Rust

for JS/TS developers

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Open source hooliganism and the TypeScript meltdown

Types in the past

```c
int main() {
  int x = 0;
  long int y = (long) x;

  println("%d", y);
}
```

1. slow to compile
2. type inference wasn't a thing
3. tooling

```
unresolved external symbol "void __cdecl
importStoredClients(class
std::basic_fstream<char,struct std::char_traits<char> > const
&,class
std::vector<class Client,class std::allocator<class Client> >
&)" (?
importStoredClients@@YAXABV?$basic_fstream@DU?
$char_traits@D@std@@@std@@AAV?
$vector@VClient@@V?$allocator@VClient@@@std@@@2@@Z)
referenced in function
_main DataTracker
```

```
1 + "2" == 3
```

Undefined is not a function

2. Types of Typings

Structural Typing (Typescript, OCaml, ...)

```
type Foo = { x: number, y: string };
type Bar = { x: number };

let x: Foo = { x: 1, y: "hello" };

// works
let y: Bar = x;

console.log(y)
// => { x: 1, y: "hello" }
```

Nominal Typing (Rust, C/C++, ...)

```rust
struct Foo { x: i32, y: String };
struct Bar { x: i32 };

fn main() {
  let x: Foo = Foo { x: 1, y: "hello".to_string() };

  // this would not compile
  // let y: Bar = x;

  // works (explicit conversion needs to be defined)
  let y: Bar = x.into();
}
```

What makes Rust good?

“If it compiles, it works”

“If it compiles, it works”

not to be taken literally

it’s how strongly typed programming **feels**

“Making illegal states unrepresentable”

1. Types, but comfortably

```
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<u32> =
  vec![1, 2, 3]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

integer types are easily inferred (u8, 16, u32, …)

```rust
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<u32> =
  vec![1, 2, 3]
    .iter()
    .map(|v| v + 1)
    .collect::<Vec<u32>>()
```

closure arguments are inferred 99% of the time

```rust
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<u32> =
  vec![1, 2, 3]
    .iter()
    .map(|v| v + 1)
    .collect::<Vec<_>>()
```

elements in collections are inferred 99% of the time

```rust
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<u32> =
  vec![1, 2, 3]
    .iter()
    .map(|v| v + 1)
    .collect()
```

actually, the entire `collect` type and `list` type are redundant

```rust
let list: Vec<u32> =
  vec![1u32, 2u32, 3u32]
    .iter()
    .map(|v: u32| v + 1)
    .collect::<Vec<u32>>()
```

```rust
let list: Vec<_> =
  vec![1, 2, 3]
    .iter()
    .map(|v| v + 1)
    .collect()
```

and the `Vec` element itself is inferred from numbers

Type inference eliminates most noise.

Exceptions: function headers; ambiguity.

```
fn increment_and_dedup(v: Vec<u32>) -> HashSet<u32> {
  v.iter().map(|v| v + 1).collect()
}
```

2. Borrow checker

Ownership and References

```
type Foo = { x: number };

function add(foo: Foo) {
  foo.x += 1;
}
```

```
struct Foo { x: u32 }

fn add(foo: Foo) {
  foo.x += 1;
}
```

error[E0594]: cannot assign to `foo.x`, as `foo` is not declared as mutable

Ownership and References

```
type Foo = { x: number };

function add(foo: Foo) {
  foo.x += 1;
}
```

```
struct Foo { x: u32 }

fn add(foo: &Foo) {
  foo.x += 1;
}
```

error[E0594]: cannot assign to `foo.x`, which is behind a `&` reference

Ownership and References

```
type Foo = { x: number };

function add(foo: Foo) {
  foo.x += 1;
}
```

```
struct Foo { x: &mut u32 }

fn add(foo: mut Foo) {
  foo.x += 1;
}
```

3. Algebraic types

Product types

when you have one thing AND another thing

```
struct Rectangle {
  width: u32,
  height: u32
}
```

Sum types

when you have one thing OR another thing

```
enum Option<T> {
  None,
  Some(T)
}
```

```
enum Result<T, E> {
  Ok(T),
  Err(E)
}
```

3. Zero cost abstractions

The ability to use higher-level features without incurring additional runtime cost.

The trade-off: compile-time complexity

4. Tooling

TODO rust-analyzer screenshot

TODO cargo

TODO build for WASM

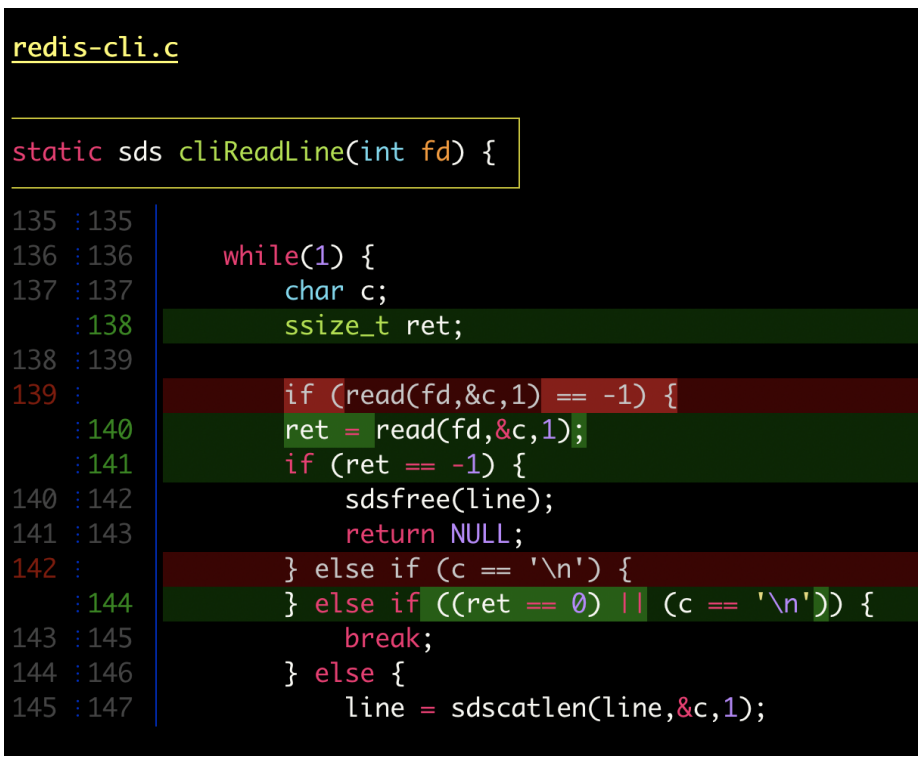
What's "built with Rust"?

just

```
alias b := build

host := `uname -a`

# build main
build:
    cc *.c -o main

# test everything
test-all: build
    ./test --all

# run a specific test
test TEST: build
    ./test --test {{TEST}}
```

```
: just -l                                ~
Available recipes:
    build     # build main
    b         # alias for `build`
    test TEST # run a specific test
    test-all  # test everything
: ▉                                      ~
```

delta


redis-cli.c
static sds cliReadLine(int fd) {
135 135
136 136 while(1) {
137 137 char c;
138 ssize_t ret;
138 139
139 if (read(fd,&c,1) == -1) {
140 ret = read(fd,&c,1);
141 if (ret == -1) {
140 142 sdsfree(line);
141 143 return NULL;
142 } else if (c == '\n') {
144 } else if ((ret == 0) || (c == '\n')) {
143 145 break;
144 146 } else {
145 147 line = sdscatlen(line,&c,1);

Typst

```
#set page(width: 10cm, height: auto)
#set heading(numbering: "1.")

= Fibonacci sequence
The Fibonacci sequence is defined through the
recurrence relation $F_n = F_(n-1) + F_(n-2)$.
It can also be expressed in _closed form:_

$ F_n = round(1 / sqrt(5) phi.alt^n), quad
  phi.alt = (1 + sqrt(5)) / 2 $

#let count = 8
#let nums = range(1, count + 1)
#let fib(n) = (
  if n <= 2 { 1 }
  else { fib(n - 1) + fib(n - 2) }
)

The first #count numbers of the sequence are:

#align(center, table(
  columns: count,
  ..nums.map(n => $F_#n$),
  ..nums.map(n => str(fib(n))),
))
```

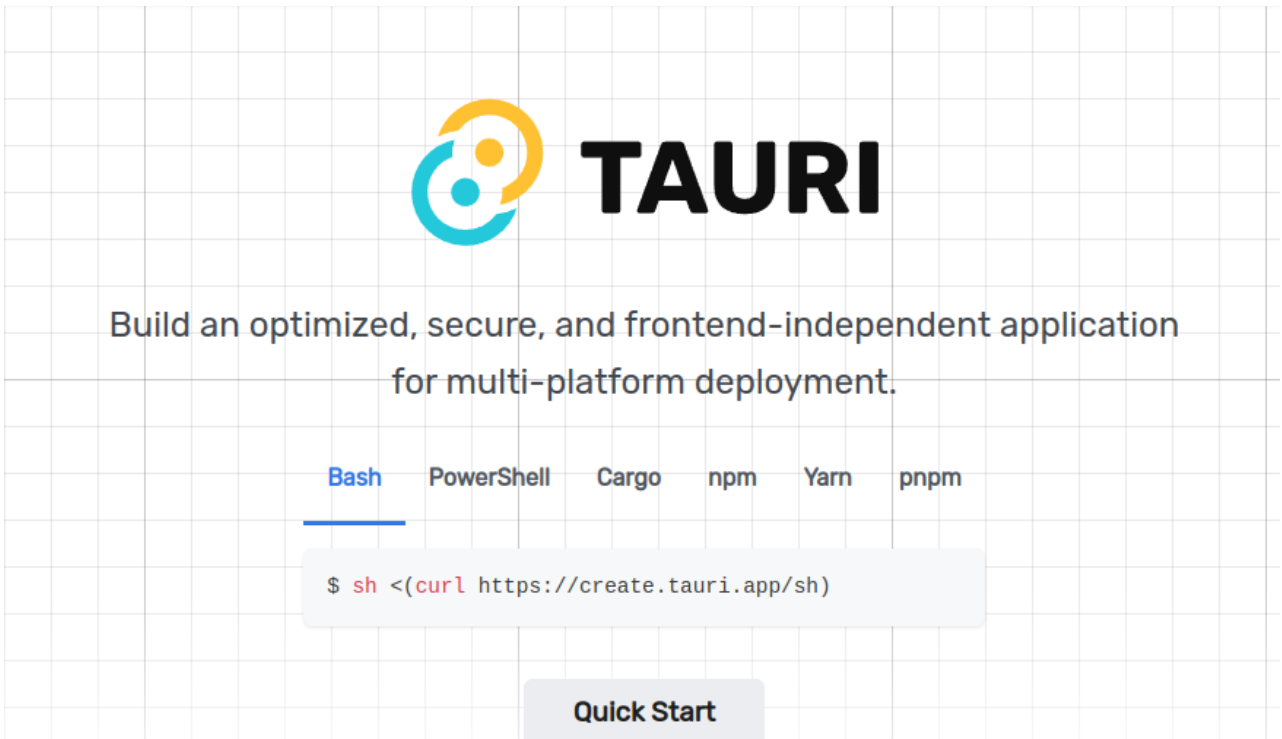
1. Fibonacci sequence

The Fibonacci sequence is defined through the recurrence relation $F_n = F_{n-1} + F_{n-2}$. It can also be expressed in *closed form:*

$$F_n = \left\lfloor \frac{1}{\sqrt{5}} \phi^n \right\rceil, \quad \phi = \frac{1+\sqrt{5}}{2}$$

The first 8 numbers of the sequence are:

F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8
1	1	2	3	5	8	13	21


TAURI
Build an optimized, secure, and frontend-independent application
for multi-platform deployment.
Bash
PowerShell
Cargo
npm
Yarn
pnpm
$ sh <(curl https://create.tauri.app/sh)
Quick Start

Why NOT Rust?

Refactoring is a slog

(Fact Checking)

Closed • 858 total votes

643 Rafactoring in Rust is Easy

215 Refactoring in Rust is Hard

Voting closed 4 days ago

Best-Idiot • 11 days ago

When you change anything, a strong type system tells you what places still need to be fixed to adapt to the change

79 Reply Share ...

Sw429 • 10 days ago

Compare this to something like python, where you won't know that you missed changing something until you get a runtime exception for it, which sometimes might be missed until it's live in production.

31 Reply Share ...

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