508:2010 for any SIL;
- ISO 26262:2018 for any ASIL;
- EN 50128:2011 + A2:2020 for any SIL;
- EN 50657:2017/A1:2023 for any SIL;
- IEC 62304:2006 + Amd 1:2015 for any software safety class;
- ISO 25119:2018 + Amd 1:2020 for any SRL;
- ISO 19014-4:2020 for any MPLr.

ECLAIR Safety and Security Manual, which contains all you need to know
on the use of ECLAIR for the development of safety-related systems

TÜV SÜD **technical report** detailing their examination of the ECLAIR
Software Verification Platform with respect to functional safety

Generous number of hours of **consulting** services to facilitate the qualification process

ECLAIR Highlights

· The hardest part of the configuration, namely the adaptation to the compiler toolchain and the particular language dialect(s) used in the project, is **fully automatic.**

· Uniform user experience whether ECLAIR is used from its **GUI**, from the **command line,** within **IDEs** and in **CI/CD** systems such as Jenkins, GitLab and GitHub.

· Automatic checking of the system architecture, **independence** and **freedom from interference** of software components.

· ECLAIR comes with an integrated **Requirements Manangement Tool.**

· ECLAIR is **certified** and qualifiable for use in safety-critical developments, according to the main functional safety standards, up to the highest SILs and ASILs.

eclairSuite

BASE | MISRA PACKAGES

B MC MP MCP

for the automatic checking of coding standards

FUSA ECO SYSTEM

eclair FU SA PACK **eclair** K QUALIFICATION PACK **eclair** S QUALIFICATION PACK

CONTINUOUS QUALIFICATION

Code SCOUT
automatically tells you the exact portion of C/C++ libraries you are using, avoiding extra and unnecessary qualifictation work

automatically turns real compiler usage into SuperTest configurations and runs them to verify the toolchain

cer T ran

SuperTest

SERVICES

ONLINE TRAINING

Effective MISRA C/C++

Our best-seller consists of two professional training courses: one focused on MISRA C and one on MISRA C++, both aligned with the latest version of the respective standards.

The courses provide guidelines for safety and security, include lectures, practical exercises and hands-on sessions, and optionally a final exam. They are designed to strengthen the skills of teams involved in the design, development and verification of safety-critical embedded software systems.

MISRA Compliance

a professional training course for all managers involved in the negotiation, planning, execution and assessment of MISRA requirements, with compounding benefits for the entire organization.

Effective ECLAIR

a very practical training course, hands on the tool, fully tailored on the daily use cases of your team. Thought to help you get the most out of your tool.

All trainings are live and interactive

TECHNICAL SUPPORT

BUGSENG technical support team members are product and technology experts with deep experience in the diverse coding standards and development environments used in industry. We are striving to provide our customers with continuous innovation and the highest levels of support.

BUGSENG offers to its customers online and self-help support in addition to online issue-tracking tools for case submission, monitoring and updating.

CONSULTING & VERIFICATION

BUGSENG offers highly specialised consulting services to help industry leaders improving their development processes and complying with functional-safety standards. E.g., bringing existing projects into MISRA compliance, development and verification of safe and secure software, integration of software verification tools into complex CI/CD infrastructures.

BUGSENG consulting services were chosen by AMD and The Linux Foundation

Xen   Zephyr™Project

	C	C-rusted	Rust
Standardized	✓ ISO	✓ ISO C	✗ Moving target
Certifiable translators exist	✓ Yes	✓ ISO C	✗ No
Portability	✓ Absolute	✓ Absolute	✗ Limited
Tool availability	✓ Very Large	✓ Large	✗ Scarce
Developers' availability	✓ Large	✓ Yes	✗ Scarce
Coding standards for safety and security	✓ Yes	✓ Yes	✗ No
Can reuse C legacy code		✓ Yes	🌡 Sometimes
Strong guarantees on memory resources for annotated programs		✓ Yes	✓ Yes
Strong guarantees on user-defined resources for annotated programs		✓ Yes	✓ Yes
Compatibility with unannotated code		✓ Yes	✓ Yes
Incremental adoption		✓ Yes	✗ No
Cost of retraining C programmers for unannotated code		✓ Zero	✗ Significant
Standardized		🌡 Moderate	✗ Significant

C-rusted is a pragmatic and cost effective solution to up the game of C programming to unprecedented integrity guarantees without giving up anything that the C ecosystem offers today. That is, keep using C, exactly as before, using the same compilers and the same tools, the same personnel... but incrementally adding to the program the information required to demonstrate correctness, using a system of annotations that is not based on mathematical logic and can be taught to programmers in a week of training.

Read more: https://bugseng.com/c-rusted

QUALITY MATTERS

OUR PARTNERS

WE ARE CERTIFIED

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).

The Arm Functional Safety Partnership Program brings together companies in Arm's broad ecosystem who specialize in functional safety. These partners can reliably support customers with industry-leading functional safety software and tools, design services, and training services, helping to fast-track product and solution certifications to international standards, including ISO 26262 and IEC 61508.