Rust Toolchain for Event-B with Language Server Support

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Abstract. We present a standalone toolchain providing Language Server Protocol support for Event-B. Written in Rust, it comprises a PEG-based parser with error recovery, an LSP server enabling Event-B development in VS Code, Neovim, and other editors, a bidirectional Rodin XML converter, and CLI tools for CI/CD integration. We have evaluated the parser on 68 publicly available Rodin projects, including industrial-scale specifications such as ARINC 653, ERTMS/ETCS, and HIMACF, the ABZ case studies, and cross-validated the results against Rodin's own parser.

Keywords: Event-B · Language Server Protocol · Rust · Formal Methods

1 Introduction

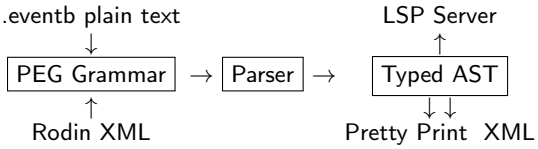
Event-B [1] is a formal method for system-level modelling widely used in safety-critical domains. The Rodin platform [2] provides the reference toolset, but its Eclipse architecture ties practitioners to a single IDE. CamilleX [4] introduced text-based editing within Rodin, but it still requires Eclipse/Xtext. Additionally, Eclipse-based solutions must be constantly maintained and updated to newer versions of the SDK, which is a costly and time-consuming process.

Modern industrial development relies on editors such as VS Code and Neovim, version control with text diffs, and CI pipelines, which are difficult to integrate with Rodin. We aim to bridge this gap with an open-source Rust toolchain [3] comprising a parser, an LSP server, an XML converter, various CLI tools, and integration with the ProB model checker.

2 Architecture

We parse Event-B models into a strongly-typed abstract syntax tree (AST) with source spans using a PEG grammar and the `pest` [9] parser. Rodin XML files (`.bum`/`.buc` and `.zip` archives) are also parsed into the same AST, enabling bidirectional conversion.

[3] The code will be published under MIT license in May, before the Rodin Workshop 2026.



The grammar covers the full Event-B language with Unicode and ASCII operator alternatives. Error recovery enables partial parsing of malformed input for responsive IDE feedback. The pretty printer roundtrips the AST back to the Event-B text and XML formats.

The `eventb-lsp` module implements the Language Server Protocol, enabling Event-B support in any LSP-capable editor:

- *editing* — completion (keywords, operators, identifiers, snippets), signature help, formatting;
- *navigation* — go-to-definition, find-references, workspace symbols, resolving across `EXTENDS`/`REFINES`/`SEES` chains;
- *refactoring* — renaming, ASCII↔Unicode conversion;
- *display* — semantic highlighting, hover, folding.

Although Xtext provides LSP support, CamilleX does not currently expose a standalone language server, remaining tied to Eclipse; our LSP server works with any compatible editor.

The `eventb-validate` module performs batch syntax validation with text or JSON output and non-zero exit codes, which is suitable for CI pipelines. `eventb-format` converts bidirectionally between Rodin `.zip` archives and `.eventb` plain text files. These enable a workflow: edit Event-B as plain text with IDE support, track changes in git, validate in CI, and convert to Rodin XML format to work with proofs. We evaluated the toolchain on 68 publicly available Rodin projects—including ARINC 653 [11], ERTMS/ETCS [7], HIMACF [3], ABZ case studies, and academic models—with successful parsing, roundtrip pretty-printing, and cross-validation against Rodin's built-in parser.

3 Conclusion

Industrial adoption of formal methods depends heavily on integration with existing development workflows. By providing LSP support, plain-text editing, git-friendly workflows, and CI integration, our toolchain makes Event-B accessible to practitioners who already work with VS Code, Neovim, and modern DevOps pipelines. We believe that meeting engineers in their familiar environments is key to broadening the Event-B user base, particularly in industry.

A further direction is LLM-based agent integration: active work on proof automation exists for Isabelle [6], Lean [10,5], and Coq [8], while Event-B has yet to benefit from similar advances. The programmatic AST access, LSP support and CLI tools offered by our toolchain lay the groundwork for closing this gap.

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