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GLOBAL SOFTWARE CONSULTANCY

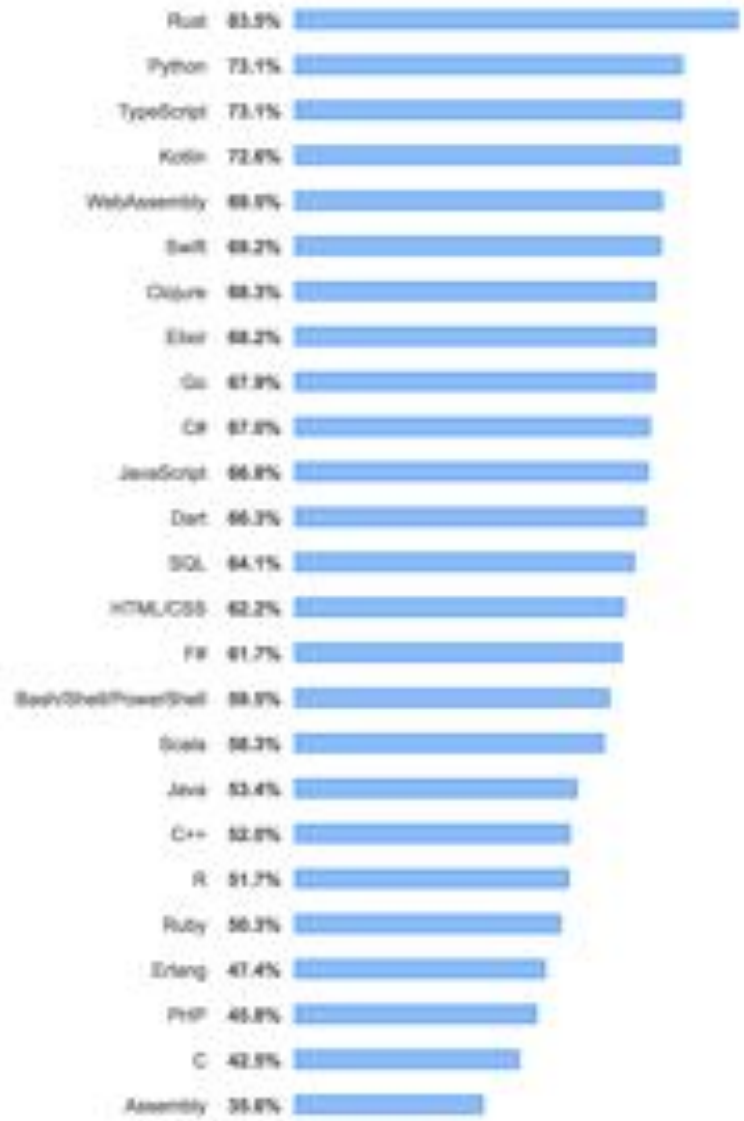
# READY FOR RUST

*Erik Dörnenburg* | ThoughtWorks | *@erikdoe*

## Most Loved, Dreaded, and Wanted

### Most Loved, Dreaded, and Wanted Languages

Loved | Dreaded | Wanted



Overview

Key Results

Developer Profile

**Technology**

**I. Most Popular Technologies**

II. Most Loved, Dreaded, and Wanted

III. Development Environments and Tools

IV. Blockchain in the Real World

V. Top Paying Technologies

VI. Correlated Technologies

Work

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Methodology

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# Most Popular Technologies

## Programming, Scripting, and Markup Languages

All Respondents | Professional Developers


Google

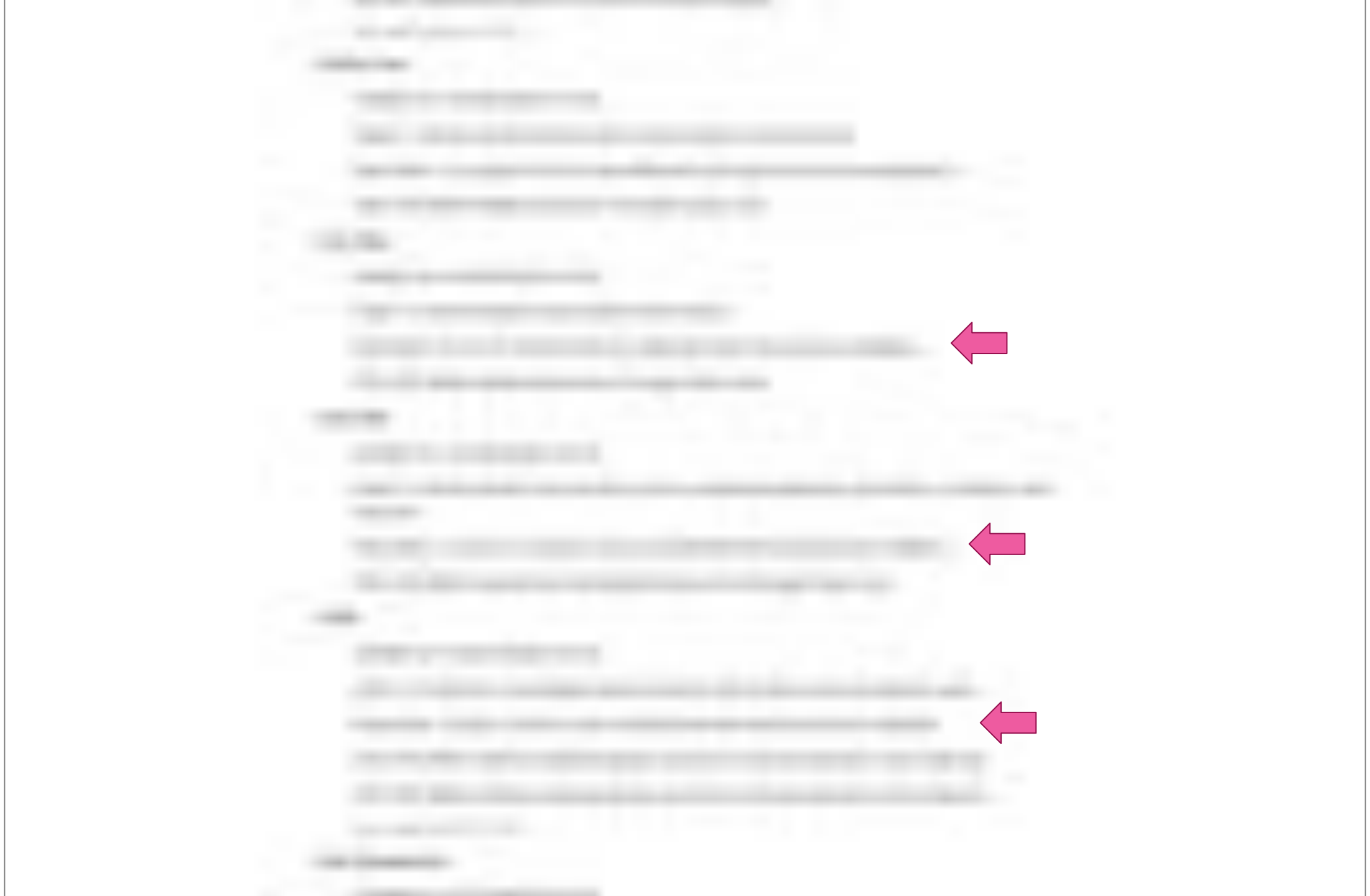

moz://a

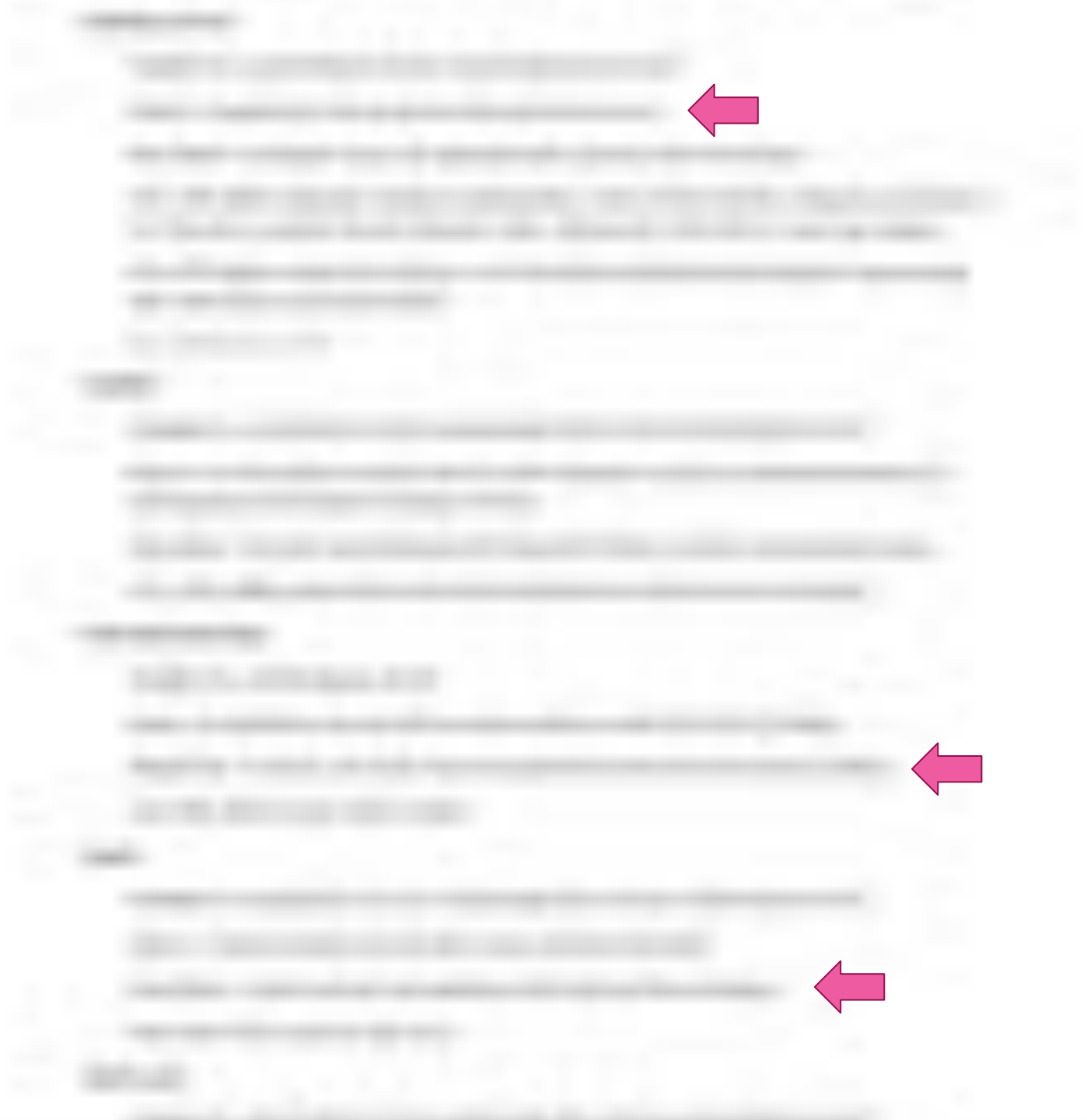

Swift


GO



https://support.apple.com/en-us/HT210348





NEWS

# C++ Memory Bugs Prompt Microsoft to Eye Rust Instead

By David Ramel ▪ 07/18/2019

Microsoft is eyeing the Rust programming language as a safer replacement of C/C++ code after discovering just how many security problems are caused by memory corruption bugs.

That news comes in a new blog post by the Microsoft Security Response Center (MSRC), which in triaging every reported Microsoft vulnerability since 2004 found that "one astonishing fact sticks out."

That astonishing fact? "The majority of vulnerabilities fixed and with a CVE



Most Popular Articles

What Are gRPC Web Services and When Should I Use Them?

How to Integrate Blazor Components

"The majority of vulnerabilities fixed and with a CVE assigned are caused by developers inadvertently inserting memory corruption bugs into their C and C++ code"

*– Microsoft Security Response Center: A proactive approach to more secure code (July 2019)*

# ISO 26262

From Wikipedia, the free encyclopedia

This article needs to be **updated**. Please update this article to reflect recent events or newly available information.
Last update: 2011 (November 2018)

**ISO 26262**, titled "Road vehicles – Functional safety", is an international standard for functional safety of electrical and/or electronic systems in production automobiles defined by the International Organization for Standardization (ISO) in 2011.

Contents [hide]



## Overview of Part 1 [edit]

Functional safety features form an integral part of each automotive product development phase, ranging from the specification, to design, implementation, integration, verification, validation, and production release. The standard ISO 26262 is an adaptation of the Functional Safety standard IEC 61508 for Automotive Electric/Electronic Systems. ISO 26262 defines functional safety for automotive equipment applicable throughout the lifecycle of all automotive electronic and electrical safety-related systems.

The first edition, published on 11 November 2011, is intended to be applied to electrical and/or electronic systems installed in "series production passenger cars" with a maximum gross weight of 3500 kg. It aims to address possible hazards caused by the malfunctioning behaviour of electronic and electrical systems.

Although entitled "Road vehicles – Functional safety" the standard relates to the functional safety of Electrical and Electronic systems as well as that of systems as a whole or of their mechanical subsystems.

Like its parent standard, IEC 61508, ISO 26262 is a risk-based safety standard, where the risk of hazardous operational situations is qualitatively assessed and safety measures are defined to avoid or control systematic failures and to detect or control random hardware failures, or mitigate their effects.

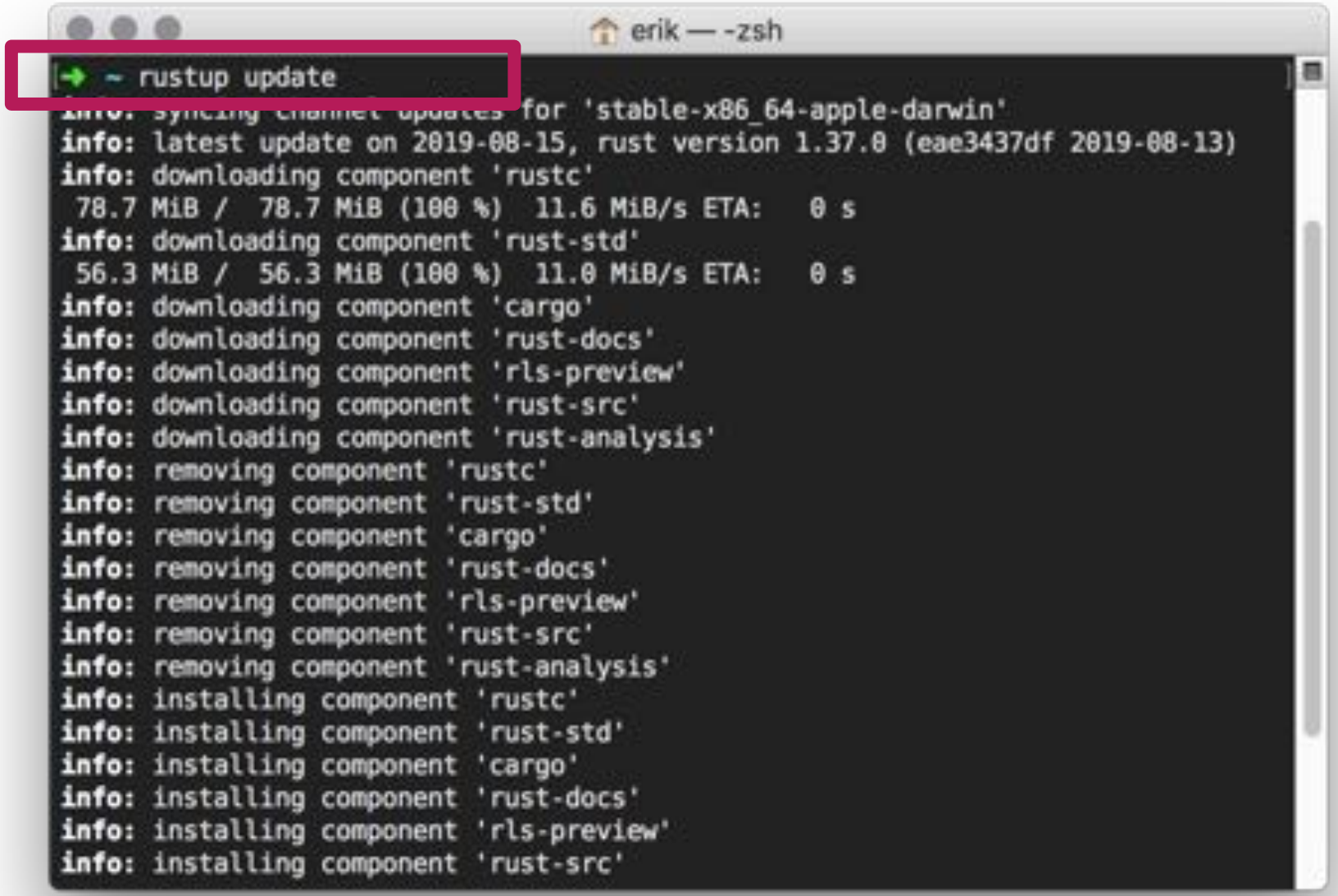
Goals of ISO 26262:

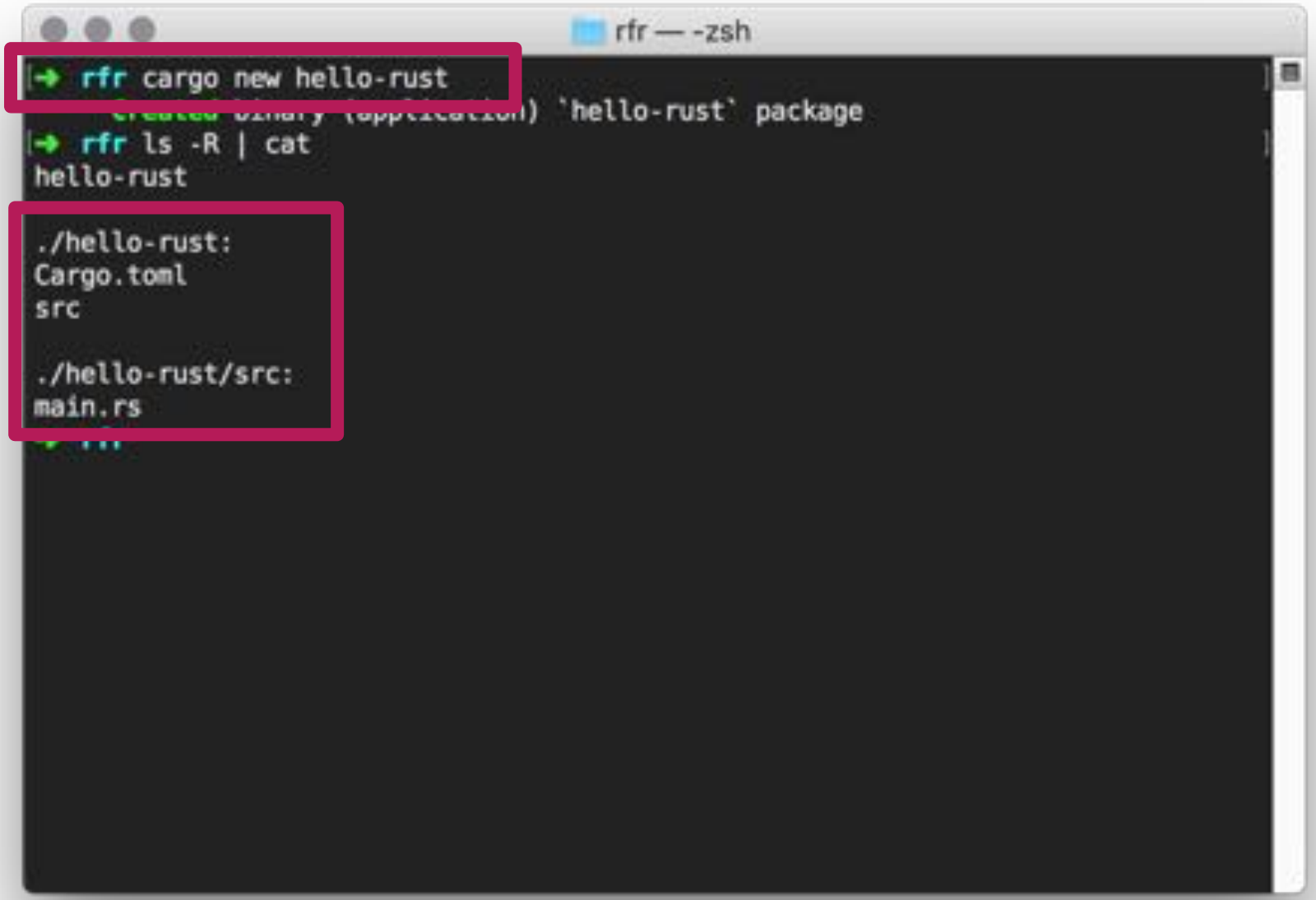
- Provides an automotive safety lifecycle (management, development, production, operation, service, decommissioning) and supports tailoring the necessary activities during these lifecycle phases.
- Covers functional safety aspects of the entire development process (including such activities as requirements specification, design, implementation, integration, verification, validation, and configuration).
- Provides an automotive-specific risk-based approach for determining risk classes (Automotive Safety Integrity Levels, ASILs).
- Uses ASILs for specifying the item's necessary safety requirements for achieving an acceptable residual risk.
- Provides requirements for validation and confirmation measures to ensure a sufficient and acceptable level of safety is being achieved.[1]

## Parts of ISO 26262 [edit]

The standard consists of 9 normative parts and a guideline for the ISO 26262 as the 10th part.

# GETTING READY


erik — -zsh
~ rustup update
for 'stable-x86_64-apple-darwin'
info: latest update on 2019-08-15, rust version 1.37.0 (eae3437df 2019-08-13)
info: downloading component 'rustc'
78.7 MiB / 78.7 MiB (100 %) 11.6 MiB/s ETA: 0 s
info: downloading component 'rust-std'
56.3 MiB / 56.3 MiB (100 %) 11.0 MiB/s ETA: 0 s
info: downloading component 'cargo'
info: downloading component 'rust-docs'
info: downloading component 'rls-preview'
info: downloading component 'rust-src'
info: downloading component 'rust-analysis'
info: removing component 'rustc'
info: removing component 'rust-std'
info: removing component 'cargo'
info: removing component 'rust-docs'
info: removing component 'rls-preview'
info: removing component 'rust-src'
info: removing component 'rust-analysis'
info: installing component 'rustc'
info: installing component 'rust-std'
info: installing component 'cargo'
info: installing component 'rust-docs'
info: installing component 'rls-preview'
info: installing component 'rust-src'


rfr — -zsh
➜ rfr cargo new hello-rust
Created binary (application) `hello-rust` package
➜ rfr ls -R | cat
hello-rust
./hello-rust:
Cargo.toml
src
./hello-rust/src:
main.rs





# Crate chrono

[-][src]

## [-] Chrono: Date and Time for Rust

It aims to be a feature-complete superset of the time library. In particular,

- Chrono strictly adheres to ISO 8601.
- Chrono is timezone-aware by default, with separate timezone-naive types.
- Chrono is space-optimal and (while not being the primary goal) reasonably efficient.

There were several previous attempts to bring a good date and time library to Rust, which Chrono builds upon and should acknowledge:

- Initial research on the wiki
- Dietrich Epp's datetime-rs
- Luis de Bethencourt's rust-datetime

Any significant changes to Chrono are documented in the CHANGELOG.md file.

### Usage

Put this in your `Cargo.toml`:

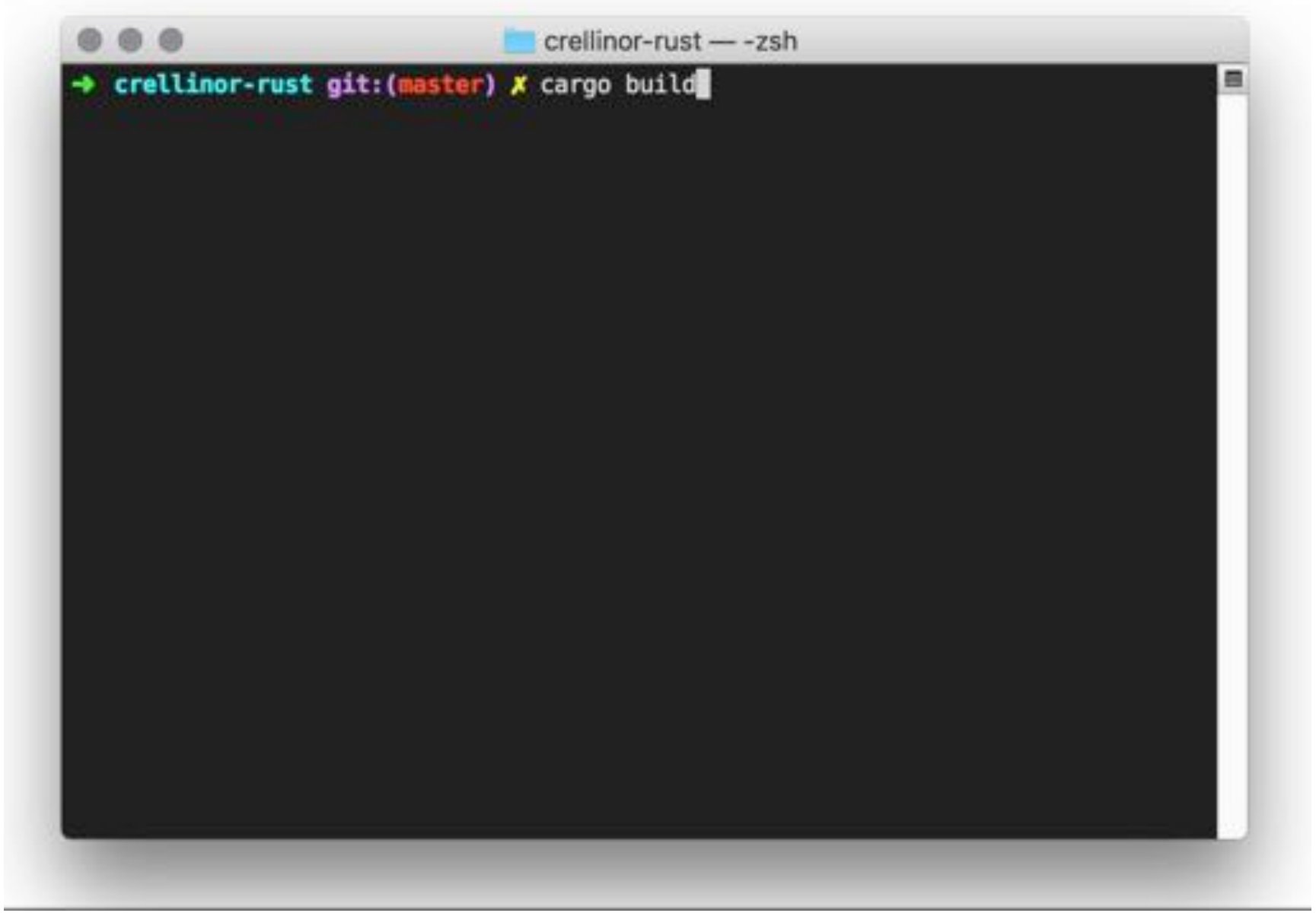
```
[dependencies]
chrono = "0.4"
```

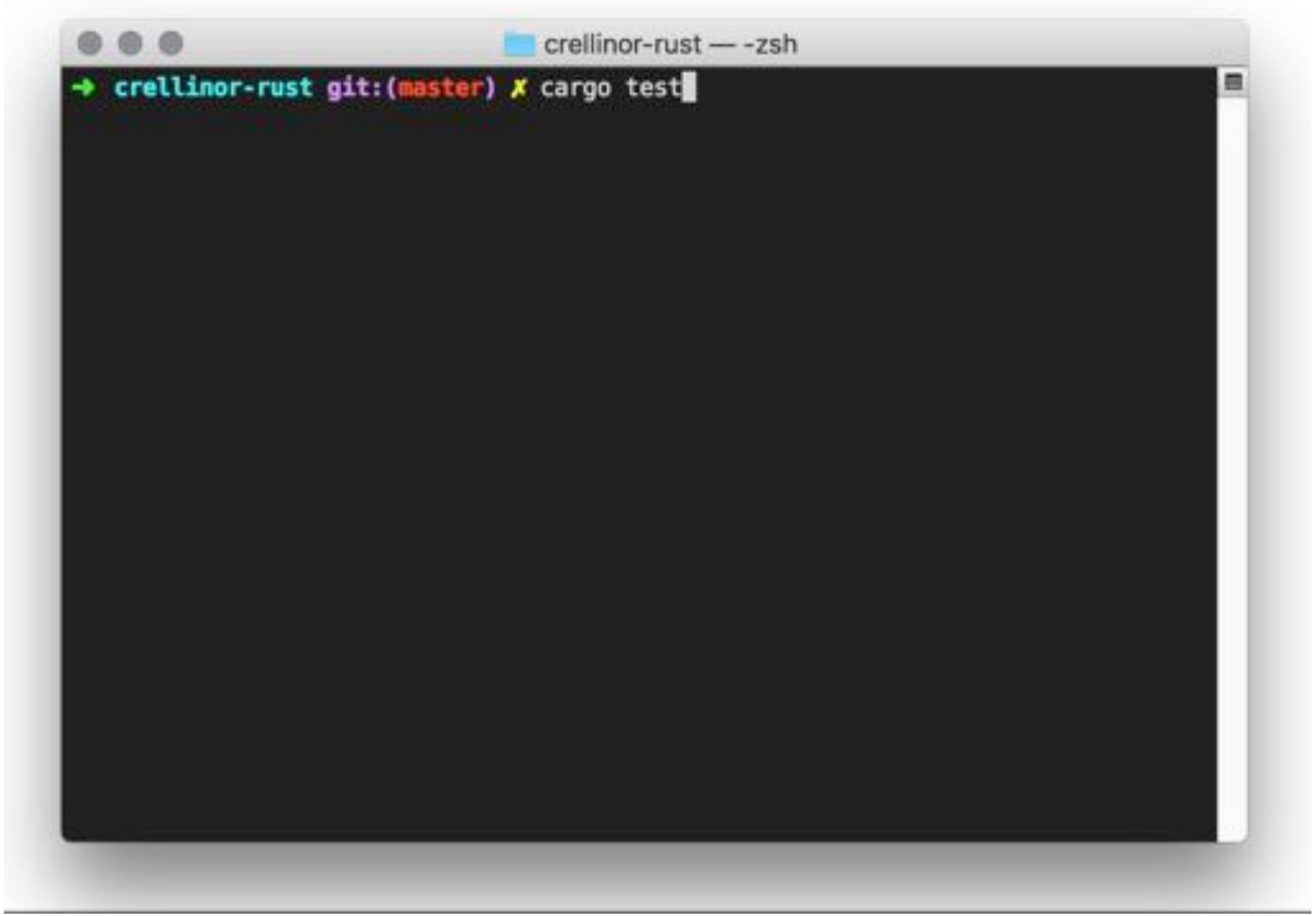
Or, if you want Serde include the feature like this:

```
[dependencies]
chrono = { version = "0.4", features = ["serde"] }
```

Then put this in your crate root:

```
extern crate chrono;
```


crellinor-rust — -zsh
➜ crellinor-rust git:(master) ✗ cargo build


crellinor-rust — -zsh
➜ crellinor-rust git:(master) ✗ cargo test

# CODE

```rust
pub struct World {
    pub name: Option<String>,
    pub params: Params,
    pub random: RNG,
    pub terrain: Terrain,
    pub cycle: u64,
    pub log: Log,
}

impl World {
    pub fn new(name: &str, params: Params) -> World {
        let terrain = Terrain::with_size(params.world_size);
        World {
            name: Some(name.to_owned()),
            params,
            random: RNG::new(),
            terrain,
            cycle: 0,
            log: Log::new(),
        }
    }
```

```rust
157     pub fn do_cycles(&mut self, num: u64) {
158         for _ in 0..num {
159             self.do_one_cycle();
160         }
161     }
162
```

```
388 pub fn cycle_count(params: &Params, prog: &[Instr]) -> u64 {
389     prog.iter().fold(0, |acc, instr| acc + params.instr_cycles(instr))
390 }
391
```

```
388 pub fn cycle_count(params: &Params, prog: &[Instr]) -> u64 {
389     prog.iter().map(|instr| params.instr_cycles(instr)).sum()
390 }
391
```

# MEMORY MANAGEMENT

```
{                       // s is not valid here, it's not yet declared
    let s = "hello";    // s is valid from this point forward

    // do stuff with s
}                       // this scope is now over, and s is no longer valid
```

```
let s1 = String::from("hello");
let s2 = s1;

println!("{}, world!", s1);
```

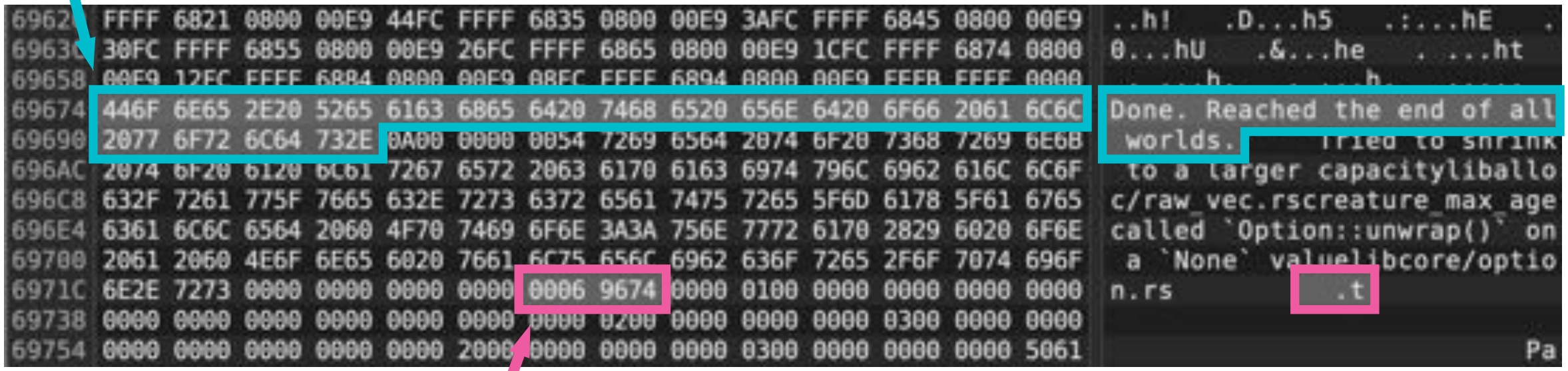
```rust
let s1 = String::from("hello");

let len = calculate_length(&s1);
```

```rust
fn calculate_length(s: &String) -> usize { // s is a reference to a String
    s.len()
} // Here, s goes out of scope. But because it does not have ownership of what
  // it refers to, nothing happens.
```

*Illustration only! Not an accurate description of Rust, or C, or Intel CPUs.*

```
let message = get_message();
```




```
let messageRef = &message;
```

```rust
let s1 = String::from("hello");

let len = calculate_length(&s1);
```

```rust
fn calculate_length(s: &String) -> usize { // s is a reference to a String
    s.len()
} // Here, s goes out of scope. But because it does not have ownership of what
  // it refers to, nothing happens.
```

```rust
fn main() {
    let s = String::from("hello");

    change(&s);
}

fn change(some_string: &String) {
    some_string.push_str(", world");
}
```


```rust
fn main() {
    let mut s = String::from("hello");

    change(&mut s);
}

fn change(some_string: &mut String) {
    some_string.push_str(", world");
}
```

```rust
let mut s = String::from("hello");

let r1 = &mut s;
let r2 = &mut s;
```

```rust
let mut s = String::from("hello");

let r1 = &s; // no problem
let r2 = &s; // no problem
let r3 = &mut s; // BIG PROBLEM
```

```rust
fn main() {
    let reference_to_nothing = dangle();
}

fn dangle() -> &String {
    let s = String::from("hello");

    &s
}
```

```
136     fn process_all_creatures(&mut self) {
137         self.terrain.do_with_creatures_mut(|terrain, creature, pos|
138             {
139                 creature.ep -= 1;
140                 if (creature.age() >= self.params.creature_max_age) || (creature.ep == 0) {
141                     return None;
142                 }
143                 let mut ctx = PContext::new(&self.params, terrain, self.cycle, pos);
144                 return Some(creature.do_cycle(&mut ctx));
145             });
146     }
147
```

```
/Users/erik/.cargo/bin/cargo build --color=always --all --all-targets
   Compiling crellinor v0.1.0 (/Users/erik/Projects/GA/crellinor-rust)
error[E0501]: cannot borrow `self.terrain` as mutable because previous closure requires unique access
   --> src/world.rs:137:9
    |
137 |           self.terrain.do_with_creatures_mut(|terrain, creature, pos|
    |           ^            ---------------------- ------------------------ closure construction occurs here
    |           |            |
    |  _________|            first borrow later used by call
    | |
138 | |             {
139 | |                 creature.ep -= 1;
140 | |                 if (creature.age() >= self.params.creature_max_age) || (creature.ep == 0) {
    | |                                       ---- first borrow occurs due to use of `self` in closure
... | |
144 | |                 return Some(creature.do_cycle(&mut ctx));
145 | |             });
    | |_____________^ second borrow occurs here

error[E0500]: closure requires unique access to `self` but it is already borrowed
   --> src/world.rs:137:44
    |
137 |         self.terrain.do_with_creatures_mut(|terrain, creature, pos|
    |         ----------- ---------------------- ^^^^^^^^^^^^^^^^^^^^^^^^ closure construction occurs here
    |         |           |
    |         |           first borrow later used by call
    |         borrow occurs here
...
140 |                 if (creature.age() >= self.params.creature_max_age) || (creature.ep == 0) {
    |                                       ---- second borrow occurs due to use of `self` in closure

error: aborting due to 2 previous errors

Some errors have detailed explanations: E0500, E0501.
For more information about an error, try `rustc --explain E0500`.
```

```
fn process_all_creatures(&mut self) {
    self.terrain.do_with_creatures_mut(|terrain, creature, pos|
        {
            creature.ep -= 1;
            if (creature.age() >= self.params.creature_max_age) || (creature.ep == 0) {
                return None;
            }
            let mut ctx = PContext::new(&self.params, terrain, self.cycle, pos);
```

```
fn process_all_creatures(&mut self) {
    let cycle = self.cycle;
    let params = &self.params;
    self.terrain.do_with_creatures_mut(|terrain, creature, pos|
        {
            creature.ep -= 1;
            if (creature.age() >= params.creature_max_age) || (creature.ep == 0) {
                return None;
            }
            let mut ctx = PContext::new(params, terrain, cycle, pos);
```

# PARALLELISM

```
fn run_multiverse(worldfn: fn() -> World) {
    let mut handles = Vec::new();

    for tnum in 0..NUM_THREADS {
        let h = thread::spawn(move || {
            for snum in 0..(NUM_SIMS / NUM_THREADS) {
                run_world(tnum, snum, worldfn());
            }
        });
        handles.push(h);
    }

    while let Some(h) = handles.pop() {
        h.join().unwrap();
    }
}
```

# PERFORMANCE

Clojure:
110,000 cycles/s


Rust:
~~3,500,000 cycles/s~~
25,000,000 cycles/s

"I had experienced some frustrations trying to implement in Rust the same structure I had had in C. So I mentally gave up on performance, resolving to just get something working first."

*– Bryan Cantrill, on his blog (September 2018)*

Time to generate a statemap for a modest trace
(229M, ~3.9M state transitions)

| | |
|---|---|
| Node.js | 83.1s |
| Node/C hybrid | 11.8s |
| Rust | 8.1s |

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**ERIK DÖRNENBURG**
HEAD OF TECHNOLOGY
erik@thoughtworks.com | @erikdoe