ECLAIR Release Notes

Release 3.14.0

May 9, 2025

1 Summary of ECLAIR Releases

The following table shows the release history of ECLAIR since version 2.1. For ECLAIR versions with an associated *ECLAIR Qualification Kit* (EQUALKIT for short), the version number and the release date of the kit are also shown.

2 Summary of Changes

In this chapter we summarize the main changes to each version of ECLAIR from the version before it. Note that major versions can (and often do) contain incompatible changes, so please make sure to read the following carefully. Please do not hesitate to contact BUGSENG for assistance on the upgrade process.

2.1 Summary of Changes from Version 3.13.1 to Version 3.14.0

ECLAIR version 3.14.0 contains new features, many enhancements to existing features, and the correction of several defects.

New features (FSSCF):

- New versioning scheme simplifies working with the many published versions of MISRA C:2012/2023/2025, including revisions, amendments and technical corrigenda. Now the latest version of, say, MISRA C Rule 21.8 (i.e., the one in MISRA C:2025) is available under MC4.R21.8, the version in MISRA C:2023 is available under MC3.R21.4 and the version after MISRA C:2012 TC1 and before MISRA C:2012 AMD2 is available under MC3R1.R21.8 (where "R1" is short for "Revision 1") and MC3C1.R21.8 (where "C1" is short for "TC1"). MISRA C:2004 checkers are available under the MC2 prefix (e.g., MC2.14.5) whereas MISRA C:1991 checkers are available under the MC1 prefix (e.g., MC1.32).
- New service B.FRAMES to verify conditions on the invoked toolchain components and the options passed to them.
- Now ECLAIR intercepts all supported toolchain components by default. Advanced users can limit interception to selected components (via environment variables CC_ALIASES, CXX_ALIASES, AS_ALIASES, LD_ALIASES, AR_ALIASES, FILEMANIP_ALIASES) and prevent interception of selected components (via environment variables CC_NALIASES, CXX_NALIASES, AS_NALIASES, LD_NALIASES, AR_NALIASES, FILEMANIP_NALIASES). The environment variables CC, CXX, LD, AS, AR and FILEMANIP are now ignored.
- New `eclairit` driver allows for greatly simplified ECLAIR use.
- Added support for MISRA C:2012 Amendment 4, MISRA C:2023 and MISRA C:2025.
- Added support for MISRA C++:2023.
- Added new tool `Scout` (service B.SCOUT) to assess the usage of C/C++ entities within a program.
- Added support for MISRA C:2012/2023 Appendix E, which recategorizes some MISRA C guidelines when applied to automatically generated code.
- The ECLAIR parser has been updated to support the most recent versions of C and C++.
- New service B.UNEVALEFF to report unevaluated side effects inside uses of the `typeof`, `sizeof` and `alignof` operators in C/C++.
- Added metrics B.CMNTLINE_JFUNC and B.COMF_JFUNC that calculate, respectively, the numer of comment lines assogiated to a function and the ratio of comment lines and logical source lines of code in a function.

Other new features:

- Added new tool `eclair_import` to generate XML reports from textual output generated by build systems that can be imported into ECLAIR databases.
- New ECLAIR Bug Finder services for security have been added.

Enhancements and corrections of existing features and services (FSSCF):

- Service STD.emptrecd is subsumed by STD.anonstct, therefore it has been removed. The service configurations of JC1.1, MC1.1, MC2.1.1, MC3.R1.1, MC3.R1.2, MP1.1-0-1, MP2.4.1.1, NC3.1.1.a are also affected by this change.
- Fixed false positives for services MC3.D1.1, MC2.12.2, MC3.R1.5, MC3.R5.3, MC3.R13.2, MC3.R10.1, MC3.R17.7, MC3.R18.2, MC3.R18.6, MP1.5-0-1, NC3.3.3.b, MC3.R20.7, B.CALL.noeffect.
- Fixed false negatives for services: MC2.R9.1, MC3.R9.1, MC3.R17.2, MC3.R18.2, MP1.0-1-7, MP1.3-2-4, MP1.7-5-4.
- Service MC3.R7.4 now takes into account the exception introduced by MISRA C:2012 Technical Corrigendum 2.
- Improved configurability of service MC3.R13.1: added the possibility to tag reports based on the effects found by the analysis.
- Services STD.nstddirv service and STD.prepdirc have only some minor differences, but they check for the same thing: they are merged into a single service STD.prepdirc.
- Corrected the semantics of the –accept option to the Un*x installers.
- Floating point max/min are now printed using finite decimal floating point notation.
- ECLAIR CerTran has been updated to work with SuperTest Aelbert Cuyp 5.0 Release.
- Improved deviation mechanism for services: MC3.R5.5 and MC3.R5.7.
- The clarity of reports involving initializer lists has been improved; this improves services: MC3.R10.1, MC3.R10.2, MC3.R10.3, MC3.R10.4, MC3.R10.5, MC3.R10.6, MC3.R10.7, MC3.R10.8, MC3.R11.7, MC3.R12.2, MC3.R14.4, MC3.R16.7, MC3.R23.6, MP1.4-5-1, MP1.4-5-2, MP1.4-5-3, MP1.5-0-10, MP1.5-0-11, MP1.5-0-12, MP1.5-0-13, MP1.5-0-14, MP1.5-0-20, MP1.5-0-21, MP1.5-0-3, MP1.5-0-4, MP1.5-0-6, MP1.5-0-8, MP1.5-0-9, MP1.5-3-1, MP1.5-3-2, MP1.5-8-1, MP1.6-4-7, MP1.7-2-1, NC3.5.3.c NC3.5.6.a.
- Improved configurability of `-stmt_selector`; this affects all services using it.
- Improved report description of service B.CALL.noeffect.
- Corrected the report counting of “unfixed” reports for kinds other than violation, caution, information or metric in differential analyses.
- Fixed some rare crashes affecting services MC3.R21.18 and MC3R1.R21.18.
- Changed default setting for global `-call_properties` to consider points-to analysis set to be consisting of all possible locations.
- Allow matching opaque types by matching the type using the global `-type_selector` instead of matching the name; this affects services: MC3.R22.5, MC3.R22.12, MC3.R22.5, MC4.R22.5.
- Extend service MC3.R2.6 to take in account GCC attribute `__attribute__((unused))`.

- Corrected the `-call_properties` global configuration `type` so as not to desugar its argument by default.
- Added the possibility of selecting a function call via `-call_selector` using a statement selectors.
- Fixed service kind from "rule" to "directive" for the following services: MC3.D1.1, MC3.D2.1, MC3.D3.1, MC3.D4.1, MC3.D4.2, MC3.D4.3, MC3.D4.4, MC3.D4.5, MC3.D4.6, MC3.D4.7, MC3.D4.8, MC3.D4.9, MC3.D4.10, MC3.D4.11, MC3.D4.12, MC3.D4.12, MC3.D4.13, MC3.D4.14, MC3.D4.15.
- Improved configurability of service MC3.R16.6 with the possibility of specifying a minimum or maximum number of switch clauses that trigger a report.
- Improved configurability of `-area_selector` to allow statements to be matched.
- Reports for service MC3.R2.1 concerning `switch` statements have been improved.
- Configurability of the `-call_properties` global configuration has been enhanced to express more fine-grained assumptions about the impact of a function call.
- The distribution technology used to package `eclair_certran` has been uniformed to that used by other Python-based tools.
- Updated and extended mapping from MISRA C:2023 guidelines to CERT-C:2016 rules and CWE weaknesses.
- The "ECLAIR Project Organization Checker" has been improved and renamed "ECLAIR Independence Checker". The service identifier B.INDEPENDENCE shall be used instead of B.PROJORG, which is deprecated but still available as an alias.
- Improved global configuration `-context_selector` to add a few configuration alternatives that may be useful in services that depend on on this selector.
- Renamed the base matcher `decl(ENTITY_MATCHER)` of global `-type_selector` to `entity(ENTITY_MATCHER)`.
- Improved performance for services MC3.D4.5, MC3.R5.2, MC3.R5.3, MP1.2-10-1, MP1.2-10-2, MP1.2-10-6, STD.nexidsig.

Other enhancements and corrections of existing features and services:

- Changed `eclair_report` colors to better reflect the severity of the report.
- Improved report descriptions.
- Updated `eclair_reqman` to a more recent version of StrictDoc.
- Updated `eclair_format` dependencies to the newest versions.
- Updated and improved the ECLAIR Qualification Kit.

Newly supported toolchains (FSSCF):

- Added support for Renesas CC-RX toolchain.

Enhancements of support for already-supported toolchains (FSSCF):

- Added support for IAR Embedded Workbench 9.50.2.
- Updated support for newest version of Renesas CC-RL and CC-RX.
- Updated support for the newest version of ESP-IDF toolchain.

- Correctly handle implicit option –cmse on IAR ARM compiler.
- Improved support for Tasking ctc compilers.
- Extended support for GCC-based compilers up to version 14.
- Extended support for QNX SDP up to version 8.0.
- Improved support for clang-based compilers.
- Improved support for the Freescale S12Z compiler.

Enhancements and additions to the *ECLAIR User's Manual*:

- Documented the use of ECLAIR_* variables of the the ECLAIR GUI.
- Improved documentation of service MC3.R12.1 and operator precedence.
- Improved documentation of global configuration `-context_selector`.

Enhancements and corrections to the ECLAIR GUI:

- Added a new advanced mode: by default the GUI now starts in simple mode.
- Other usability and documentation improvements.

Enhancements and additions to collateral documentation:

- All guides and brochures have been updated.
- Updated and improved the ECLAIR Qualification Kit documentation.

Enhancements to license-enforcing mechanisms:

- Updated the protection mechanisms to Sentinel LDK 10.13.
- The `eclair_licman` program has been improved with inspective features: now it can list the Sentinel keys, features and products along with their attributes and properties (`-S` option).

Enhancements to the integrations with IDEs:

- Updated the IntelliJ plugin to support the most recent versions of the IDE.

2.2 Summary of Changes from Version 3.13.0 to Version 3.13.1

ECLAIR version 3.13.1 contains only minor fixes and documentation improvements.

Enhancements of support for already-supported toolchains (FSSCF):

- Improved support for "armcc" Keil v5 toolchains: fixed B.PARSER errors caused by inclusions of "stdio.h" and "stdarg.h" (in this order) and by expressions with bracket nesting level higher than 256.

Enhancements and corrections of existing features and services (FSSCF):

- Fixed service B.TEXTFIND matching ranges in compliance with their specification.
- Fixed crashes in services MC1.109, MC2.18.2, MC3.R19.1, MC3R1.R19.1, MC3R1.R23.1, MC3R1.R23.7 and MP1.0-2-1.
- Fixed false positives potentially affecting all services that depend on the recognition of unevaluated contexts, most notably services MC3.R2.1 and MC3R1.R2.1.

- Improved quality of implementation of services B.AUTOINIT, CC2.EXP33, MC1.30, MC2.9.1, MC3.R9.1, MP2D1.152 MC3R1.R9.1, MP1.8-5-1 and NC3.7.2.a.

Enhancements and additions to collateral documentation:

- Added a FAQ about the compatibility of the ECLAIR GUI with legacy Linux-based operating systems.

Enhancements and corrections to the ECLAIR GUI:

- Fixed crash in the ECLAIR GUI that caused the interface to become blank and unresponsive.

2.3 Summary of Changes from Version 3.12.0 to Version 3.13.0

ECLAIR version 3.13.0 contains new features, many enhancements to existing features, and the correction of several defects.

> **Note**
>
> Starting from this version, the summary of changes uses the acronym **FSSCF**, from *Functional Safety and Security Certified Feature*, in order to distinguish certified/qualifiable features from other features.

New features (FSSCF):

- Added service B.CERTRAN, basis of a new stand-alone product for the automation of compiler qualification in compliance with functional safety standards.
- Added service B.MACROS, for the reporting of the macros defined in a particular build (essential for ascertaining that the right configuration has been built).
- Added service B.REQMAN, for the automatic checking of the traceability between requirements and program entities (this is a clone of existing MISRA C:2012 services MC3.D3.1 and MC3R1.D3.1).
- Added service B.TEXTFIND, a powerful, user-controllable search facility for the automation of tasks such as the recognition of SPDX identifiers.
- Added support for MISRA C:2012 Amendment 3, including the addition or revision of the following services: MC3R1.D4.15, MC3R1.R1.5, MC3R1.R6.3, MC3R1.R7.5, MC3R1.R8.15, MC3R1.R8.16, MC3R1.R8.17, MC3R1.R17.9, MC3R1.R17.10, MC3R1.R17.11, MC3R1.R17.12, MC3R1.R17.13, MC3R1.R18.9, MC3R1.R21.22, MC3R1.R21.23, MC3R1.R21.24, MC3R1.R23.1, MC3R1.R23.2, MC3R1.R23.3, MC3R1.R23.4, MC3R1.R23.5, MC3R1.R23.6, MC3R1.R23.7, MC3R1.R23.8.
- Added support for MISRA C:2012 TC2.
- Added support for MISRA C:2012 Deviation Permits.
- Added support for the MISRA C:2012 rationale-based classification: this allows subsetting and prioritizing the work on MISRA compliance for projects with different requirements.

Other new features:

- Added a tagging system for mapping CWE weaknesses to MISRA guidelines.

- Added a tagging system for mapping CERT-C:2016 rules and recommendations to MISRA guidelines.
- Added a requirement management tool distributed and installed along with ECLAIR.
- Added MISRA C++:2023 services: MP2D1.23, MP2D1.25, MP2D1.42, MP2D1.43, MP2D1.45, MP2D1.46, MP2D1.47, MP2D1.81, MP2D1.82, MP2D1.83, MP2D1.94, MP2D1.103, MP2D1.105, MP2D1.106, MP2D1.107, MP2D1.133, MP2D1.134, MP2D1.135, MP2D1.143, MP2D1.145, MP2D1.146, MP2D1.147, MP2D1.148, MP2D1.149, MP2D1.152, MP2D1.158, MP2D1.159, MP2D1.162, MP2D1.163, MP2D1.165, MP2D1.171, MP2D1.187, MP2D1.191, MP2D1.194, MP2D1.196, MP2D1.199, MP2D1.203, MP2D1.204, MP2D1.207, MP2D1.210, MP2D1.211, MP2D1.212, MP2D1.220, MP2D1.224, MP2D1.225, MP2D1.226, MP2D1.228, MP2D1.301, MP2D1.320, MP2D1.321, MP2D1.325, MP2D1.359, MP2D1.387, MP2D1.395, MP2D1.396, MP2D1.397, MP2D1.403.
- Reports now are tagged with the frames that trigger the analysis: this greatly facilitates analysis of violations involving macros that are expanded differently in different translation units.
- The `eclair_format` program has been extended and improved: it now supports arbitrary user configurations.
- Added the possibility to compile ECL files and added `eclair_env` options `-config_file`, `-load_config` and `-save_config` in order to work with compiled ECL files: this facility provides significant speedups in the case of large ECL configurations.
- Added `eclair_report` option `-server_ext` that allows serving arbitrary contents.
- Added `eclair_report` commands to export tables from an ECLAIR database in XSLT, XML, PROTOBUF, JSON and YAML formats.
- Added `eclair_report` options `-add_data` and `-clean_data` allowing the addition and removal of arbitrary data to and from an ECLAIR database.
- Added `eclair_report` option `-load_xml` to permit loading of third-party reports into an ECLAIR database: this allows browsing reports from different sources in a consistent way.
- Added message-based selectors to `-loc_selector` and `-area_selector`: now it is possible to use regular expressions on areas and locations messages.

Enhancements and corrections of existing features and services (FSSCF):

- Improved the internal C/C++ parser.
- Improved the support for C++ lambda expressions.
- Improved support for long paths in Windows.
- Improved the `taken` call property: now it is possible to specify the property for each argument index (`maybe/never/always`).
- Adapted service MC3R1.R21.21 to work with C++ code.
- Fixed bug in the tagging system for services MC3.D4.5, MC3R1.D4.5, MC3.R9.1 and MC3R1.R9.1.

- Fixed false positives for services NC3.3.4, NC3.4.3.b, NC3.8.6.a, MC3.D3.1, MC3R1.D3.1, MC3.D4.7, MC3R1.D4.7, MC3.D4.9, MC3R1.D4.9, MC3.R1.1, MC3R1.R1.1, MC3.R2.1, MC3R1.R2.1, MC3R1.R2.2, MC3.R5.6, MC3R1.R5.6, MC3.R8.3, MC3R1.R8.3, MC3.R9.1, MC3R1.R9.1, MC3.R9.3, MC3R1.R9.3, MC3.R14.3, MC3R1.R14.3, MC3.R17.8, MC3R1.R17.8, MP1.0-1-2, MP1.2-7-1, MP1.3-4-1, MP1.5-0-12, MP1.16-0-4, MP1.16-0-8 and STD.implfunc.
- Services MC3.D3.1 and MC3R1.D3.1 have been improved.
- Fixed false negatives for services NC3.4.3.b, MC3.D4.9, MC3R1.D4.9, MC3.D4.10, MC3R1.D4.10, MC3.R1.3, MC3R1.R1.3, MC3.R5.6, MC3R1.R5.6, MC3.R8.3, MC3R1.R8.3, MC3.R9.1, MC3R1.R9.1, MC3.R9.3, MC3R1.R9.3, MC3.R21.12, MC3R1.R21.12, MP1.0-1-2, MP1.2-7-1, MP1.3-1-1, MP1.7-5-4, MP1.8-4-2, MP1.15-3-3, MP1.16-0-8 and MP1.16-2-3.
- Revised Harrison cyclomatic complexity definition computed by metric service HIS.v_G.
- Fixed crashes of services MC1.18, MP1.14-6-1 and MP1.14-7-1.
- Fixed bug in service STD.inclqote: the service configurations `behavior` did not allow the standard identification `c95`.
- Fixed bug in services MC3.R18.6 and MC3R1.R18.4: the bug caused the misinterpretation of call properties defined with `-call_properties` in case of indirect calls.
- Avoided duplicated tagging areas for many services.
- Improved tagging system for MC3.R1.2 and MC3R1.R1.2: now they can accept any tag.
- Improved report selector handling.
- Added entity-based tagging for services MC3.R2.1 and MC3R1.R2.1.
- Improved the efficiency of all services that require points-to analysis.
- Improved the analysis accuracy of all services that check the use of enumeration constants in case statements.
- Improved messages of services MC3.R14.2 and MC3R1.R14.2.
- Improved performance of service B.PROJORG.
- Improved the analysis accuracy of all services that check asm effects.
- Improved quality of implementation of services that require macro arguments tracking.
- Improved quality of implementation of services MC3.R8.3 and MC3R1.R8.3.
- Improved quality of implementation of service B.CBT: now the service reports warnings if a label is used or declared multiple times.
- Improved quality of implementation of services MC3.R2.1 and MC3R1.R2.1: now the services allow easily deviating branches that are intentionally unreachable.
- Improved quality of implementation of service STD.charescp: now it checks preprocessed tokens instead of source-code ones.
- Improved quality of implementation of service MP1.3-4-1: now the service reports all the declarations of entities to be moved; improved service messages.

- Improved quality of implementation of services NC3.8.6.a: now the service uses `stmt_matchers` in its configurations.
- Improved quality of implementation of service MC3R1.R9.1: removed avoidable cautions due to macro calls.
- Improved configurability of services MC3.R2.1 and MC3R1.R2.1: now it is possible to deviate particular statements and the services report the statements causing the unreachability.
- Improved configurability of service MP1.3-4-1: now it is possible to ignore `const` variables.
- Improved internal utilities for checkers that require a flow-reachability analysis.
- Fixed B.PARSER errors due to conversions from `_Atomic` to non-`_Atomic` types.
- Fixed crash due to non standard uses of flexible array members.
- Improved quality of implementation of services MC3.D4.9 and MC3R1.D4.9: now the checkers do not report macros where the `typeof` macro is used on an expression where a macro parameter occurs (while the macro can theoretically be replaced by several inline functions, the code quality will clearly suffer).
- The `__public_api_decls` selector no longer requires external linkage.

Other enhancements and corrections of existing features and services:

- Fixed missing cache reloading after changes to the database in the interactive reports view.
- Improved quality of implementation of service B.CMPREXPR-01: now the service uses `stmt_matchers` in its configurations.
- Improved the "unknown tool" warning of `eclair_env`: now the message specifies the tool kind.
- Improved the macro expansion tracing feature.
- Fixed crashes in `eclair_format`.
- Updated `eclair_format` dependencies.

Newly supported toolchains (FSSCF):

- Added support for Intel FPGA - NIOS2EDS GCC Altera toolchains up to version 10.3.
- Added support for Intel FPGA - x86_64 MinGW32 GCC toolchains up to version 10.3.
- Added support for CodeWarrior Development Studio for Microcontrollers Kinetis Freescale up to version 4.9.

Enhancements of support for already-supported toolchains (FSSCF):

- Extended support for Microchip XC32 toolchains up to version 4.30.
- Extended support for Microchip XC8 toolchains up to version 2.40.
- Extended support for MSVC up to version 14.30.
- Extended support for Keil C51 and CX51 compilers up to version 9.60.
- Extended support for TI ARM compilers up to version 20.2.5. LTS.

- Extended support for TI Arm Clang compilers up to version 1.3.1 LTS.
- Extended support for TI C2000 compilers up to version 22.6.0 LTS.
- Extended support for TI C6000 compilers up to version 8.3.12 LTS.
- Extended support for TI MSP430 compilers up to version 21.6.0 LTS.
- Extended support for GCC-based compilers up to version 12.
- Improved support for Arm Keil MDK v5 toolchains with evaluation licenses.
- Added support for the GCC pragma `GCC system_header`.
- Added support for TASKING VX-Compilers for ARM up to version 6.3r1.
- Added support for TASKING VX-Compilers for 8051 up to version 6.3r1.
- Added support for TASKING VX-Compilers for PCP up to version 6.3r1.
- Added support for Clang-based compilers up to version 16.
- Improved support for GCC-based toolchains.
- Improved support for Clang-based toolchains.
- Improved support for the IAR toolchains.
- Improved support for the MSVC toolchains.
- Improved support for XC8-cc toolchains.
- Improved support for the TASKING toolchains.
- Improved support for the TI toolchains.
- Improved support for MinGW-based toolchains.
- Improved support for compilers based on sparc-rtems-gcc.

New integrations with IDEs, editors and, CI/CD systems:

- Added plugin for NetBeans-based IDEs (including MPLAB X).
- Added plugin for IntelliJ-based IDEs (including CLion).
- Added integration with GitHub, including the support of Sarif outputs compatible with GitHub.
- Added integration with GitLab, including the support of CodeClimate outputs compatible with GitLab and of GitLab authorization checking.

Enhancements to the integrations with IDEs, editors, and CI/CD systems:

- Updated the Visual Studio plugin to support the most recent versions of the IDE.
- Updated the Jenkins plugin to support the most recent versions of the “Analysis Model API Plugin” and “Warning Next Generation Plugin”.

Enhancements and additions to the *ECLAIR User’s Manual*:

- Added new chapter on *Service Classification and Prioritization*.
- Added new chapter on *Adoption of Deviation Permits in ECLAIR*.
- Added new chapter on *Requirements Management with ECLAIR*.

- Added new tables detailing undefined behaviors of the C programming language that are prevented by using ECLAIR MISRA C services: all versions of the C standard are covered.
- Added new section on *Running ECLAIR in Docker Containers* to chapter *Installation*.
- Added new section on *Opening an ECLAIR Database* to chapter *Outputs*.
- Added new section on *Integrating ECLAIR with Netbeans-Based IDEs* to chapter *Integrating ECLAIR with IDEs, Editors, and CI Tools*.
- Added new section on *Integrating ECLAIR with IDEs based on the IntelliJ Platform* to chapter *Integrating ECLAIR with IDEs, Editors, and CI Tools*.
- Added new section on *Integrating ECLAIR with Services for Software Development and Continuous Integration* to chapter *Integrating ECLAIR with IDEs, Editors, and CI Tools*.
- Added section on *Running Pipelines Within a Docker Container* to chapter *Integrating ECLAIR with IDEs, Editors, and CI Tools*.
- Added paragraph on *Running Pipelines Within a Docker Container* to section *Integrating ECLAIR with Jenkins*.
- Updated section *Integrating ECLAIR with Visual Studio* in chapter *Integrating ECLAIR with IDEs, Editors, and CI Tools*.
- Expanded paragraph on *Report Summary Pages* in chapter *Outputs* to document the interactive reports chart.
- Expanded section *Integrating ECLAIR with Jenkins* to consider a new plugin-free integration possibility.
- The theme of the HTML version of the manual has been updated for increased readability.
- Many examples have been added and many have been improved.
- Added documentation for new commands and configurations.
- Many other small improvements and corrections.

Enhancements and corrections to the ECLAIR GUI:

- When setting an empty `PATH` in the *Environment* section of the GUI, the system `PATH` will be used instead of an empty one.
- Added the possibility to configure the directory where the analysis results are stored.
- Added the possibility to customize the help message for named settings.
- The self-contained documentation in the ECLAIR GUI has been improved.
- The documentation for `ECLAIR_FULL_TXT` has been corrected.

Enhancements to license-enforcing mechanisms:

- Updated the protection mechanisms to Sentinel LDK 8.5.

2.4 Summary of Changes from Version 3.11.0 to Version 3.12.0

ECLAIR version 3.12.0 contains new features, many enhancements to existing features, and the correction of several defects.

New features:

- New program `eclair_format` allows reformatting source code in compliance with most of the code layout guidelines of the BARR-C:2018 coding standard.
- New "ECLAIR client kit" allows users of centralized ECLAIR analysis services to minimize the installed software base on their PCs.

New services:

- Added a new service B.TROJANSOURCE that checks for vulnerabilities to Trojan source attacks.
- Added a new service B.PREPCMNT that can be used to check that conditional inclusion preprocessor directives are closed with an `#endif` that is commented by the guard.
- Added a new service B.STATINIT that can be used to check that static storage declarations have a complete initializer (this is useful when using compilers, such as TI's TMS320C28x C/C++ compiler, that do not zero-initialize static and global variables).
- Added a new service B.RECUMACR that can be used to check that a program does not contain recursive macro invocations.
- Added a new service B.MACREXPR that can be used to complete the partial protection provided by MISRA guidelines about argument capture in macro body expansions.
- Added a new service B.ECL to show unused ECL configurations.

Newly supported toolchains:

- Added support for the Emscripten compiler toolchain to WebAssembly.
- Added support for the xPack GNU RISC-V Embedded GCC toolchain.
- Added support for the MPLAB XC8 C Compiler new driver xc8-cc.

Enhancements to existing services:

- False positives have been fixed for the following services: MC2.1.1, MC2.9.1, MC2.19.4, MC2.19.7, MC3.R2.2, MC3R1.R2.2, MC3.D4.7, MC3R1.D4.7, MC3.D4.9, MC3R1.D4.9, MC3.R8.5, MC3R1.R8.5 MC3.R8.10, MC3R1.R8.10, MC3.R9.1, MC3R1.R9.1, MC3.R9.2, MC3R1.R9.2, MC3.R10.6, MC3R1.10.6, MC3.R10.7, MC3R1.R10.7, MC3.R10.8, MC3R1.10.8, MC3.R11.2, MC3R1.R11.2, MC3R1.R12.5, MC3.R13.3, MC3R1.R13.3, MC3.R14.2, MC3R1.R14.2, MC3.R17.4, MC3R1.R17.4, MC3.R17.8, MC3R1.17.8, MC3.R18.2, MC3.R18.8, MC3R1.R18.2, MC3.R18.3, MC3R1.R18.3, MC3.R18.6, MC3R1.R18.6, MC3R1.R18.8, MC3.R20.6, MC3R1.R20.6, MC3.R20.7, MC3R1.R20.7, MC3.R20.12, MC3R1.R20.12, MC3R1.R21.19, MC3.R22.5, MC3R1.R22.5, MC3R1.R22.10, MP1.0-1-8, MP1.0-1-9, MP1.3-2-4, MP1.5-0-17, MP1.7-3-5, MP1.8-5-1, MP1.12-8-2, MP1.15-3-4, MP1.16-2-2, NC3.3.1.e, NC3.3.1.m, NC3.3.3.b, NC3.3.4.b.
- Fixed false negatives in the following services: MC3.D4.4, MC3R1.D4.4, SC1.PROG_003.
- Fixed false positive and negatives in service SC1.PROG-038.

- Where ECLAIR cannot be sure if the code is non-compliant, *violation* reports have been changed to *caution* reports and some messages have been improved for the following services: MC2.13.5, MC2.13.5L, MC2.17.2, MC3.R14.2, MC3R1.R14.2, MC3.R18.2, MC3R1.R18.2, MC3.R18.3, MC3R1.R18.3, MC3.R22.6, MC3R1.R22.6, MP1.5-0-17.
- Fixed rare crashes caused by checks for the Clang and GCC `error` attribute in the following services: MC2.16.10, MC3.D4.7, MC3R1.D4.7, MC3R1.R22.10, MP1.0-3-2.
- Fixed rare crashes in the following services: MC2.19.7, MC3.R8.9, MC3R1.R8.9, MP1.0-1-8 and MP1.0-2-1.
- The MC3.D3.1 and MC3R1.D3.1 services have been improved: the configuration parameter `requirement_set` has an extra field to select the unit or program to be checked for requirements; all reporting is now for the whole project.
- Service MP1.8-4-3 now avoids reporting the missing return statements in dead branches.
- Service MC3.R16.1 now reports a *violation* when there are insufficient case clauses.
- For services MC3.R7.4 and MC2R1.R7.4, *caution* reports are now output when the string literal is a function argument and there is no corresponding parameter declaration.
- Defects have been fixed in the following ancillary services: STD.anonfild, STD.arayzero, STD.pteincmp, STD.ptruse, STD.strincmp, STD.stdtypes.
- Reports for services MC3.R20.7 and MC3R1.R20.7 have been improved.
- Reports for services MC2.2.4, MC3.D4.4, MP1.2-7-2, MP1.2-7-3 and NC3.2.1.c have been improved: redundant violations have been removed.
- Reports for services MP1.0-1-1, MC3.R2.1 and MC2.14.1 have been improved: now `do-while(0)` constructs and parentheses are not reported as unreachable code.
- Reports for services MC3.D4.9 and MC3R1.D4.9 have been improved: now they include the values of the function-like macro with their types.
- Improved some analysis tables to reduce their size.
- A few bugs in service B.EXPLAIN have been fixed and report messages have been improved.
- Added new service configurations: MC3.R14.3, MC3R1.R14.3, MC3.R2.1 and MC3R1.R2.1
- Improved the accuracy of services that require an analysis of potential side effects: MC2.12.13, MC2.12.2, MC2.12.3, MC2.12.4, MC2.13.5L, MC2.13.5, MC2.14.10, MC2.14.1, MC2.14.2, MC2.19.7, MC2.8.9, MC3.D4.9, MC3.R13.1, MC3.R13.2, MC3.R13.3, MC3.R13.5, MC3.R13.6, MC3.R14.2, MC3.R15.7, MC3.R2.1, MC3.R2.2, MC3.R2.3, MC3.R2.4, MC3.R8.6, MP1.0-1-10, MP1.0-1-1, MP1.0-1-3, MP1.0-1 -5, MP1.0-1-8, MP1.0-1-9, MP1.15-3-4, MP1.16-0-4, MP1.3-2-4, MP1.5-0-1, MP1.5-2-10, MP1.5-3-4, MP1.6-4-2, MP1.6-5-1, MP1.6-5-2, MP1.6-5-4, MP1.6-5-5, MP1.6-5-6, MP1.8-3-1, NC3.6.3.a, NC3.8.2.d.

- All services now follow the convention used in GCC to refer to local classes and lambda functions.
- A new global configuration parameter `tool_tag` has been added. The configuration parameter `compilers` has been modified to accept a list of tool tags; tools with the same tag are taken to be compatible. Note that `compilers` is an optional configuration parameter for users of: MC2.1.3, MC3.D1.1, MC3R1.D1.1, MP1.1-0-2.
- Report tags have been added or replaced hide/show tags for some configuration parameters: MC2.19.2, MC2.19.3, MC3.R20.2, MC3.R20.3, MC3R1.R20.2, MC3R1.R20.3, MP1.16-2-4, MP1.16-2-5, MP1.16-2-6, NC3.2.2.b, NC3.2.2.d, NC3.2.2.h, NC3.4.3.b, NC3.4.3.d, NC3.4.3.f, NC3.7.2.c, NC3.8.4.d.
- Implementation of MC2.19.4, MC3.R20.4 and MC3R1.R20.4 have been improved to check all floating-point literals.
- The POSIX library can be included as a standard library using a new global configuration parameter `stdlib`. ECLAIR now supports:
  - the checking for reuse of the identifiers provided by POSIX (services MC2.20.1, MC2.20.2, MC3.R21.1, MC3R1.R21.1, MC3.R21.2, MC3R1.R21.22, MP1.17-0-1, MP1.17-0-2, MP1.17-0-3);
  - the checking of the use of `errno` just before and following calls to POSIX functions and macros that can modify errno (services MC3R1.R22.9, MC3R1.R22.10);
  - ensuring that there are adequate checks for error values that may be returned by calls to POSIX functions (services MC2.16.10, MC3.D4.7, MC3R1.D4.7 and MP1.0-3-2).
- For the `behavior` configurations for the used C/C++ implementation, a warning is now given if a behavior for a tool is specified multiple times. The syntax of these configurations has also been improved and simplified.
- Improved the `etypes` and `terminals` report taggers.
- Added new selector for calls, contexts, statements, and types that allow to differentiate the matching depending on the language or standard.
- Added new condition `line(LIN_RANGE)` to matcher `loc` that allows selecting locations by line number range.
- Improved comment-based tagging. The end label of a tagging comment should now always be prefixed by `:` to permit a more robust syntax checking. Multiline tagging comments are now accepted.
- The user can now set ECLAIR attributes for types and declarations directly in the source code.
- Fixed a performance bug in macro name extraction from a `macro_selector`.

Enhancements to the *ECLAIR User's Manual*:

- The relationship between MC3.R1.1 and MC3.R1.2 (similarly, MC3R1.R1.1 and MC3R1.R1.2) has been clarified and examples have been added.

- References in the documentation for some MC3A1 and MC3R1 services have been corrected.
- Added section on "AUTOSAR C Implementation Rules Coverage."
- SiFive Freedom Studio has been added to the list of supported IDEs and instructions for the installation of the ECLAIR Eclipse plugin on it have been added.

Enhancements of support for already-supported toolchains:

- Support for the IAR toolchains has been improved.
- Support for the ARM/Keil toolchains has been improved: this affects both ARM Compiler 6 (a.k.a. `armclang`) and ARM Compiler 5 (a.k.a. `armcc`).
- Support for the Microsoft Visual C++ toolchain has been improved.
- Support for the GCC-based toolchains has been improved.
- Support for the QNX SDP toolchain has been extended to the latest versions.

Enhancements to the ECLAIR GUI:

- Now it is possible to create multiple build, analysis, and reporting configurations that can subsequently be referred in the `Configurations` steps.
- Improved the documentation accessible via the `?` buttons.

Enhancements to detailed outputs:

- A chart for quick visualization of report counts has been added.
- Selections can now be exported or shared with a link.
- The selection and sorting of rows and columns for the reports count is now supported.
- Added a new feature that allows excluding or including reports that match the currently selected text.
- The commands starting with `-report_counts1_` and with `-report_counts2_` have been uniformed and they now start with the prefix `-report_counts_`.
- The memory consumption of `eclair_report` and of browsers visualizing detailed outputs has been reduced.
- Tags applied to a report are now visible in all report kinds. This required a change in the `.ecd` file format: old `.ecd` files are thus no longer compatible and should be regenerated from the corresponding `.ecb` files using the new version of ECLAIR.
- Rich outputs in HTML, ODT, DOC, XML and pure text format can now be generated with all license coverages (partial and SME), although with different precision in the localization of the involved code locations and corresponding messages: line/column numbers and messages are (as always) only available to SME coverage licensees.
- Fixed a bug in the `Import action` feature of the ECLAIR report view.

Enhancements to summary outputs:

- Added a new `by_tag.txt` file with tags information to the outputs produced with `-summary_txt`.
- The integrated filter mechanism now allows to enable and disable items separately by simple clicking on them.

- Improved the generation of the `FCA 7-Z0072` reports.

Enhancements to the integration with IDEs and editors:

- The report displayed in the IDE/editor is now also highlighted in the ECLAIR detailed reports page.
- The `eclair_report -auto_shutdown` options has been improved: now it no longer stops `eclair_report` if a client is connected.
- Improved the logging of all the plugins.
- Improved positioning in the integration for Visual Studio.
- Fixed possible `eclair_report` crash during client connection.

Enhancements to installers:

- The same installers can now be used independently from the licensed packages, from the license coverage, and from the license-enforcing mechanism.
- The installation log files generated by Windows installers are now written in UTF-8.
- The installation log files generated by all (Windows, Linux and OS X) installers are now terminated with a line reporting the system time at completion of the installation process.

Enhancements to license-enforcing mechanisms:

- Updated the protection mechanisms to Sentinel LDK 8.2.1.
- Clone-detection has been improved especially for users planning to deploy ECLAIR in Docker or LXC containers.
- The `eclair_licman` program is now more general and can be used to work with ECLAIR license keys of any kind; consequently, both the options `-d` (express detach) and `-c` (express cancel detach) now take the product numeric id as a mandatory argument.

2.5 Summary of Changes from Version 3.10.0 to Version 3.11.0

ECLAIR version 3.11.0 contains several new features, lots of enhancements to existing features, and some bug fixes.

Enhancements to `eclair_report`:

- Added the possibility to run an external script directly from the `eclair_report` interface. The script can be triggered from either browser, GUI or IDE and can perform every type of action exploiting the information of the selected report(s).
- Added an `-auto_shutdown` option that allows to turn off `eclair_report` automatically after a set period of time from when all GUI or browser tabs are closed.
- The magnifying glass icon next to a report will now save a screenshot of the source code area interested by it in the clipboard.
- Added options `-summary_doc` and `-full_doc` to produce summary outputs in DOC format.
- Renamed option `-metrics_txt`.

Enhancements to toolchains support:

- Added support for the CrossWorks toolchain for ARM: this supports the GCC/cc1 compilation tools, the LLVM/Clang compilation tools, as well as the native (cc) compiler driver.

Enhancements to Linux integration:

- The Linux installer will add `eclair_report` and `eclair_gui` to the application list of the desktop environment.
- The Linux installer will create an association between the `.ecs` files and `eclair_gui`.
- The Linux installer will create an association between the `.ecd` files and `eclair_report`.

Enhancements to the GUI and integration with external IDEs and CI systems:

- A Visual Studio plugin has been added.
- Several help-messages in the ECLAIR GUI have been improved and extended with more information.
- The ECLAIR GUI and all the integration plugins now allow specifying `eclair_report` server options.
- Improved loading/saving of `.ecs` files.
- Improved support for Windows UNC paths.
- The interface with Jenkins has been improved in several respects:
  - support for Jenkins pipelines has been added;
  - added *ECLAIR Project Home* in the left panel of the build view, which links to the `eclair_report` homepage of the reports database generated by the selected build.
- The selection of reports has been further improved.

Enhancements to existing services:

- Analysis speed and memory consumption has been generally improved.
- The helpers that collect the effects of source code components have been improved; these changes are relevant to:
  - the added MISRA C++ services MP1.0-1-8 and MP1.15-3-4, and
  - other existing services that rely on a knowledge of the effects.
- False positives have been fixed in the following services: MC3A1.R21.19, MC3R1.R21.19, MC3.R14.3, MC3.R14.3, MC3R1.R14.3, MC3.R18.6, MC3R1.R18.6, MC3.R9.1, MC3R1.R9.1, MC3.R8.5, MC3R1.R8.5, MC3.R5.7, MC3R1.R5.7, MP1.0-1-2, MP1.3-3-1, MP1.2-10-3, MP1.7-5-2.
- Support for MC3.R3.1 and MC3R1.R3.1 has been improved.
- The report locations for MC3A1.R21.18 and MC3R1.R21.18 have been improved.
- A bug leading to wrong report suppression has been fixed.
- Reports concerning recursive function have improved messages.
- A new global configuration `extra_definitions` has been added that allows the user to add information about defined entities when the analyzed source code is incomplete.
- Improved non-ASCII characters handling.
- Reimplemented MP1.0-1-12 to better match the rule's source description.
- Reimplemented NC3.5.3.c.

Enhancements to documentation:

- The *ECLAIR User's Manual* has been improved and integrated in several aspects:
  - A GEP (Guideline Enforcement Plan) for MISRA C++:2008 has been added;
  - Chapter **Custom Get and Run actions in ECLAIR** has been added;
  - a list of suggested tagging systems has been added in *The Report Tagging System* Section;
  - the of *Common Features* for all the HTML output pages has been improved and completed;
  - all the sections about the integration with IDEs and editors have been revised and updated;
  - the sections about Jenkins integration have been revised and updated;
  - Section *Producing DOC Outputs* about the generation of outputs in DOC format has been added;
  - Section *Producing ODT Outputs* about the generation of outputs in ODT format has been extended and improved.
  - Section *Metrics Output to Spreadsheet Programs* about the generation of spreadsheet files containing the program metrics has been updated.

New services:

- Services MP1.14-8-1, MP1.14-5-1, MP1.14-6-1, MP1.12-1-1, MP1.0-1-8, MP1.7-4-2 and MP1.15-3-4 for checking compliance with the corresponding MISRA guidelines for C++ have been added.
- A new metric B.LINES_FILE that counts the number of physical lines in a file has been added and the services MET.B.LINES_FILE and EMET.B.LINES_FILE have been added to the MET and EMET rule sets, respectively.

2.6 Summary of Changes from Version 3.9.0 to Version 3.10.0

ECLAIR version 3.10.0 contains several enhancements, some new features, and bug fixes.

Enhancements to detailed outputs:

- The first table in the *Overall Information* page shows the *static* selection and variant, if any, that have been used to produce the reports.
- The *ECLAIR* selection panel switch is now visualized in red when the current *dynamic* selection (i.e., the one operated via the panel itself) is hiding reports.
- The *ECLAIR* selection panel now supports message-based selection with regular expressions; this allows working more effectively on projects with many violations.
- The *ECLAIR* selection panel now allows to save and load named selections.
- The summary pages (showing reports counts by service, by first file or by service and first file) now begin with a row containing the totals for each column; such total numbers reflect the current selection (the *static* one as further refined by the *dynamic* one, if any).

Enhancements to the GUI and integration with external IDEs and CI systems:

- Added a *File Manipulator* setting to the *Toolchain Components* page of the GUI.

- The interface with all supported IDEs has been improved: now IDEs can connect to a remote ECLAIR report server.
- Support for multi-IDE access to an ECLAIR report server has been added: now IDEs from different computers can be connected to the same ECLAIR report server at the same time.
- The ECLAIR report server has been improved in several respects:
  - HTTPS support has been added (the `-ssl` option, if present, specifies that the server must run in HTTPS mode; the `-ssl_certificate` option specifies the path for a PEM certificate for the ECLAIR report server when run in HTTPS mode).
  - Stability and security have been significantly improved (the `-actions` option specifies whether remote users can perform *stop*, *changing* and *changed* actions on the ECLAIR report server).
  - Logging has been improved.
  - Support for Jenkins and HTPASSWD authorizations have been added (the `-auth` option specifies which database paths are/aren't accessible and which need Jenkins or HTPASSWD authentication).
  - Pairing mechanisms have been added to associate browsers with an IDE (the *eclair_report server host* option specifies the ECLAIR report server hostname/IP address to connect to); the *Use local ECLAIR report server as a proxy* option specifies whether the remote server is running without a site license and therefore requires a local **`eclair_report`** proxy).
- The interface with Jenkins has been improved in several respects:
  - HTTPS support has been added (the *Use ECLAIR SSL mode* option specifies whether the ECLAIR report server needs to be launched or is already running in HTTPS mode; the *ECLAIR SSL certificate path* option specifies the location of the certificate to be used when starting the ECLAIR report server).
  - Efficiency has been considerably improved.
  - The ECLAIR report server stability has been improved under Jenkins (the *ECLAIR server ownership* option specifies whether the ECLAIR report server is managed by Jenkins).
  - Jenkins logging for the ECLAIR report server has been added.

Enhancements to existing services:

- Several services for checking compliance with the MISRA C and C++ guidelines have been improved, false positives have been corrected, and messages have been clarified.
- False negatives of the service for checking compliance with MISRA C:2012 Rule 22.6 (concerning pointers to `FILE` not to be used after the associated stream has been closed) have been corrected.
- Several services for checking compliance with the BARR-C:2012 guidelines have been improved as well.
- False negatives for checking compliance with the BARR-C:2012 Rule 1.5.b when no file was specified by the configuration has been fixed and a caution report is shown if the named file is empty.

- Service B.PTRUSE that checks for redundant casts has been improved and false positives fixed.
- Failure when using B.EXPLAIN has been fixed and reports improved.
- All services concerned with tagging and checking tools in the toolchain will now use the canonical pathname. Note that this may require a change to configuration values that select a tool; for instance, when the value is a regular expression matching a tool name, it will need to be modified to match the tool's canonical pathname.

Enhancements to toolchain support:

- Support for the Renesas RX toolchain has been improved.
- Support for the GNU toolchains and all their variants has been improved.

Enhancements to documentation:

- The *ECLAIR User's Manual* has been integrated and improved.

New services:

- Services MP1.0-1-2 and MP1.0-1-6 for checking compliance with the corresponding MISRA guidelines for C++ have been added.
- Service B.REDCAST that checks for redundant casts has been added.

2.7 Summary of Changes from Version 3.8.1 to Version 3.9.0

ECLAIR version 3.9.0 contains several enhancements and some bug fixes.

- A brand new, very effective Jenkins plugin has been added.
- ECLAIR now provides support for 100% of the guidelines in MISRA C:2012 Revision 1 with Amendment 2.
- New service B.PROJORG allows checking the project organization and internal dependencies as well as detecting unwanted interference between project components.
- Support for all MISRA standards has been improved further.
- Support for BARR-C:2018 has been improved.
- The models of GNU and derived toolchains have been improved.
- The models of IAR toolchains have been improved.
- The ECLAIR GUI has been improved.
- The ECLAIR workspace default directory has been changed so as to be tied to the particular ECLAIR version; this facilitates users that need to run different versions of ECLAIR.
- All documentation has been extended and improved.
- Analysis efficiency has been improved.
- The ECLAIR Bug Finder messages have been improved.
- A defect causing crashes in some rare circumstances has been fixed.
- Sentinel LDK has been updated to the latest version published by Thales, which solves several issues and contains numerous improvements. All user are recommended to upgrade and not skip the installation of Sentinel LDK RTE when/if proposed by the ECLAIR 3.9.0 installer.

2.8 Summary of Changes from Version 3.8.0 to Version 3.8.1

ECLAIR version 3.8.1 contains only minor fixes and documentation improvements.

- The model of ARM Compiler 5 (armcc) has been improved.
- Defects in the use of the ancillary services have been fixed.
- The computation of metric HIS.COMF did not correctly account for header files and this has been corrected.
- For services concerned with entity name checking, the short circuit tagger for selecting the entity name now matches both the entity and its name before the associated report tag is assigned.
- STM32CubeIDE and Silicon Labs Simplicity Studio have been added to the list of supported IDEs and instructions for the installation of the ECLAIR Eclipse plugin on them have been added to the manual.
- IDE integration has been improved to support old versions of Eclipse.
- The manual has been improved.

2.9 Summary of Changes from Version 3.7.0 to Version 3.8.0

ECLAIR version 3.8.0 contains numerous enhancements and some bug fixes.

- Support for MISRA C:2012 Amendment 2 has been added: this allows coding MISRA C compliant projects using any version of the ISO C language standard.
- Brand new integration technology with Eclipse, Visual Studio Code and Emacs has been added: these features are now available across all ECLAIR licensing schemes.
- ECLAIR support for HIS and non-HIS metrics has been completely reviewed: a total of 48 function, translation unit, and program metrics are now available and qualifiable also in the context of critical development.
- Support for all guidelines concerned with the C/C++ implementation, unspecified and undefined behaviors has been improved. Note that this includes changes to the `behavior` configuration parameters provided by the ancillary services.
- Support for the BARR-C:2018 coding standard has been further extended and improved. In particular:
  - rules concerning the spacing and alignment of code have been improved;
  - rules concerning the use of identifiers reserved for the standard library have been revised to match the BARR-C source description and avoid false positives.
- Support for several MISRA C/C++ guidelines has been improved.
- ECLAIR User's Guide has been improved. In particular:
  - clickable references to the official coding standard documents have been added so that when the appropriate PDF files are installed in ECLAIR, the document is opened at the right page;
  - a chapter describing the installation and use of the new integration technology (see above) has been added;
  - the section about checking the project vocabulary has been clarified.

- Support for toolchains has been improved. In particular:
  - support for the ESP-IDF and the IAR MSP430 toolchains has been added;
  - support for other IAR toolchains and the CodeWarrior HC12 toolchain has been improved.
- A GUI glitch whereby garbled text was sometimes displayed in the run log area has been fixed.
- All ECLAIR executables in the Windows version are now digitally signed by BUGSENG with an extended validation (EV) code-signing certificate issued by Sectigo (formerly Comodo), a Microsoft partner enrolled and authorized for *Kernel Mode Code Signing* as part of the *Microsoft Trusted Root Certificate Program*. In previous versions only the installers and uninstallers were digitally signed.

2.10 Summary of Changes from Version 3.6.3 to Version 3.7.0

ECLAIR version 3.7.0 contains numerous enhancements and some bug fixes.

- Support for the BARR-C:2018 coding standard [2] has been extended and improved. This version of ECLAIR covers, under the prefix NC3, more than 80% of the guidelines.
- Support for MISRA C:2012 rule 22.3 (see [3] and [6]) has been added.
- Support has been added to the GUI for computing metrics and consulting the results.
- The HTML reporting facility has been enhanced to allow easier selection of what should be shown; the documentation in the manual for this has been updated and improved.
- New rule sets MET for metric reporting and EMET for exceeded metric reporting have been added.
- Sentinel LDK has been updated to the latest version published by Thales, which solves certain important security issues of Sentinel LDK itself. All user are recommended to upgrade and not skip the installation of Sentinel LDK RTE when/if proposed by the ECLAIR 3.7.0 installer.
- Checkers concerned with encapsulating and documenting asm statements, have been improved, so that false positives are avoided. Also we have added two configuration parameters whereby the user can select if they wish to allow or disallow an encapsulating macro or function to include both encapsulated asm statements mixed with unencapsulated asm statements.
- For checkers whose results depend on the, possibly approximate, evaluation of a numeric value, because of an improved evaluation procedure, the number of caution reports have been reduced: both by removing any caution reports that are now known to be false and by upgrading other caution reports to a violation that are now known to be true.
- Checkers reporting the inclusion of increment-decrement operators in expressions with other potential side effects were falsely reporting the operators when applied to volatile objects. This is now fixed.
- Checkers concerned with reporting invariant Boolean expressions have been improved so that they are not reported when in a constant context.
- When showing the include paths, the file locations in the reports depended nondeterministically on the selected paths. Such nondeterminism is now avoided.

- Crash that occurred when analyzing some preprocessor conditional expressions has been fixed.
- Report tagging has been changed to allow for the assignment of multiple tags.
- Keil armcc model now recognizes the inline keyword in C99 mode.

2.11 Summary of Changes from Version 3.6.2 to Version 3.6.3

ECLAIR version 3.6.3 contains only minor fixes and documentation improvements.

- Support for the Wind River DIAB and the Freescale HC12 toolchains has been improved.
- A chapter about troubleshooting has been added to the manual.

2.12 Summary of Changes from Version 3.6.1 to Version 3.6.2

ECLAIR version 3.6.2 contains only minor fixes and documentation improvements.

- The model of the IAR compiler for ARM has been improved.
- A glitch in the GUI has been fixed that caused some unwanted scrolls when zoom was applied.
- A glitch in some goto-related metrics related to indirect gotos has been fixed.
- The manual formatting and content has been improved.

2.13 Summary of Changes from Version 3.6.0 to Version 3.6.1

ECLAIR version 3.6.1 contains only bug fixes and documentation improvements.

- The manual formatting and content has been improved.

2.14 Summary of Changes from Version 3.5 to Version 3.6.0

ECLAIR version 3.6.0 contains numerous enhancements and some bug fixes.

- Support has been added for MISRA C:2012 Third edition, first revision [6]. Note that this comprises:
  - MISRA C:2012 [3] with the MISRA C:2012 Technical Corrigendum [5] and the clarifications in MISRA information and discussion forum[1],
  - MISRA C:2012 Amendment 1 [4].

  These new guidelines are available under the prefix MC3R1, while the guidelines for MISRA C:2012 [3] and MISRA C:2012 Amendment 1 [4] remain available under the prefixes MC3 and MC3A1, respectively.
- Support has been added for the BARR-C:2018 coding standard [2]. This support covers more than 75% of the guidelines which are available under the prefix NC3.
- the configuration parameter `user_entity_name`, provided for checkers concerned with the syntax of entity names, that specified the allowed format and vocabulary for the entity and macro identifiers, has been split into two and improved.
- Due to bug fixes, recently noted false negatives are now reported, in particular:
  - for checkers concerned with the initialization of automatic variables;

[1] http://www.misra.org.uk/forum/

  - in the checking of undefined and unspecified behavior
  - for checkers that require knowledge about the expected behavior of calls to standard library functions and the variables passed as arguments;
  - for checkers requiring pointee types to be declared `const` whenever possible;
  - when checking for guards in empty header files.
- Due to improvements to the checkers and associated tools, the number of false positives has been reduced:
  - for checkers concerned with the initialization of automatic variables;
  - for checkers concerned with functions that return error values and with ensuring the returned value is checked;
  - for checkers concerned with functions that may return the end-of-file indicator `EOF` and with ensuring the return value is checked;
  - for checkers concerned with standard library functions that provide error information using `errno`;
  - for checkers that require knowledge about the expected behavior of calls to standard library functions and the variables passed as arguments;
  - for checkers concerned with missing return statements that were wrongly reporting `asm` statements;
  - for MC2.20.2 and the false reporting of the use of structure names reserved by the standard library;
  - for checkers detecting commented-out code;
  - for checkers concerned with detecting recursive method calls.
  - for checkers concerned with casts removing `const` or `volatile` qualification from the type of a pointer or reference.
  - for checkers that report unnecessary use of external linkage
- Due to improvements to the checkers and associated tools, the number of false *caution reports* has been reduced and some true *caution reports* have been converted to *violation reports*:
  - for checkers concerned with the initialization of automatic variables;
  - for checkers concerned with reporting recursive functions when the function call is indirect or the callee is virtual.
- Due to improvements to the checkers and associated tools, the report messages have been improved.
- For checkers when the report concerns an entity and not a specific declaration of the entity, we have added a configuration parameter whereby the user can select if all declarations for that entity should be shown or just a single representative.

2.15 Summary of Changes from Version 3.4 to Version 3.5

ECLAIR version 3.5 contains, besides numerous enhancements to all parts of the system, major efficiency improvements: memory consumption has been cut to half and analysis speed has been doubled or more, without any impact on analysis precision (speedups up to 6x have been observed).

2.16 Summary of Changes from Version 3.3 to Version 3.4

ECLAIR version 3.4 contains a new web application for viewing reports, several new and revised services and improvements to all aspects of the system.

New services include support for an appreciable part of the BARR-C:2018 coding standard [2]. This replaces ECLAIR support for the previous version [1].

There is a brand new innovative HTML reporting tool providing clear visualization with versatile navigation facilities of all the information concerning an ECLAIR analysis. With this new reporting tool the user has quick access to:

- information about the build process and the ECLAIR analyses performed;
- statistics on the various findings;
- detailed reports about each finding;
- optionally, full project sources, both before and after preprocessing.

The HTML outputs are compatible with most popular browsers, such as Google Chrome, Internet Explorer, Mozilla Firefox, Safari and Opera.

The configuration language, ECL, has also further improved and simplified. While ECLAIR 3.4 is mostly backward compatible with ECLAIR 3.3, the syntax of some configuration options has changed. As usual, to facilitate users in the transition, BUGSENG provides a free update service: let us have your old configuration files and we will send the new ones to you.

2.17 Summary of Changes from Version 3.2 to Version 3.3

ECLAIR version 3.3 contains substantial new functionality over the previous versions and offers significant improvements in all aspects of the system. Most notably:

- there is a brand new GUI that makes it very simple to configure a project for static analysis with ECLAIR;
- a new service, called `B.EXPLAIN`, outputs a natural language description for each ECLAIR configuration in force;
- configuration templates are provided for global configurations and for each supported service (e.g., coding rule checkers);
- reports suitable for printing can now be generated in the *OpenDocument Text* format (which can be easily turned into, e.g., PDF);
- the suppression mechanisms allow more fine-grained control, which is very useful when dealing with all the not-completely-defined behaviors of C and C++.

The configuration language, ECL, has also further improved and simplified. While ECLAIR 3.3 is mostly backward compatible with ECLAIR 3.2, the syntax of some configuration options has changed. As usual, to facilitate users in the transition, BUGSENG provides a free update service: let us have your old configuration files and we will send the new ones to you.

2.18 Summary of Changes from Version 3.1 to Version 3.2

ECLAIR version 3.2 contains many new static analyses, especially targeted at security. Support has been improved and extended for C11, C++11, C++14 and C++1z. The quality of ECLAIR reports has been improved further and their generation has been sped up by more than an order of magnitude.

There are new, very convenient installers both for the Windows and the Linux versions.

The configuration language, ECL, has also been significantly improved and simplified. While ECLAIR 3.2 is mostly backward compatible with ECLAIR 3.1, the syntax of some configuration options has changed. As usual, to facilitate users in the transition, BUGSENG provides a free update service: let us have your old configuration files and we will send the new ones to you.

2.19 Summary of Changes from Version 3.0 to Version 3.1

ECLAIR version 3.1 contains significant improvements in the checking of underlying/essential types required by the MISRA coding standards. More generally, the messages in ECLAIR reports have been uniformed and improved.

ECLAIR version 3.1 has improved support for Windows 8.* and Windows 10.

2.20 Summary of Changes from Version 2.3 to Version 3.0

ECLAIR version 3.0 contains many new services and major improvements to existing services, most notably those supporting the MISRA C:2012 coding standard [3].

Configurability has also been enhanced and makes it easier to support projects that use C and C++ at the same time and/or use different coding standards on different parts of the project. Deviation mechanisms have also been extended and improved.

New services include the exceedingly useful B.OBJCMP, which allows users to **guarantee** their changes to make the code compliant do not modify the generated object code (which implies no new bug has been introduced). And B.REMAKE, which automatically builds makefiles that can reproduce a build (and the analysis) at maximum parallelism, even if the project build system does not support parallel builds.

While ECLAIR 3.0 is mostly backward compatible with ECLAIR 2.*, the syntax of some configuration options has changed. As usual, to facilitate users in the transition, BUGSENG provides a free update service: let us have your old configuration files and we will send the new ones to you.

2.21 Summary of Changes from Version 2.1 to Version 2.3

The environment variables used to specify the toolchain components to be intercepted have been made uniform between the Windows and the Linux versions of ECLAIR. The following table gives the correspondence between the environment variables for which support has been dropped and those that have taken their place:

ECLAIR 2.1	ECLAIR 2.3
MS_LINK	LD
MS_CL	CC
MS_LIB	AR
CL_ALIASES	CC_ALIASES
LINK_ALIASES	LD_ALIASES
LIB_ALIASES	AR_ALIASES

2.22 Summary of Changes from Version 1.2

ECLAIR version 2.* contains major improvements and radical changes in every part of the system. As a consequence, as is often the case for major versions, there is no backward compatibility with respect to ECLAIR version 1.2, the previous released version. In particular, the syntax of many configuration options changed and configuration files for ECLAIR version 1.2 cannot be expected to work with ECLAIR version 2.*. To facilitate users in the transition, BUGSENG provides a free update service: let us have your old configuration files and we will send the new ones to you.

References

[1] M. Barr. *Embedded C Coding Standard*. Barr Group, www.barrgroup.com, 2013.

[2] M. Barr. *BARR-C:2018 — Embedded C Coding Standard*. Barr Group, www.barrgroup.com, 2018.

[3] MISRA. *MISRA C:2012 — Guidelines for the use of the C language in critical systems*. MIRA Limited, Nuneaton, Warwickshire CV10 0TU, UK, March 2013.

[4] MISRA. *MISRA C:2012 Amendment 1 — Additional security guidelines for MISRA C:2012*. HORIBA MIRA Limited, Nuneaton, Warwickshire CV10 0TU, UK, April 2016.

[5] MISRA. *MISRA C:2012 Technical Corrigendum 1 — Technical clarification of MISRA C:2012*. HORIBA MIRA Limited, Nuneaton, Warwickshire CV10 0TU, UK, June 2017.

[6] MISRA. *MISRA C:2012 — Guidelines for the use of the C language critical systems*. HORIBA MIRA Limited, Nuneaton, Warwickshire CV10 0TU, UK, February 2019. Third edition, first revision.

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