

# Rust

as a viable option for the  
next **50 years** of  
space exploration



# Who am I

- Community Manager of AeroRust
- Software engineer
- From PHP on the web to Rust everywhere
- From blockchain and streaming backend services to nanosatellites and rockets.
- A father

Discord: [elpiel](#)

GitHub: [elpiel](#)

X: [elpiel](#)

LinkedIn: [elpiel](#)

Hi, my name is  
**Lachezar Lechev**



# Rust's journey from a crustacean point of view



# Rust's journey

from a crustacean point of view

- Rust v1.0
  - Green threads
- Personal perspective from 2019
  - This week in Rust
  - Weekly content
- Async MVP - a game changer
- Editions
- Linting - clippy and rustfmt

# Ongoing efforts

- Async as an ongoing effort:
  - Dual API
  - async/blocking code and embedded APIs
  - Async Drop
- Const generics and statics
- Constant functions

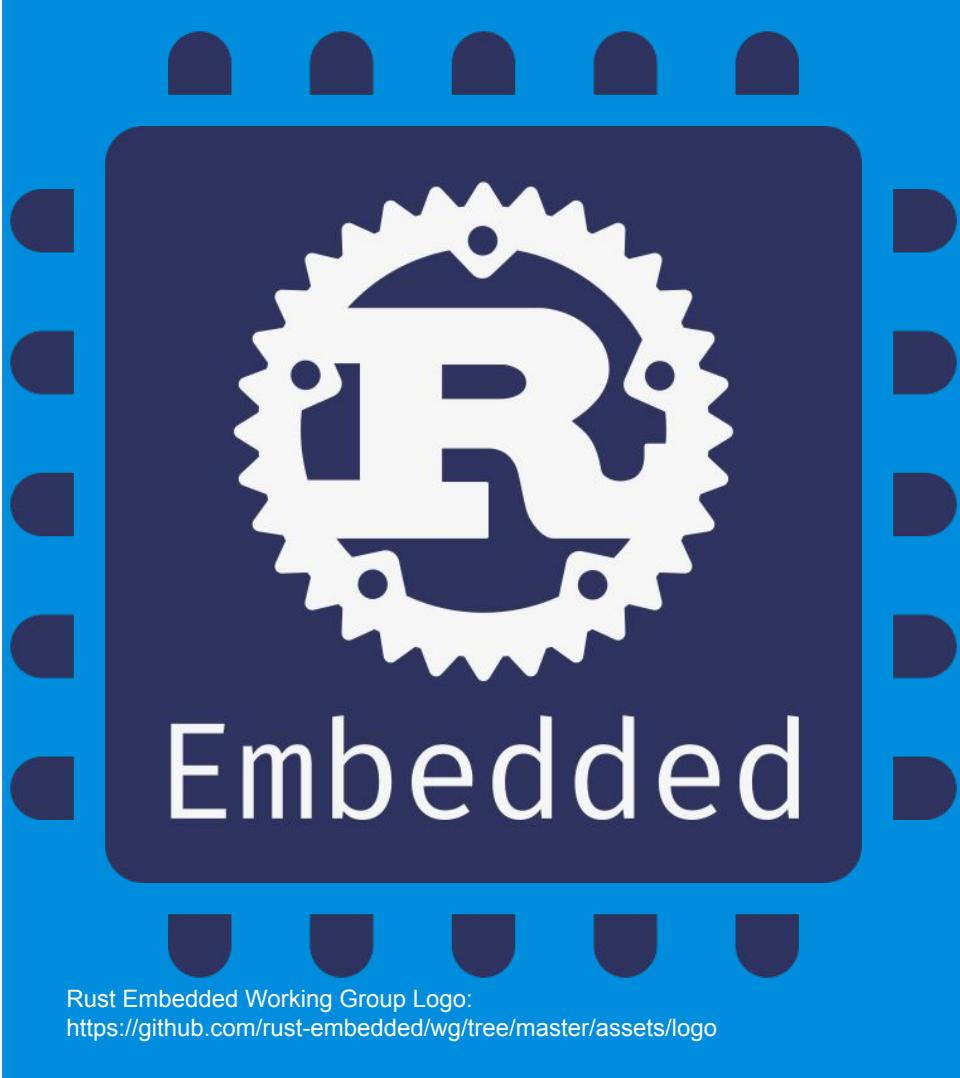
# **What can we do? with the Embedded ecosystem**

(present and future)

# Embedded ecosystem

## APIs and traits

- embedded-hal & embedded-hal-async
- embedded-storage & embedded-storage-async
- embedded-io & embedded-io-async
- embedded-graphics
- etc.

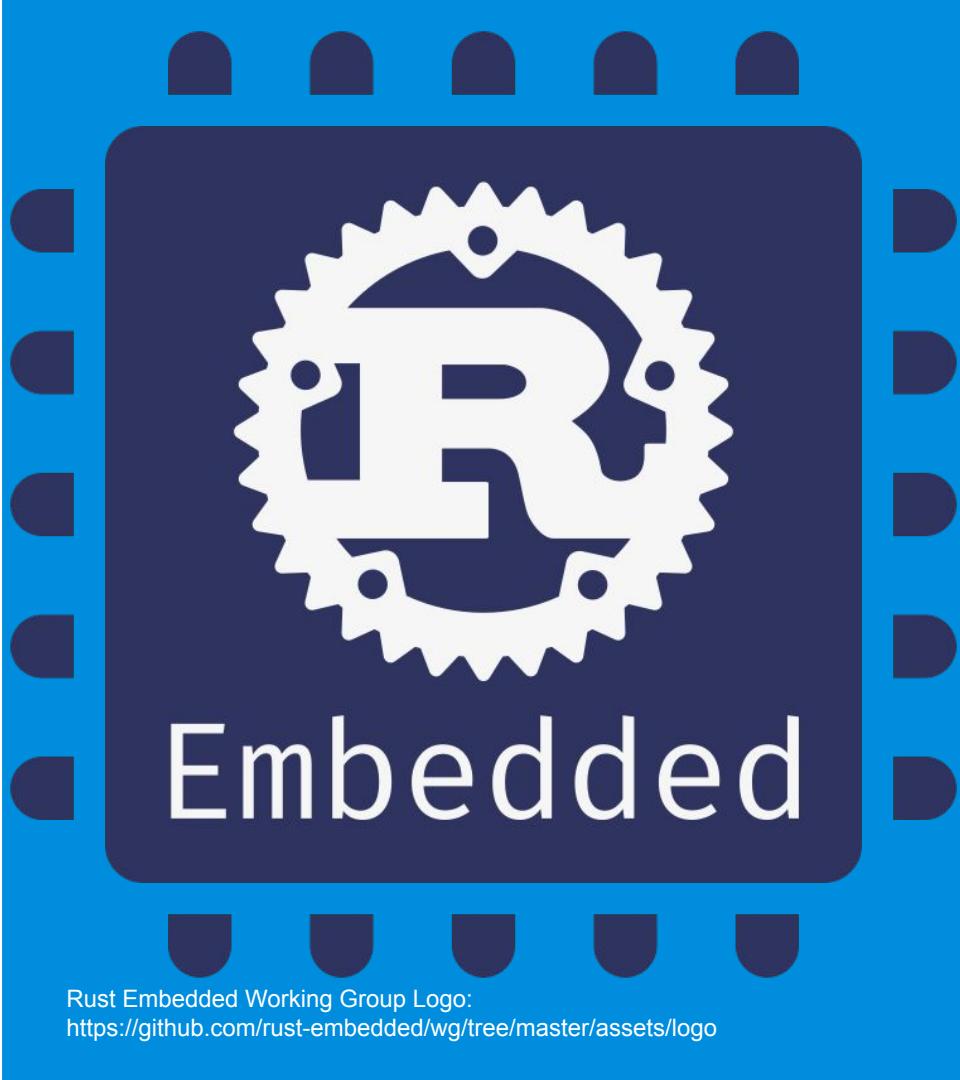


Rust Embedded Working Group Logo:  
<https://github.com/rust-embedded/wg/tree/master/assets/logo>

# Embedded ecosystem

## Crates

- Probes support
  - ◆ probe-rs & cargo-flash - ARM, RISC-V, CMSIS-DAP, STLink, JLink
  - ◆ espflash - flashing esp chips
- Embassy & RTIC
- Logging
  - ◆ defmt & probe-run
  - ◆ log
  - ◆ ..storage?!

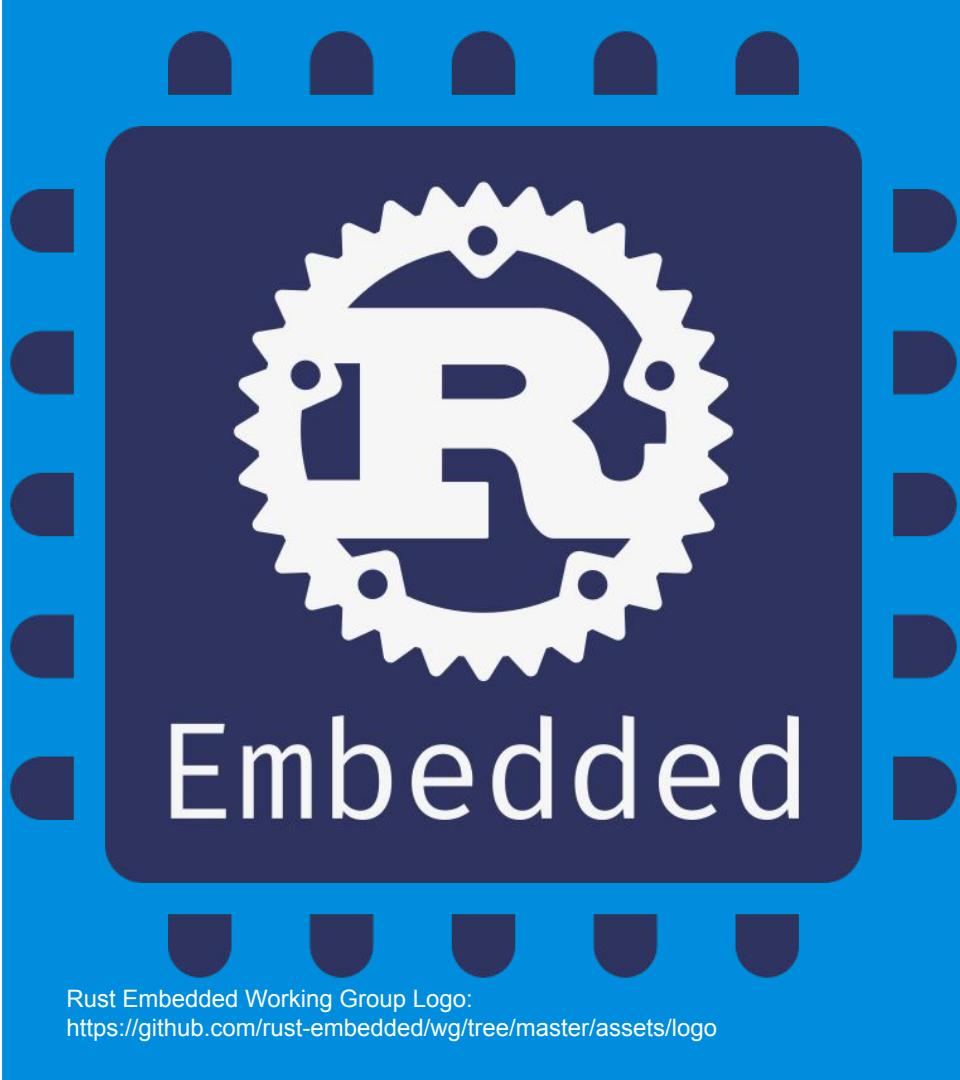


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# Embedded ecosystem

## Crates

- embedded-sdmmc - SD cards
- Filesystems
  - ◆ littlefs - Rust bindings for a C library
  - ◆ VLFS - minimal NOR flash FS
- Sensors
- northstar - Containers runtime?!



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# Other domains and applications

# Other domains and applications

1 / 2

- Tokio / Hyper / Tower - async backbone
- Reqwest - HTTP requests made simple
- axum - web framework
- Clap - for CLIs
- Quinn - Quic protocol
- Ockam - for distributed systems, supports no\_std

# Other domains and applications

2 / 2

- Cloud
- cargo sub-commands
  - [cargo-generate](#)
  - [cargo-release](#) - publishing crates
  - [cargo-espflash](#)
  - [cargo-semver-checks](#) - API breakage checks
  - [cargo-dist](#) - releasing software
  - [cargo-about](#) - dependencies licences

# Rust, Adoption and Safety!

and a bit more...

# Efforts and adoption

## Safety-critical systems

- Space - French start-up, 2 big private companies in the US
- Ferrocene
- OxidOs
- Embedded Rust Adoption Tracking

# Efforts and adoption

## Safety-critical systems

- All aboard the Rust (electric freight) train! - RustConf 2022
- Why Volvo thinks you should have Rust in your car
- AUTOSAR investigates how the Programming Language Rust could be applied in Adaptive Platform Context
- JA1020 (WIP) Recommendations for the Rust Programming Language in Safety-Related Systems - SAE International

- Machine Learning
- Computer Vision
- Matrix for:
  - Rust Embedded
  - Embassy
  - esp-rs
- AeroRust

# Communities



conference  
**code::dive**

# AeroRust

The Rust community  
for aerospace



NOKIA

# AeroRust

The Rust community for aerospace



- A meeting place (for hobbyists and professionals)  
of more than 590 community members
- Learning materials
- Building the ecosystem
- Advocating for Rust adoption

# AeroRust

## Events

- Meetups ([Youtube playlist](#))
  - [The CUAVA-1 CubeSat](#)
  - [Rust London | AeroRust takeover](#)
- [Space Conference - Plovdiv \(2023\)](#) - First edition!
- Bi-weekly casual meetups in Discord

Aerospace, space, Rust and everything in between

# AeroRust

## Projects

- [www.AreWeInSpaceYet.org](http://www.AreWeInSpaceYet.org) crates catalog
- [Drone](#) (MAVLink protocol)
- [Nmea crate](#) (NMEA 0183 parsing library)
- [Embedded workshop](#)

# Join the community!

Discord server: <https://discord.gg/6wFvsFWfnu>

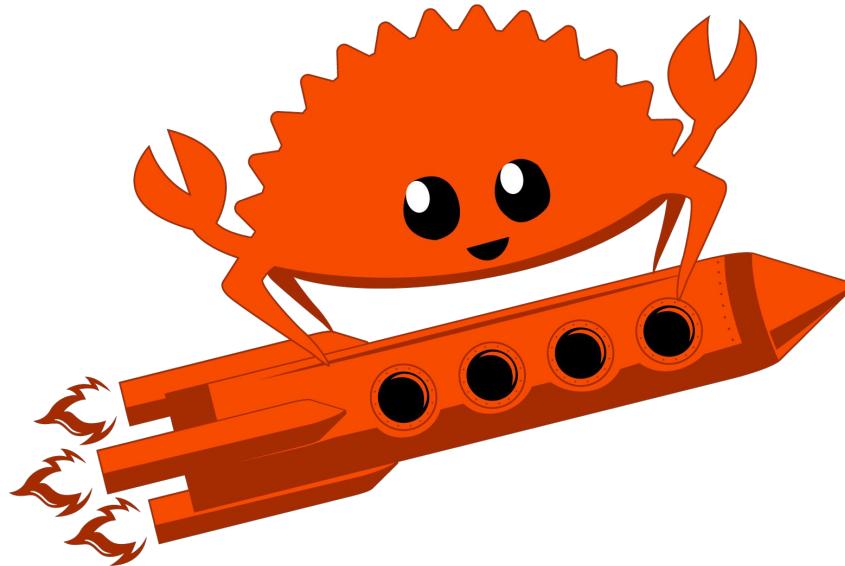
Youtube channel: <https://www.youtube.com/AeroRust>

Github: <https://github.com/AeroRust>

Twitter: <https://twitter.com/AeroRust>

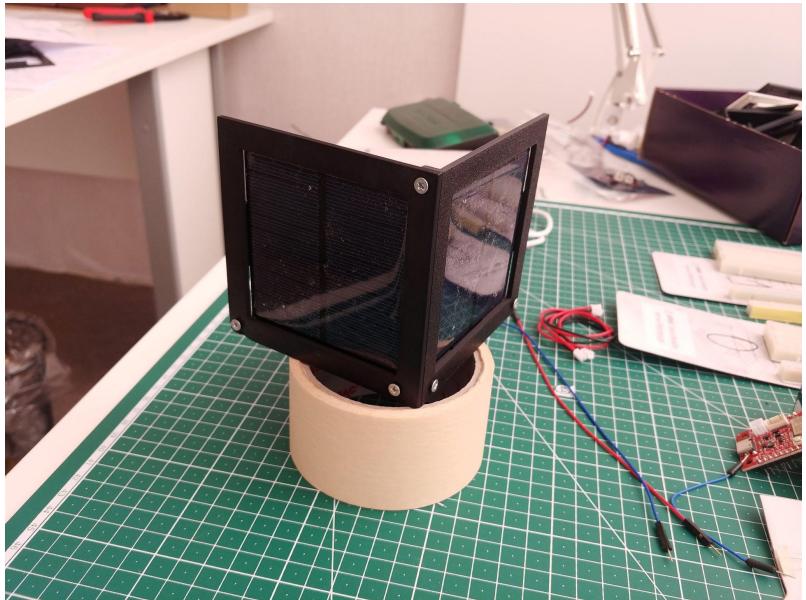
# Open-source workshop Demo

## Nanosatellites



# Mnogo.space kits

Many types of space kits



[www.mnogo.space](http://www.mnogo.space)



# Conclusion

**Predicting the Future  
is Hard**

*(three postcards from 1900)*

The Future of Colonizing Space  
Neil deGrasse Tyson  
WGS 2018

[www.aerorust.org/slides/code::dive\\_2023.pdf](http://www.aerorust.org/slides/code::dive_2023.pdf)

**Thank you!**  
**Q & A**

