Safety-Critical Rust Adoption

Adoption of Safety-Critical Rust

This survey is being administered by the Rust Safety-Critical Consortium, a part of the Rust Foundation. The goal of the consortium is to advance adoption of the Rust programming language in industries like automotive, aerospace, industrial, medical, and others. The consortium provides a forum for collaboration between safety-critical software developers, Rust community members, and software development tooling providers.

The goal of the survey is to understand the state of adoption of the Rust language in these industries and identify gaps in tooling, community, ecosystem, or language features. Any and all engineers or managers working in safety-critical industries are invited to respond and share your thoughts!

To view the activities of the Rust Safety-Critical Consortium or get involved visit us at our GitHub repo:

https://github.com/rustfoundation/safety-critical-rust-consortium

Prelude

Do you work in a safety-critical industry? (Automotive, aerospace, medical, robotics, etc) *

- ◯ Yes
- ◯ No

What industry do you work in? *

You can select multiple options.

- ☐ Automotive
- ☐ Aerospace
- ☐ Medical
- ☐ Industrial
- ☐ Robotics
- ☐ Defense
- ☐ Nuclear
- ☐ Rail
- ☐ Other

What is the size of the company that you work for?

- ◯ < 10
- ◯ 10 - 49
- ◯ 50 - 249
- ◯ 250 - 1000

- ◯ 1000 - 10,000
- ◯ > 10,000

Approximately how many people actively write Rust at your company?

- ◯ < 10
- ◯ 10 - 19
- ◯ 20 - 49
- ◯ 50 - 200
- ◯ > 200

What is your primary role or responsibility related to software development or safety within your organization? *

You can select multiple options.

- ☐ Software Engineer
- ☐ Safety Engineer
- ☐ Quality Assurance Engineer
- ☐ Cybersecurity Engineer
- ☐ DevOps/Tooling Engineer
- ☐ Project Manager
- ☐ R&D Engineer
- ☐ Engineering Management
- ☐ Startup Owner/Founder

- [ ] C-suite (CEO, CTO, etc)
- [ ] Other

Can you elaborate on your role?

(Optional)

Languages

What language(s) do you use in your safety critical role? *

You can select multiple options.

- [ ] Rust
- [ ] C
- [ ] C++
- [ ] Ada/Spark
- [ ] Python
- [ ] Other

Do you currently use Rust? *

You can select multiple options.

- [ ] Yes, in my safety critical role
- [ ] Yes, in non-safety critical production
- [ ] Yes, as a hobby/in my free time
- [ ] No

Would you be interested in using Rust in your safety-critical role? *

- ( ) Yes, I already am
- ( ) Yes, but not I'm not yet using it
- ( ) No, I'm not interested in using Rust
- ( ) Not Sure Yet

Using or Interested in Rust

What were your/your company's primary reasons to switch to Rust? *

You can select multiple options.

- [ ] Memory safety
- [ ] Speed/performance
- [ ] Tooling (cargo, crates.io, clippy, etc)
- [ ] Language features (type system, matching, zero cost abstractions, etc)
- [ ] Specific library/crate/framework
- [ ] Hiring advantages (interest in Rust/quality of Rust engineers)
- [ ] Regulatory requirement
- [ ] Cybersecurity advantages
- [ ] Other

What are some of the advantages to Rust in your role?

(Optional)
Such as specific language features, tools, or parts of the ecosystem.

What are the primary blockers or disadvantages to using Rust in your safety critical role?

You can select multiple options.

- [ ] Lack of tooling
- [ ] Standards

- [ ] Hiring engineers
- [ ] Hardware support
- [ ] Ecosystem (libraries, drivers, etc)
- [ ] Lack of qualified tooling
- [ ] Regulatory hurdles
- [ ] Legacy codebase
- [ ] Training
- [ ] Other

How do you or would you be interested in using Rust in your safety-critical role?

You can select multiple options.

- [ ] Starting a new project in Rust
- [ ] Rewriting an existing project in Rust
- [ ] Integrating Rust with an existing codebase
- [ ] Integrating Rust components into an existing system
- [ ] Using C/C++ Interoperability Layer
- [ ] Other

Not Interested in Rust

What are the primary disadvantages to using Rust in your safety-critical role?

You can select multiple options.

- [ ] Doesn't offer any/enough advantage over existing languages
- [ ] Too difficult to learn
- [ ] Doesn't support my hardware target(s)
- [ ] Not certifiable
- [ ] Not enough hirable Rust engineers
- [ ] Doesn't integrate with existing codebase
- [ ] Doesn't integrate with existing process/tooling/build system
- [ ] Software supply chain concern (open-source)
- [ ] Don't know enough about it
- [ ] Other

Can you elaborate on the downsides to Rust for your role?

Tooling

What types of safety critical code tools does your work require?

You can select multiple options.

- [ ] Certified compiler
- [ ] Formal verification
- [ ] Code coverage analysis
- [ ] Code-requirements traceability
- [ ] Static analysis
- [ ] Source code metrics (cyclomatic complexity, lines of code, etc)
- [ ] Linting tools (naming contenvtions, style guides, etc)
- [ ] Automated testing (fuzz, prop-based, etc)
- [ ] Post compilation analysis (worst case execution time, stack size, etc)
- [ ] Other

Are there "best-in-class" libraries or solutions in another language which have features lacking within the Rust ecosystem for your use cases?

Are there any libraries that are not written in Rust that you would like to use in the Rust ecosystem?

Are there any crates in the Rust ecosystem that you would use in safety-critical software if it were certified?

Standards/Guidelines

What standard(s) do you work with in your safety critical work?

You can select multiple options.

- [ ] ISO-26262
- [ ] DO-178
- [ ] IEC-61508
- [ ] IEC-62304
- [ ] Other

What levels of ISO-26262 do you work with?

You can select multiple options.

- [ ] QM
- [ ] ASIL-A
- [ ] ASIL-B
- [ ] ASIL-C
- [ ] ASIL-D

What levels of IEC-61508 do you work with?

You can select multiple options.

- [ ] SIL-1
- [ ] SIL-2
- [ ] SIL-3

- [ ] SIL-4

What levels of DO-178 do you work with?

You can select multiple options.

- [ ] DAL A
- [ ] DAL B
- [ ] DAL C
- [ ] DAL D
- [ ] DAL E

What levels of IEC-62304 do you work with?

You can select multiple options.

- [ ] Class A
- [ ] Class B
- [ ] Class C

What coding guidelines do you work with in your safety critical work?

You can select multiple options.

- [ ] MISRA (C)
- [ ] AEC
- [ ] AUTOSAR (C++)
- [ ] JSF AV (C++)
- [ ] CERT (C, C++, Java)

- [ ] HIC++
- [ ] CWE
- [ ] Other

Hardware/Environments

To what environments do you deploy your safety critical code?

You can select multiple options.

- [ ] Cloud
- [ ] WebAssembly
- [ ] Native applications
- [ ] Embedded Linux
- [ ] Embedded with a hypervisor (RTOS, event-driven architecture, etc)
- [ ] Bare metal embedded
- [ ] Other

What chip architectures do you work with?

You can select multiple options.

- [ ] ARM Cortex (R or M)
- [ ] ARM Cortex (A)
- [ ] Infineon Tricore
- [ ] x86-x64
- [ ] PowerPC
- [ ] Renesas
- [ ] RISC-V
- [ ] Other

Open Ended Feedback

What kind of support or resources from the Rust community or the Safety-Critical Rust Consortium would be most helpful in enabling Rust adoption in your industry?

What steps would your organization need to take to seriously consider or adopt Rust for safety-critical projects?

Summary

Thank you so much for filling out this survey! The Rust Safety-Critical Consortium is looking forward to using this information to identify gaps in the Rust ecosystem and helping to close them.

If you would like to join the consortium, you can file an issue in the GitHub repo for the consortium.

Other good ways to stay in touch with the Rust community is to subscribe to This Week in Rust or The Embedded Rustacean.