Should you rewrite in Rust?

talks.edunham.net/lca2018/rust

@qedunham

LinuxConf Australia

January 23, 2018

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Pop Quiz

Should you rewrite in Rust?

@qedunham

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Should you rewrite?

Categorizing Rewrites
Communicating about Code Changes
Rewriting to understand
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Rewriting to understand

Rewriting to deploy

What’s the smallest change that would solve your problem?
Can Rust solve your problem?
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http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Pop Quiz

- Do you know what I’m here to tell you?
Pop Quiz

- Do you know what I’m here to tell you?
- ”Rewrite your code!”
Pop Quiz

- Do you know what I'm here to tell you?
- "Rewrite your code!"
- "Don't rewrite your code!"

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Should you rewrite in Rust?

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- DevOps at Mozilla Research

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➢ Rust, Servo, VR

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► Rust, Servo, VR
► Rust Community Team
► Opinions mine, formed through research
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http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
I assume

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
I assume

- You’re working on some code.

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
I assume

- You’re working on some code.
- People help you with the code.

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
I assume

- You’re working on some code.
- People help you with the code.
- People help the project in non-code ways.
I assume

- You’re working on some code.
- People help you with the code.
- People help the project in non-code ways.
- People use the code.

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Peoples’ **time** and **happiness** are valuable.
Peoples’ **time** and **happiness** are valuable.

- You
Peoples’ **time** and **happiness** are valuable.

- You
- Colleagues
Peoples’ **time** and **happiness** are valuable.

- You
- Colleagues
- Users

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Q & A
What’s a rewrite?

**Rewriting** is starting anew on a problem that you already have code to address. **Refactoring** is modifying code which tries to solve a problem.
Sort rewrites by size

Smaller ____________________________ Larger
Constrained
Few new bugs
Quick

Constrained Green-field
Few new bugs YOLO
Quick Slow

What's the smallest change that would solve your problem?
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Sort rewrites by motive

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http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Sort rewrites by motive

- Learn a tool
Sort rewrites by motive

- Learn a tool
- Understand a task

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Sort rewrites by motive

- Learn a tool
- Understand a task
- Ship production code
Rewriting to Understand

Costs your time:

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Rewriting to Understand

Costs your time:

- Researching
- Writing
Rewriting to Understand

Costs your time:

- Researching
- Writing
- Debugging

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Rewriting to deploy

Costs everyone’s time:

Should you rewrite?

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- Communicating about Code Changes
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- What’s the smallest change that would solve your problem?
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Costs everyone’s time:

► Researching

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Rewriting to deploy

Costs everyone’s time:

- Researching
- Writing
Rewriting to deploy

Costs everyone’s time:

- Researching
- Writing
- Debugging
Rewriting to deploy

Costs everyone’s time:

- Researching
- Writing
- Debugging
- Explaining

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Rewriting to deploy

Costs everyone’s time:
- Researching
- Writing
- Debugging
- Explaining
- Ensuring backwards compatibility
Rewriting to deploy

Costs everyone’s time:

▶ Researching
▶ Writing
▶ Debugging
▶ Explaining
▶ Ensuring backwards compatibility
▶ Tooling and automation

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Rewriting to deploy

Costs everyone’s time:

- Researching
- Writing
- Debugging
- Explaining
- Ensuring backwards compatibility
- Tooling and automation
- Fixing new bugs
Rewriting to deploy

Costs everyone’s time:

- Researching
- Writing
- Debugging
- Explaining
- Ensuring backwards compatibility
- Tooling and automation
- Fixing new bugs
- Learning new system

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Why deploy a rewrite?

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Why deploy a rewrite?

- Improve performance
Why deploy a rewrite?

- Improve performance
- Improve maintainability
Why deploy a rewrite?

- Improve performance
- Improve maintainability
- Increase contributor base

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Identify the problem
Identify the problem

- What does the code do?
Identify the problem

- What does the code do?
- What should it do?
Identify the problem

- What does the code do?
- What should it do?
- What if I don’t change it?
Identify the problem

- What does the code do?
- What should it do?
- What if I don’t change it?
- How would I know if the problem was solved?
Where’s the problem?
Where’s the problem?

- Your definitions of what the system does and should do?
Where’s the problem?

- Your definitions of what the system does and should do?
- Architecture and problem definition?
Where’s the problem?

- Your definitions of what the system does and should do?
- Architecture and problem definition?
- Tooling, libraries, dependencies?

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Where’s the problem?

- Your definitions of what the system does and should do?
- Architecture and problem definition?
- Tooling, libraries, dependencies?
- Code’s logic?
Where’s the problem?

- Your definitions of what the system does and should do?
- Architecture and problem definition?
- Tooling, libraries, dependencies?
- Code’s logic?
- Code’s unintended side effects?

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Who will the change affect?
Who will the change affect?

- You
Who will the change affect?

- You
- Other coders
Who will the change affect?

- You
- Other coders
- Documentation writers

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Who will the change affect?

- You
- Other coders
- Documentation writers
- Marketers

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Who will the change affect?

- You
- Other coders
- Documentation writers
- Marketers
- Users

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Learn from history.

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Learn from history.

- Ask people about the proposed solution!
Learn from history.

- Ask people about the proposed solution!
- Research others’ attempts here!

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Learn from history.

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- Research other projects’ attempts!

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Learn from history.

- Ask people about the proposed solution!
- Research others’ attempts here!
- Research other projects’ attempts!
- Can you get buy-in? Why or why not?

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Experts prefer small changes.
Experts prefer small changes.

- Break big changes into small ones
Experts prefer small changes.

- Break big changes into small ones
- Lowest-cost solution for desired impact

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Experts prefer small changes.

- Break big changes into small ones
- Lowest-cost solution for desired impact
- Minimize wasted effort

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- Break big changes into small ones
- Lowest-cost solution for desired impact
- Minimize wasted effort
- Avoid consequences of needless complexity

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Experts prefer small changes.

- Break big changes into small ones
- Lowest-cost solution for desired impact
- Minimize wasted effort
- Avoid consequences of needless complexity
- Risks compound.

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
"You should go rewrite your code!"

What are you saying?
“You should go rewrite your code!”

What are you saying?

▶ “You should throw out your hard work!”
“You should go rewrite your code!”

What are you saying?

- “You should throw out your hard work!”
- “Your work would be easy to replace!”

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
“You should go rewrite your code!”

What are you saying?

- “You should throw out your hard work!”
- “Your work would be easy to replace!”
- “You don’t understand your own engineering tradeoffs!”

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“You should go rewrite your code!”

What are you saying?

- “You should throw out your hard work!”
- “Your work would be easy to replace!”
- “You don’t understand your own engineering tradeoffs!”
- “I don’t understand the problem you’re trying to solve!”
How not to troll

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How not to troll

▶ “I notice you’re getting a lot of issue reports about...”
How not to troll

▶ “I notice you’re getting a lot of issue reports about...”
▶ “Your code has been tested by a lot of users!”

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
How not to troll

▶ “I notice you’re getting a lot of issue reports about... ”
▶ “Your code has been tested by a lot of users!”
▶ “Would you like a patch which....?”
How not to troll

▶ “I notice you’re getting a lot of issue reports about... ”
▶ “Your code has been tested by a lot of users!”
▶ “Would you like a patch which....?”
▶ “Where can I learn about other times you’ve tried to solve this?”
How not to troll

► “I notice you’re getting a lot of issue reports about... 
► “Your code has been tested by a lot of users!”
► “Would you like a patch which....?”
► “Where can I learn about other times you’ve tried to solve this?”
► Why write code a project doesn’t want?
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- Use a familiar task or tool

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Case studies: Rewriting to understand

- Use a familiar task or tool
- Document what you learn

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- Use a familiar task or tool
- Document what you learn
- Take lessons home

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Case studies: Rewriting to understand

“I know Rust and I wonder if it could make Zopfli compression faster”
github.com/carols10cents/rust-out-your-c-talk
Case studies: Rewriting to understand

“I have some familiar problems and I’d like to practice Rust”
github.com/BartMassey/advent-of-code-2016

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Can your current language solve the problem?

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Can your current language solve the problem?

- You already know it

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http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Can your current language solve the problem?

- You already know it
- Minimal new dependencies
Can your current language solve the problem?

- You already know it
- Minimal new dependencies
- Rewrite to understand, then apply lessons

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Can your current language solve the problem?

- You already know it
- Minimal new dependencies
- Rewrite to understand, then apply lessons
- Extant code describes the problem

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Would a refactor suffice?

It’s slow...

It’s confusing...

People are bored...

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Would a refactor suffice?

It’s slow…

▶ Refactor hot code

It’s confusing…

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Would a refactor suffice?

It’s slow…

- Refactor hot code
- Find a faster implementation

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Would a refactor suffice?

It’s slow...
  ▶ Refactor hot code
  ▶ Find a faster implementation

It’s confusing...
  ▶ Fix your docs

People are bored...
Would a refactor suffice?

It’s slow...

- Refactor hot code
- Find a faster implementation

It’s confusing...

- Fix your docs
- Prune dead code

People are bored...

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It’s slow...

- Refactor hot code
- Find a faster implementation

It’s confusing...

- Fix your docs
- Prune dead code
- Simplify and refactor

People are bored...

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It’s confusing…

- Fix your docs
- Prune dead code
- Simplify and refactor
- Build and document boundary where you would add code

People are bored…

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- Refactor hot code
- Find a faster implementation

It’s confusing…
- Fix your docs
- Prune dead code
- Simplify and refactor
- Build and document boundary where you would add code

People are bored…
- Recognize contributions publicly

Would a refactor suffice?
Would a refactor suffice?

It’s slow…

- Refactor hot code
- Find a faster implementation

It’s confusing…

- Fix your docs
- Prune dead code
- Simplify and refactor
- Build and document boundary where you would add code

People are bored…

- Recognize contributions publicly
- Communicate costs of ill-conceived changes

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It’s slow…

- Refactor hot code
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It’s confusing…

- Fix your docs
- Prune dead code
- Simplify and refactor
- Build and document boundary where you would add code

People are bored…

- Recognize contributions publicly
- Communicate costs of ill-conceived changes
- Gamify issue fixing

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Rust’s goals

- Memory safety
Rust’s goals

- Memory safety
- C-like performance

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Rust’s goals

- Memory safety
- C-like performance
- Minimal runtime
Rust’s goals

- Memory safety
- C-like performance
- Minimal runtime
- Integration with other languages

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Rusty choices

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Rusty choices

- Stable vs Nightly

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Rusty choices

- Stable vs Nightly
- Safe vs Unsafe
Rusty choices

- Stable vs Nightly
- Safe vs Unsafe
- Libraries vs Binaries
Rusty choices

- Stable vs Nightly
- Safe vs Unsafe
- Libraries vs Binaries
- Dynamic vs static linking
Rust tools
Rust tools

- Rustup
Rust tools

- Rustup
- Cargo, crates.io

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Rust tools

- Rustup
- Cargo, crates.io
- Rustfmt
Rust tools

- Rustup
- Cargo, crates.io
- Rustfmt
- Clippy

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Learning Rust?

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Learning Rust?

- doc.rust-lang.org

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- doc.rust-lang.org
- http://community.rs/resources
- 1:40pm Thursday, Rust Programming Techniques, Nick Cameron

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Industry lessons

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Industry lessons

- Isolate a problem

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Industry lessons

- Isolate a problem
- Rewrite to reduce risk
Industry lessons

- Isolate a problem
- Rewrite to reduce risk
- Establish deployment workflow
Industry lessons

- Isolate a problem
- Rewrite to reduce risk
- Establish deployment workflow
- Small, expert team

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- Isolate a problem
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- Incremental rewrite

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Industry lessons

- Isolate a problem
- Rewrite to reduce risk
- Establish deployment workflow
- Small, expert team
- Incremental rewrite
- Educate larger teams later

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Case study: NPM
Case study: NPM

- [github.com/ceejbot/npm-first-rust-service](https://github.com/ceejbot/npm-first-rust-service)
Case study: NPM

- [github.com/ceejbot/npm-first-rust-service](https://github.com/ceejbot/npm-first-rust-service)
- [https://www.youtube.com/watch?v=GCsxYAxw3JQ](https://www.youtube.com/watch?v=GCsxYAxw3JQ)
Case study: NPM

- github.com/ceejbot/npm-first-rust-service
- https://www.youtube.com/watch?v=GCsxYAxw3JQ
- Wrote proxy, replaced microservice with Rust version
Case study: Project Quantum

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Case study: Project Quantum

▶ http://bholley.net/blog/2017/stylo.html
Case study: Project Quantum

▶ [http://bholley.net/blog/2017/stylo.html](http://bholley.net/blog/2017/stylo.html)
▶ [https://blog.rust-lang.org/2017/11/14/Fearless-Concurrency-In-Firefox-Quantum.html](https://blog.rust-lang.org/2017/11/14/Fearless-Concurrency-In-Firefox-Quantum.html)
Case study: Project Quantum

- http://bholley.net/blog/2017/stylo.html
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- [http://bholley.net/blog/2017/stylo.html](http://bholley.net/blog/2017/stylo.html)
- [https://blog.rust-lang.org/2017/11/14/Fearless-Concurrency-In-Firefox-Quantum.html](https://blog.rust-lang.org/2017/11/14/Fearless-Concurrency-In-Firefox-Quantum.html)
- “Rebuilding a jet engine in flight”

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Rewriting vs green field

Should you rewrite in Rust?

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Rewriting vs green field

- Dropbox, Habitat, Coursera, etc

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Rewriting vs green field

- Dropbox, Habitat, Coursera, etc
- Rewriting requires backwards compatibility.

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FFI from Your Language

- Foreign Function Interface
- Call guest language from host language
FFI from Your Language

- Foreign Function Interface
- Call guest language from host language
- github.com/alexcrichton/rust-ffi-examples

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
FFI from Your Language

- Foreign Function Interface
- Call guest language from host language
- github.com/alexcrichton/rust-ffi-examples
FFI from Your Language

- Foreign Function Interface
- Call guest language from host language
- [github.com/alexcrichton/rust-ffi-examples](https://github.com/alexcrichton/rust-ffi-examples)
- `cargo.toml`, `main.rs`, `main.pl`, `Makefile`
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cargo.toml

```toml
[package]
name = "perl-to-rust"
version = "0.1.0"
#modified based on python version
authors = ["Hao Wu <echowuhao@gmail.com>"]

[lib]
name = "double_input"
crate-type = ["dylib"]
```
main.rs

#[no_mangle]
pub extern fn double_input(input: i32) -> i32 {
    input * 2
}

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main.pl

use v5.10;
use FFI::Raw;

my $double_input = FFI::Raw->new(
    "target/debug/libdouble_input.so",
    'double_input',
    FFI::Raw::int,    # return value
    FFI::Raw::int     # arg #1
);

my $input = 4;
my $output = $double_input->call($input);
say $input . " * 2 = " . $output;

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Makefile

ifeq ($(shell uname),Darwin)
    EXT := dylib
else
    EXT := so
endif

all: target/debug/libdouble_input.$(EXT)
    perl src/main.pl

target/debug/libdouble_input.$(EXT): src/lib.rs Cargo.toml
    cargo build

clean:
    rm -rf target

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doc.rust-lang.org/reference/linkage.html
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Static Linking Rust

doctorlang.org/reference/linkage.html

https://doctorlang.org/1.12.1/book/advanced-linking.html#static-linking

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- doc.rust-lang.org/reference/linkage.html
- staticlib crate type
Should you rewrite in Rust?

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Static Linking Rust

doc.rust-lang.org/reference/linkage.html
staticlib crate type

$ rustc --target=x86_64-unknown-linux-musl foo.rs

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**Static Linking Rust**

- [doc.rust-lang.org/reference/linkage.html](doc.rust-lang.org/reference/linkage.html)
- staticlib crate type
- $ rustc --target=x86_64-unknown-linux-musl foo.rs
- Recompile dependencies with musl

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http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Optional Tools

▶ usehelix.com, Ruby
Optional Tools

- usehelix.com, Ruby
- github.com/neon-bindings/neon, Node.js

http://talks.edunham.net/lca2018/should-you-rewrite-in-rust/
Optional Tools

- usehelix.com, Ruby
- github.com/neon-bindings/neon, Node.js
- github.com/rust-lang-nursery/rust-bindgen, C

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Questions

- Your project and mentors
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- Host language docs
Questions

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- Host language docs
- irc.mozilla.org: #rust, #rust-beginners, #rust-community
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- lca@edunham.net

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Stories

- Rewriting code
- Impact of others’ rewrites
- Fun with Rust