Learning systems programming with Rust

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Rust is a great way to learn systems programming

The Rust community is a treasure ♥

contribute without coding

never stop learning
Reasons to ❤️ Rust

- Write fast, safe software
- Security
- Cool PL ideas
Julia comet
Why I love Rust:
- Learning systems programming
- Experiments
- Community
“... empowering for a wide variety of people who might not otherwise consider themselves systems programmers.”
Rust is great for experiments.
Rules of programming experiments

* it doesn’t have to be good
* it doesn’t have to work
* you have to learn something ☺️
the intermediate programmer

What do I learn NEXT?!?!

me, 2013

- web dev
- 6 languages
- 10 years in
- CS degree
definitely not a systems programmer

What is a kernel?

System call?
the Recurse Center
what's a system call?

It's how you tell your OS to do things!

OK!
I want to write an operating system.

Maybe try Rust?

me

Lindsey Kuper
I want to write a keyboard driver

we can help

gcc intrinsics assembly

#rust
you can contribute without coding
julia's blog in 2013

"what is an ELF and how do you run one"

"I tried to write a keyboard driver AND NOW IT DOESN'T CRASH"

"12 things I learned about linkers"
"if it's not documented it might as well not exist"
chief developer advocate, strace

have you heard?
build something great

+ advertise it

advertising something great

(I live here mostly)
how do you learn systems programming?
one evening at julia's

so, what IS concurrency?!
systems primitives for concurrency

threads

futex

atomic
step 1: make something bad

- int counter = 0
- make 1000 threads
- each thread increments 1000 times
$./count
463721
$./count
489217
step 2: mutexes

futex

"wake me up when I can update the counter?"

pthread_mutex_lock

* update *

"I'm done!"
step 3: atomic

lock inc eax

x86 can atomically increment!
exercise: “write a multithreaded program where all the threads increment the same counter! Do it 2 ways!”
Rust makes improbable programs possible
empowering

maybe I can write that program
$ top
100% ruby

why.
I can see what Chrome is doing. (perf top).

Why not Ruby?
goal:

`./ruby-top $PIP

58% start-api-request`
spy on a running Ruby process
0. write a C demo

memory usage

infinity and beyond
julia: I have a C demo
kama: I know Rust!
a process

memory

010010010
0010000
1111001
000

???

struct rb-string-t{
    ptr (4 bytes)
    len (14 bytes)
    as (16 bytes)
}
DWARF
libdwarf
-no idea how it works
-terrible API
-slow
-linker problems
@fitzgen:

@børk it's not done but it might work for you! Tell me if I can help.
- easier to read
- less features
- zero-copy
- friendly maintainers
- I can submit pull requests!
how does DWARF work?

ELF sections

code code data debug debug

a program
WE DID IT

$ sudo ./ruby-stacktrace 433

43% jekyll-build
Rust is frustrating . . .

. . . but it helps me do

awesome things
never stop learning
you can contribute by blogging
make resources for intermediate devs

this is how a database works
don't make it sound harder than it is
Linux Debugging Tools

You'll love...

I know! I'll use tcpdump!

Wizard tool handbook for anyone who writes (or runs!!) programs on Linux computers

By: Julia Evans
the Rust community is a treasure
What's a system call?
many many questions later...

omg I can do systems programming now!
I’m a fan. keep being awesome

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