ESCAPE 824064

LAPP
Laboratoire d'Annecy de Physique des Particules

Introduction to Rust

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History

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1957

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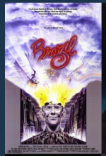

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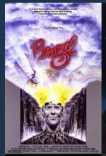

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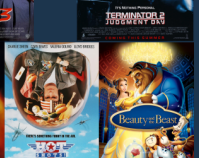

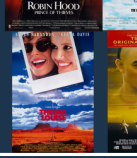

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Rust

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is a **system language** such as

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Cargo

Project builder

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Rust-doc **Doc builder**

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doxygen

```rust
fn main(){
    println!("Hello world !");
}
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```cpp
#include <iostream>
int main(int argc, char** argv){
    std::cout << "Hello world !" << std::endl;
    return 0;
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Project generator :
cargo new --name rusty_example RustyExample
Program Project

A lot of IDEs

Rust is Brilliant

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Trait -> API contract

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or for static usage

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///Generic Implementation of "trait" isSimpleType
template<typename T>
bool isSimpleType(){return false;}
///Specialisation of "trait" isSimpleType for int
template<>
bool isSimpleType<int>(){return true;}
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Can be used with **Gibi**

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- Powerfull **error handling** : **Option<T>**, **Result<T, E>**, **panic!**

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```
size_t val = 0lu;
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let val: u64 = 0;
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```cpp
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```rust
let val: u64 = 0;
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- No default parameter

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    - **error**: **parameter defaults** are not supported

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One main **question** :
Does this **type** implement this **trait** ?

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Overload / Specialization (kind of)

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```rust
use std::{any::TypeId, fmt::Display};

///Try to overload function
/// # Parameters
/// - `value` : value
fn overload_function<T>(value: T)
»       where T: Display + 'static
{
»       if TypeId::of::<i32>() == TypeId::of::<T>() {
»       »       println!("overload_function : this is an i32, value = {}", value);
»       }else{
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fn main() {
»       overload_function(42 as i32);
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```

Rust is Light

Overload / Specialization (kind of)

```rust
use std::{any::TypeId, fmt::Display};

///Try to overload function
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fn overload_function<T>(value: T)
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Specialization for **i32**

Call for **other types**

Rust is nice

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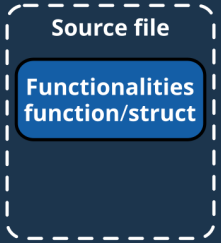

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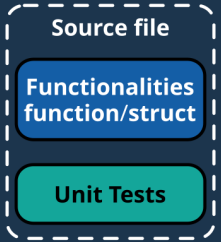

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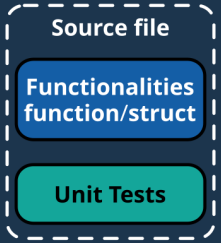

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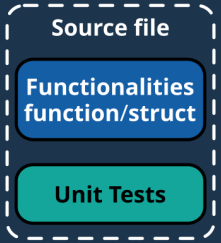

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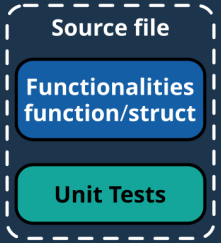

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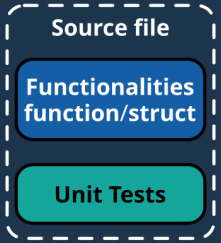

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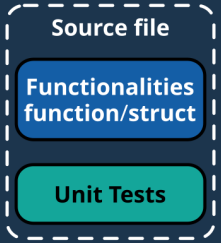

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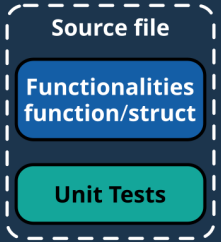

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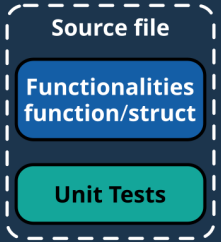

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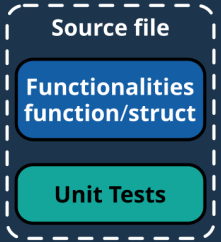

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pixi.lock comes from **Cargo.lock**

Rust is Concise

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Type :
- **char** : **i8**
- **unsigned char** : **u8**
- **short** : **i16**
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- **int** : **i32**
- **unsigned int** : **u32**
- **float** : **f32**
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- **const char * : str**
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- **implementation** : **impl**

Pointer and reference :
- ***** : **Box**
- **Reference** : **&**, **Ref**, **RefMut**, **RefCell**
- **Reference Counter** : **Rc**

Rust is Explicit

Rust is Explicit

Function call

Rust is Explicit

Function call

Rust

```rust
let mut var: u32 = 0;
function_call(&mut var);
```

C++

```cpp
int var = 0;
function_call(var);
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Only **one** possible call :

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pub fn function_call(var: &mut u32);
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var **can be** modified by **function_call**

var **could** remain **const**

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Macro

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macro_rules! create_hello_print {
»       ($function_name:ident, $ty:ty) => {
»       »       fn $function_name(value: $ty){
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}

create_hello_print!(print_u32, u32);
create_hello_print!(print_f32, f32);

fn main() {
»       println!("Hello, world macro!");
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Rust is Explicit

Macro

Macro Declaration (#define of C/C++)

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Macro Parameters are typed !

With very inspired types names :
- **ty** : type
- **tt** : token tree
- **pat** : pattern
- **ident** : identifier (function name, variable name, etc)
- **expr** : expression
- **block** : a block expression
- **path** : a TypePath style path
- etc

Rust is Subtle

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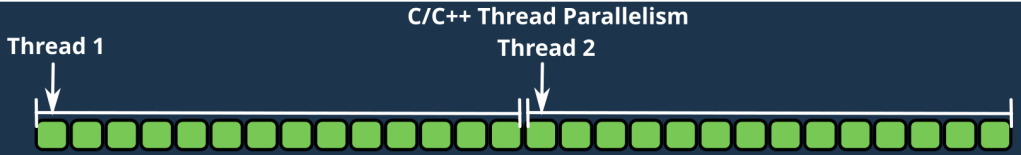
C/C++ Thread Parallelism

Rust is Subtle

C/C++ Thread Parallelism

Rust is Subtle



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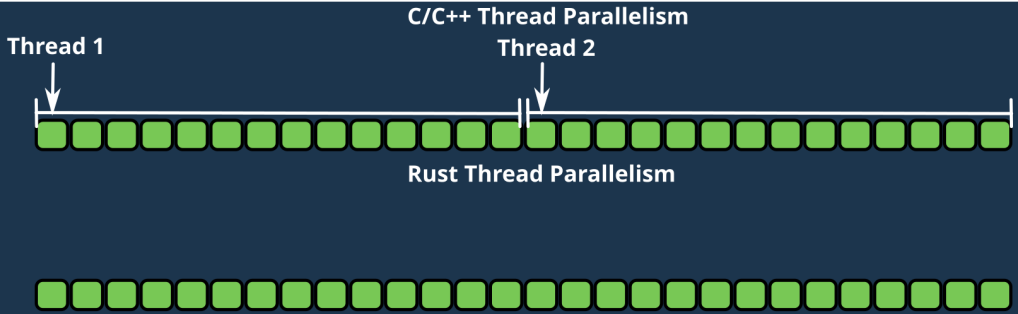

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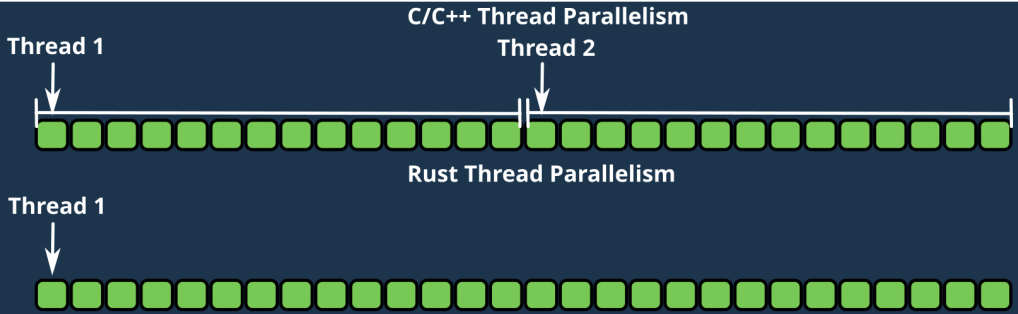

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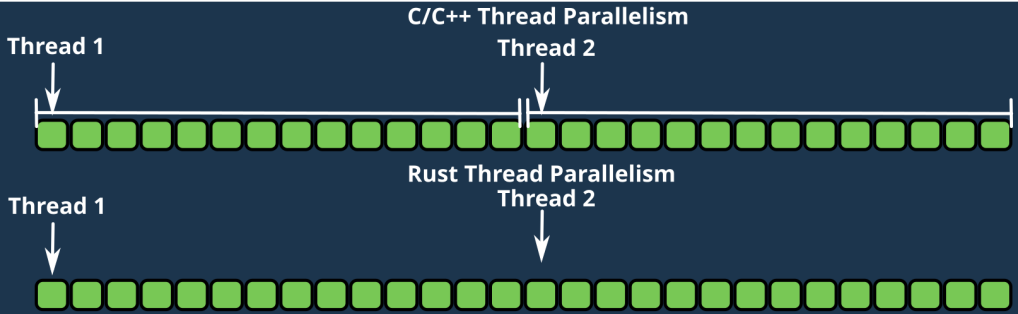

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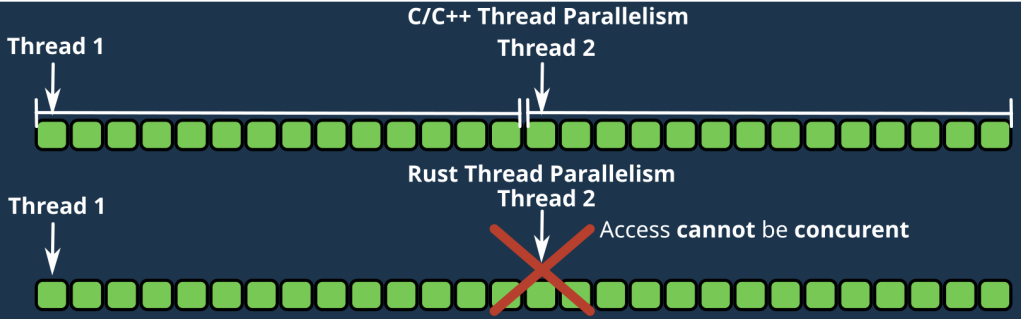

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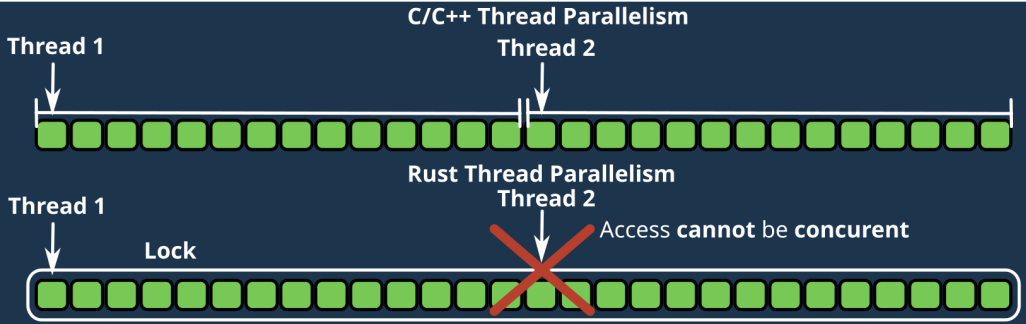

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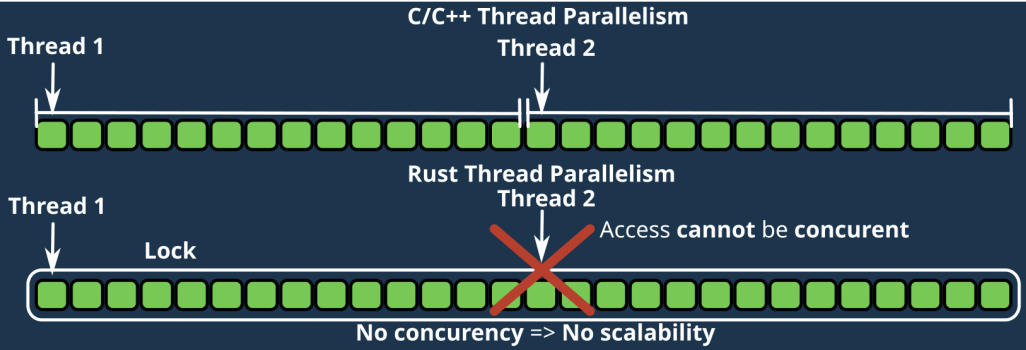

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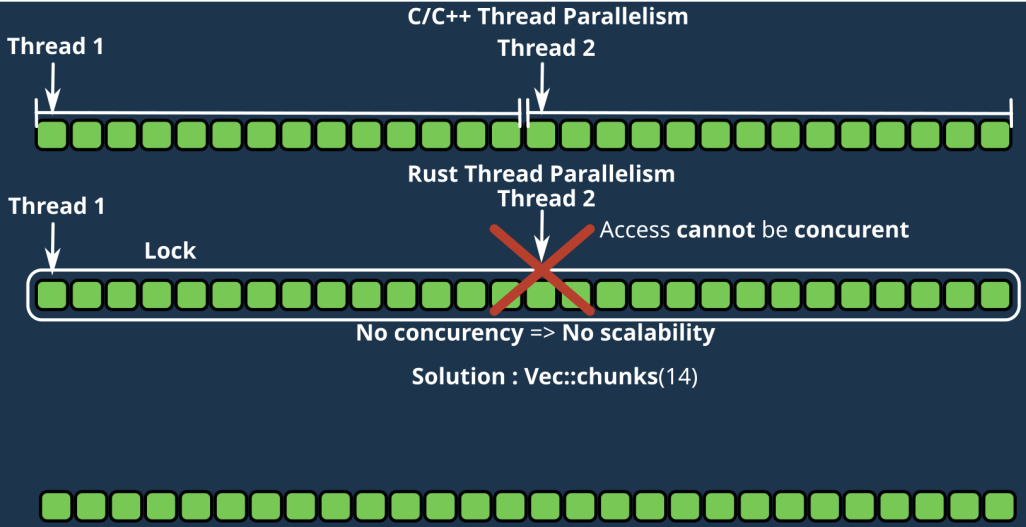

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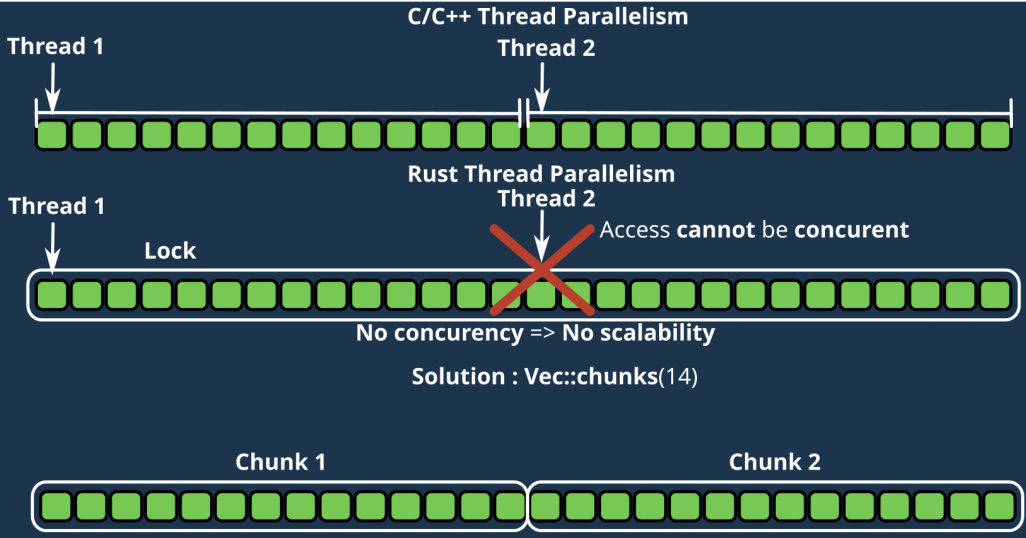

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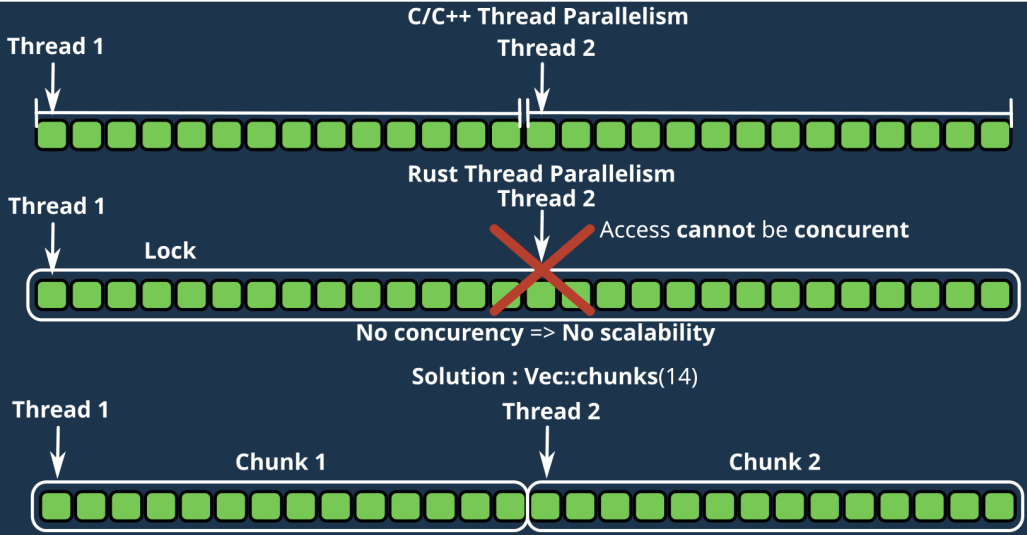

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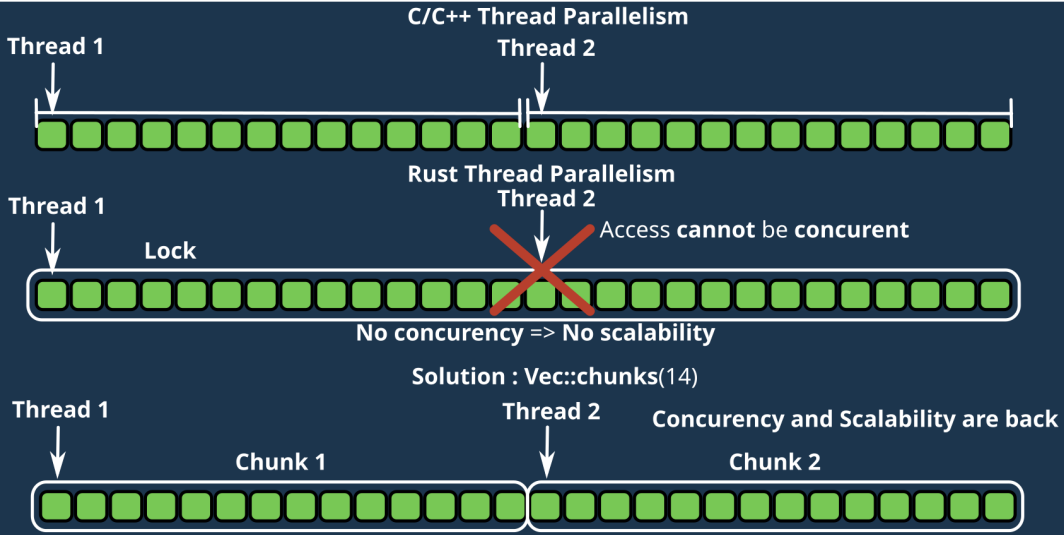

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let vec_a: Vec<i32> = vec![1, 2, 3, 4];
let vec_b: Vec<i32> = vec![10, 20, 30, 40];
for (a, b) in vec_a.iter().zip(vec_b.iter()) {
»       println!("a = {}, b = {}", a, b);
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///Print a Rouxel
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/// - `rouxel` : Rouxel to be printed
fn print_rouxel(rouxel: Rouxel){
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Only for **very specific use** :
- **Complexity quickly increases**
- A **proc-macro cannot** be used in the **crate** which **defines it**
  - So **0% coverage** for this project

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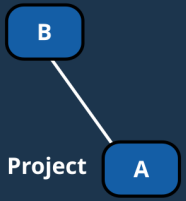

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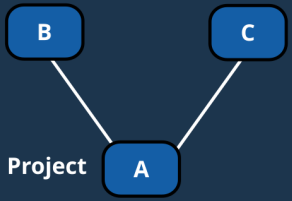

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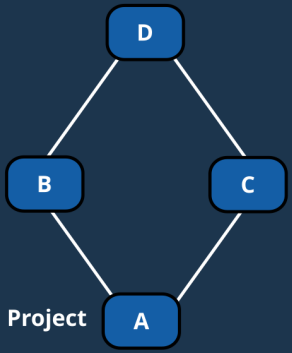

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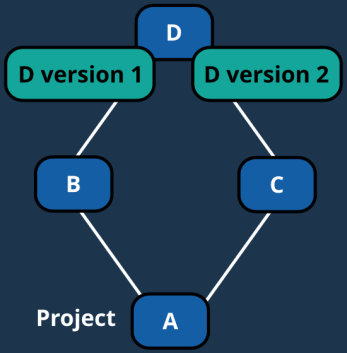

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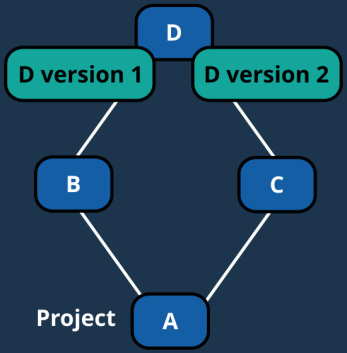

cargo can **mix** different versions of different **crates** to compile

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json, **toml**, **yml**, etc

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- C++ **PhoenixFileGenerator**
  - **DataStream** : binary file/message/size (C++, Rust)
  - **TypeStream** : type names (C++, Rust)
  - **CheckStream** : value check (C++, Rust)
  - **ConfigStream** : config parsing (C++, Rust)

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use clap::Parser;

#[derive(Debug, Parser)]
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struct Shadok {
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C++ PhoenixOptionParser

```cpp
#include "OptionParser.h"
OptionParser createOptionParser(){
    OptionParser parser(true, "1.0.0");
    parser.setExampleLongOption("program --name \"shadoko\" --age 42");
    parser.setExampleShortOption("program -n \"shadoko\" -a 42");
    parser.addOption("name", "n", OptionType::STRING, true, false, "Name of the Shadok");
    size_t age(42lu);
    parser.addOption("age", "a", age, "Age of the Shadok");
    return parser;
}
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Laboratoire d'Annecy de Physique des Particules

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Python ArgParse

```python
parser = argparse.ArgumentParser(description="Program description")
parser.add_argument("--name", "-n", action="store",
        type=str, help="Name of the shadok", required=True)
parser.add_argument("--age", "-a", action="store",
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Cargo's convention :
- sources are in **src** dir
  - main is in **main.rs**
  - library is in **libs.rs**
- unit tests are in **tests** dir

If you **do not respect cargo**'s convention, **nothing will work**

Rust is Meh

The **most anoying** compiler ever !

Conventions are rules :
- Namming Convention :
  - Variables / Parameters / Functions / Methods / Source Files / Directories : **snake_case**
  - Structs / Enums / Traits : **CamelCase**
  - Constants : **RIHNO_CASE**

Technically you can change convention but you will have **1000s of warnings** !

Cargo's convention :
- sources are in **src** dir
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mod keyword -> **cmake add_subdirectory**

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Mix of **build instructions inside sources**

Rust is Meh

The **return** keyword **is not** mandatory

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```
fn function() -> u32{
»       42
}
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Rust is Meh

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fn function() -> u32{
»       return 42;
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Nice, because you cannot search anymore for a **return** keyword, but for a missing **;** because of matlab !!!

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Very confusing on complex functions

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No Header

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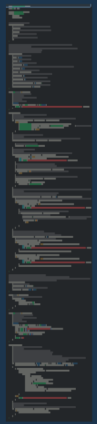
Need to **dive into** a **full source file** to get **exposed structs/traits** and **functions**



Rust is Meh

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=> **Solved** with a **good IDE**

Rust is NOT C++

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int var = 0;
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Variables

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Rust is NOT C++

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Avoid a lot of mistakes

Rust is Pretentious

People present **rust-doc** as a better tool that **doxygen** but :

- doc

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  - you are **forced** to **handle correctly the returned types**
  - a lot of developpers use **'?'** to foreward the error handling to the caller function
    - **lazy** but very **usefull** in **I/O implementation**

Rust is a Liar

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- **Rust** is **safe** :

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  But a lot of **crates** are **wrappers of C**, **C++** or **js libraries** because nobody wants to develop them again

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- **Cargo** eases packages **sharing** :

  - But some **projects** already have **way to much dependencies** : **191** for **cargo-tarpaulin** (for coverage)
    - To much foreign dependencies -> **big technical dept**
    - And **very long compilation time**

Rust is Horrible

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- **Coverage report** is **ugly**

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Error stack

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Error stack

Ugly **RUST_BACKTRACE=1** to get error stack

```
pierre@pierre-Precision-7670:~/projects/PHOENIX2/RustyPhoenixGenerator$ RUST_BACKTRACE=1 ./target/debug/rusty_phoenix_generator -i tests/generator.toml -o generated

thread 'main' (96637) panicked at src/main.rs:33:21:
rusty_phoenix_generator: crate creation error : No such file or directory (os error 2)
stack backtrace:
   0: __rustc::rust_begin_unwind
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
   1: core::panicking::panic_fmt
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
   2: rusty_phoenix_generator::main
             at ./src/main.rs:33:15
   3: core::ops::function::FnOnce::call_once
             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
note: Some details are omitted, run with `RUST_BACKTRACE=full` for a verbose backtrace.
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   2: rusty_phoenix_generator::main
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   3: core::ops::function::FnOnce::call_once
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stack backtrace:
   0: __rustc::rust_begin_unwind
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
   1: core::panicking::panic_fmt
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
   2: rusty_phoenix_generator::main
             at ./src/main.rs:33:15
   3: core::ops::function::FnOnce::call_once
             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
note: Some details are omitted, run with `RUST_BACKTRACE=full` for a verbose backtrace.
```

OK but which path ???!!!!

Rust is Horrible

Error stack

Ugly **RUST_BACKTRACE=1** to get error stack

```
pierre@pierre-Precision-7670:~/projects/PHOENIX2/RustyPhoenixGenerator$ RUST_BACKTRACE=1 ./target/debug/rusty_phoenix_generator -i tests/generator.toml -o generated

thread 'main' (96637) panicked at src/main.rs:33:21:
rusty_phoenix_generator: crate creation error "No such file or directory (os error 2)"
stack backtrace:
   0: __rustc::rust_begin_unwind
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
   1: core::panicking::panic_fmt
             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
   2: rusty_phoenix_generator::main
             at ./src/main.rs:33:15
   3: core::ops::function::FnOnce::call_once
             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
note: Some details are omitted, run with `RUST_BACKTRACE=full` for a verbose backtrace.
```

OK but which path ???!!!!

Rust is Horrible

```
pierre@pierre-Precision-7670

thread 'main' (96637) panick
rusty_phoenix_generator: cra
stack backtrace:
   0: __rustc::rust_begin_un
             at /rustc/ed61e
   1: core::panicking::panic
             at /rustc/ed61e
   2: rusty_phoenix_generato
             at ./src/main.r
   3: core::ops::function::F
             at /home/pierre
note: Some details are omitt
```

```
   8:     0x57a55a5700f2 - std::sys::backtrace::BacktraceLock::print::hf67a46baa62198e0
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:42:9
   9:     0x57a55a571f5c - std::panicking::default_hook::{{closure}}::h391aa815d5e47ec8
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:301:27
  10:     0x57a55a571db6 - std::panicking::default_hook::hd6fdcf2489bb807d
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:328:9
  11:     0x57a55a5725e5 - std::panicking::panic_with_hook::h185ddfb86bf14d73
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:834:13
  12:     0x57a55a57247a - std::panicking::panic_handler::{{closure}}::had89ddd01b6112c9
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:707:13
  13:     0x57a55a570229 - std::sys::backtrace::__rust_end_short_backtrace::h5d0fc36eef7265ea
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:174:18
  14:     0x57a55a55dc2d - __rustc[eb8946e36839644a]::rust_begin_unwind
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
  15:     0x57a55a5a7880 - core::panicking::panic_fmt::h92c8e5abe71dd8d1
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
  16:     0x57a55a4b5417 - rusty_phoenix_generator::main::hd164d4b9c84e7c94
                               at /home/pierre/projects/PHOENIX2/RustyPhoenixGenerator/src/main.rs:33:15
  17:     0x57a55a4bbae3 - core::ops::function::FnOnce::call_once::h39f21887f05d4088
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
  18:     0x57a55a4bbae3 - std::sys::backtrace::__rust_begin_short_backtrace::h277653590cab7736
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/sys/backtrace.rs:158:18
  19:     0x57a55a4bb4d9 - std::rt::lang_start::{{closure}}::h9d12810b45177177
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/rt.rs:206:18
  20:     0x57a55a56b730 - core::ops::function::impls::<impl core::ops::function::FnOnce<A> for &F>::call_once::h6bd8af1873a4fcba
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/ops/function.rs:287:21
  21:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h8502df911ab1d854
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
  22:     0x57a55a56b730 - std::panicking::catch_unwind::hf8590bd54a09e620
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
  23:     0x57a55a56b730 - std::panic::catch_unwind::hef0d4e02e13f8ea6
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
  24:     0x57a55a56b730 - std::rt::lang_start_internal::{{closure}}::h813a94d4aa317bce
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:175:24
  25:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h0a1ac6ae8aee102d
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
  26:     0x57a55a56b730 - std::panicking::catch_unwind::hddd02d0cb4cfa799
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
  27:     0x57a55a56b730 - std::panic::catch_unwind::hbe5a97997afb140b
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
  28:     0x57a55a56b730 - std::rt::lang_start_internal::h6ba36b077a531782
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:171:5
  29:     0x57a55a4b647c - main
  30:     0x714030e2a1ca - __libc_start_call_main
                               at ./csu/../sysdeps/nptl/libc_start_call_main.h:58:16
  31:     0x714030e2a28b - __libc_start_main_impl
                               at ./csu/../csu/libc-start.c:360:3
  32:     0x57a55a4ac6ce - _start
  33:                0x0 - <unknown>
```

```
/generator.toml -o generated
```

!!

Rust is Horrible

```
pierre@pierre-Precision-7670

thread 'main' (96637) panick
rusty_phoenix_generator: cra
stack backtrace:
   0: __rustc::rust_begin_un
             at /rustc/ed61e
   1: core::panicking::panic
             at /rustc/ed61e
   2: rusty_phoenix_generato
             at ./src/main.r
   3: core::ops::function::F
             at /home/pierre
note: Some details are omitt
```

```
 8:     0x57a55a5700f2 - std::sys::backtrace::BacktraceLock::print::hf67a46baa62198e
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:42:9
 9:     0x57a55a571f5c - std::panicking::default_hook::{{closure}}::h391aa815d5e47ec8
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:301:27
10:     0x57a55a571db6 - std::panicking::default_hook::hd6fdcf2489bb807d
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:328:9
11:     0x57a55a5725e5 - std::panicking::panic_with_hook::h185ddfb86bf14d73
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:834:13
12:     0x57a55a57247a - std::panicking::panic_handler::{{closure}}::had89ddd01b6112c9
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:707:13
13:     0x57a55a570229 - std::sys::backtrace::__rust_end_short_backtrace::h5d0fc36eef7265ea
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:174:18
14:     0x57a55a55dc2d - __rustc[eb8946e36839644a]::rust_begin_unwind
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
15:     0x57a55a5a7880 - core::panicking::panic_fmt::h92c8e5abe71dd8d1
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
16:     0x57a55a4b5417 - rusty_phoenix_generator::main::hd164d4b9c84e7c94
                           at /home/pierre/projects/PHOENIX2/RustyPhoenixGenerator/src/main.rs:33:15
17:     0x57a55a4bbae3 - core::ops::function::FnOnce::call_once::h39f21887f05d4088
                           at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
18:     0x57a55a4bbae3 - std::sys::backtrace::__rust_begin_short_backtrace::h277653590cab7736
                           at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/sys/backtrace.rs:158:18
19:     0x57a55a4bb4d9 - std::rt::lang_start::{{closure}}::h9d12810b45177177
                           at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/rt.rs:206:18
20:     0x57a55a56b730 - core::ops::function::impls::<impl core::ops::function::FnOnce<A> for &F>::call_once::h6bd8af1873a4fcba
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/ops/function.rs:287:21
21:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h8502df911ab1d854
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
22:     0x57a55a56b730 - std::panicking::catch_unwind::hf8590bd54a09e620
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
23:     0x57a55a56b730 - std::panic::catch_unwind::hef0d4e02e13f8ea6
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
24:     0x57a55a56b730 - std::rt::lang_start_internal::{{closure}}::h813a94d4aa317bce
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:175:24
25:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h0a1ac6ae8aee102d
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
26:     0x57a55a56b730 - std::panicking::catch_unwind::hddd02d0cb4cfa799
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
27:     0x57a55a56b730 - std::panic::catch_unwind::hbe5a97997afb140b
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
28:     0x57a55a56b730 - std::rt::lang_start_internal::h6ba36b077a531782
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:171:5
29:     0x57a55a4b647c - main
30:     0x714030e2a1ca - __libc_start_call_main
                           at ./csu/../sysdeps/nptl/libc_start_call_main.h:58:16
31:     0x714030e2a28b - __libc_start_main_impl
                           at ./csu/../csu/libc-start.c:360:3
32:     0x57a55a4ac6ce - _start
33:                0x0 - <unknown>
```

Not your Buisness

/generator.toml -o generated

!!

Rust is Horrible

Background terminal (partly covered):

```
pierre@pierre-Precision-7670                                   /generator.toml -o generated

thread 'main' (96637) panick
rusty_phoenix_generator: cra
stack backtrace:
   0: __rustc::rust_begin_un
             at /rustc/ed61e
   1: core::panicking::panic
             at /rustc/ed61e
   2: rusty_phoenix_generato
             at ./src/main.r
   3: core::ops::function::F
             at /home/pierre
note: Some details are omitt
```

Full backtrace:

```
 8:     0x57a55a5700f2 - std::sys::backtrace::BacktraceLock::print::hf67a46baa621998e
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:42:9
 9:     0x57a55a571f5c - std::panicking::default_hook::{{closure}}::h391aa815d5e47ec8
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:301:27
10:     0x57a55a571db6 - std::panicking::default_hook::hd6fdcf2489bb807d
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:328:9
11:     0x57a55a5725e5 - std::panicking::panic_with_hook::h185ddfb86bf14d73
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:834:13
12:     0x57a55a57247a - std::panicking::panic_handler::{{closure}}::had89ddd01b6112c9
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:707:13
13:     0x57a55a570229 - std::sys::backtrace::__rust_end_short_backtrace::h5d0fc36eef7265ea
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:174:18
14:     0x57a55a55dc2d - __rustc[eb8946e36839644a]::rust_begin_unwind
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
15:     0x57a55a5a7880 - core::panicking::panic_fmt::h92c8e5abe71dd8d1
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
16:     0x57a55a4b5417 - rusty_phoenix_generator::main::hd164d4b9c84e7c94
                             at /home/pierre/projects/PHOENIX2/RustyPhoenixGenerator/src/main.rs:33:15
17:     0x57a55a4bbae3 - core::ops::function::FnOnce::call_once::h39f21887f05d4088
                             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
18:     0x57a55a4bbae3 - std::sys::backtrace::__rust_begin_short_backtrace::h277653590cab7736
                             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/sys/backtrace.rs:158:18
19:     0x57a55a4bb4d9 - std::rt::lang_start::{{closure}}::h9d12810b45177177
                             at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/rt.rs:206:18
20:     0x57a55a56b730 - core::ops::function::impls::<impl core::ops::function::FnOnce<A> for &F>::call_once::h6bd8af1873a4fcba
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/ops/function.rs:287:21
21:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h8502df911ab1d854
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
22:     0x57a55a56b730 - std::panicking::catch_unwind::hf8590bd54a09e620
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
23:     0x57a55a56b730 - std::panic::catch_unwind::hef0d4e02e13f8ea6
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
24:     0x57a55a56b730 - std::rt::lang_start_internal::{{closure}}::h013a94d4ae317bce
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:175:24
25:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h0a1ac6ae8aee102d
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
26:     0x57a55a56b730 - std::panicking::catch_unwind::hddd02d0cb4cfa799
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
27:     0x57a55a56b730 - std::panic::catch_unwind::hbe5a97997afb148b
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
28:     0x57a55a56b730 - std::rt::lang_start_internal::h6ba36b077a531782
                             at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:171:5
29:     0x57a55a4b647c - main
30:     0x714030e2a1ca - __libc_start_call_main
                             at ./csu/../sysdeps/nptl/libc_start_call_main.h:58:16
31:     0x714030e2a28b - __libc_start_main_impl
                             at ./csu/../csu/libc-start.c:360:3
32:     0x57a55a4ac6ce - _start
33:                0x0 - <unknown>
```

Not your Buisness (frames 8–15)

!! (frame 16)

Not your Buisness (frames 17–33)

Rust is Horrible

```
pierre@pierre-Precision-7670

thread 'main' (96637) panick
rusty_phoenix_generator: cra
stack backtrace:
   0: __rustc::rust_begin_un
             at /rustc/ed61e
   1: core::panicking::panic
             at /rustc/ed61e
   2: rusty_phoenix_generato
             at ./src/main.r
   3: core::ops::function::F
             at /home/pierre
note: Some details are omitt
```

```
   8:     0x57a55a5700f2 - std::sys::backtrace::BacktraceLock::print::hf67a46baa62198e0
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:42:9
   9:     0x57a55a571f5c - std::panicking::default_hook::{{closure}}::h391aa815d5e47ec8
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:301:27
  10:     0x57a55a571db6 - std::panicking::default_hook::hd6fdcf2489bb807d
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:328:9
  11:     0x57a55a5725e5 - std::panicking::panic_with_hook::h185ddfb86bf14d73
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:834:13
  12:     0x57a55a57247a - std::panicking::panic_handler::{{closure}}::had89ddd01b6112c9
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:707:13
  13:     0x57a55a570229 - std::sys::backtrace::__rust_end_short_backtrace::h5d0fc36eef7265ea
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:174:18
  14:     0x57a55a55dc2d - __rustc[eb8946e36839644a]::rust_begin_unwind
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
  15:     0x57a55a5a7880 - core::panicking::panic_fmt::h92c8e5abe71dd8d1
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/panicking.rs:75:14
  16:     0x57a55a4b5417 - rusty_phoenix_generator::main::hd164dd9c84e7c94
                               at /home/pierre/projects/PHOENIX2/RustyPhoenixGenerator/src/main.rs:33:15
  17:     0x57a55a4bbae3 - core::ops::function::FnOnce::call_once::h39f21887f05d4088
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/core/src/ops/function.rs:250:5
  18:     0x57a55a4bbae3 - std::sys::backtrace::__rust_begin_short_backtrace::h277653590cab7736
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/sys/backtrace.rs:158:18
  19:     0x57a55a4bb4d9 - std::rt::lang_start::{{closure}}::h9d128104b45177177
                               at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/rt.rs:206:18
  20:     0x57a55a56b730 - core::ops::function::impls::<impl core::ops::function::FnOnce<A> for &F>::call_once::h6bd8af1873a4fcba
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/ops/function.rs:287:21
  21:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h8502df911ab1d854
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
  22:     0x57a55a56b730 - std::panicking::catch_unwind::hf8590bd54a09e620
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
  23:     0x57a55a56b730 - std::panic::catch_unwind::hef0d4e02e13f8ea6
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
  24:     0x57a55a56b730 - std::rt::lang_start_internal::{{closure}}::h813a94d4aa317bce
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:175:24
  25:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h0a1ac6ae8aee102d
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:590:40
  26:     0x57a55a56b730 - std::panicking::catch_unwind::hddd02d0cb4cfa799
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:553:19
  27:     0x57a55a56b730 - std::panic::catch_unwind::hbe5a97997afb148b
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panic.rs:359:14
  28:     0x57a55a56b730 - std::rt::lang_start_internal::h6ba36b077a531782
                               at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/rt.rs:171:5
  29:     0x57a55a4b6647c - main
  30:     0x714030e2a1ca - __libc_start_call_main
                               at ./csu/../sysdeps/nptl/libc_start_call_main.h:58:16
  31:     0x714030e2a28b - __libc_start_main_impl
                               at ./csu/../csu/libc-start.c:360:3
  32:     0x57a55a4ac6ce - _start
  33:                0x0 - <unknown>
```

/generator.toml -o generated

Not your Buisness

!!

Your buisness

Not your Buisness

Rust is Horrible

```
pierre@pierre-Precision-7670

thread 'main' (96637) panick
rusty_phoenix_generator: cra
stack backtrace:
   0: __rustc::rust_begin_un
             at /rustc/ed61e
   1: core::panicking::panic
             at /rustc/ed61e
   2: rusty_phoenix_generato
             at ./src/main.r
   3: core::ops::function::F
             at /home/pierre
note: Some details are omitt
```

```
 8:     0x57a55a5700f2 - std::sys::backtrace::BacktraceLock::print::hf67a46baa62198e0
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:42:9
 9:     0x57a55a571f5c - std::panicking::default_hook::{{closure}}::h391aa815d5e47ec8
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:301:27
10:     0x57a55a571db6 - std::panicking::default_hook::hd6fdcf2489bb807d
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:328:9
11:     0x57a55a5725e5 - std::panicking::panic_with_hook::h185ddfb86bf14d73
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:834:13
12:     0x57a55a57247a - std::panicking::panic_handler::{{closure}}::had89ddd01b6112c9
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:707:13
13:     0x57a55a570229 - std::sys::backtrace::__rust_end_short_backtrace::h5d0fc36eef7265ea
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/sys/backtrace.rs:174:18
14:     0x57a55a55dc2d - __rustc[eb8946e36839644a]::rust_begin_unwind
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/std/src/panicking.rs:698:5
15:     0x57a55a5a7880 - core::panicking::panic_fmt::h92c8e5abe71dd8d1
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19:     0x57a55a4bb4d9 - std::rt::lang_start::{{closure}}::h9d128104b4577177
                           at /home/pierre/projects/RUST/PixiRust/.pixi/envs/default/lib/rustlib/src/rust/library/std/src/rt.rs:206:18
20:     0x57a55a56b730 - core::ops::function::impls::<impl core::ops::function::FnOnce<A> for &F>::call_once::h6bd8af1873a4fcba
                           at /rustc/ed61e7d7e242494fb7057f2657300d9e77bb4fcb/library/core/src/ops/function.rs:287:21
21:     0x57a55a56b730 - std::panicking::catch_unwind::do_call::h8502df911ab1d854
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33:                0x0 - <unknown>
```

/generator.toml -o generated

Not your Buisness

!!

Your buisness

Not your Buisness

Not reversed Stack as Python but **still confusing** enough

Rust redefines Stupidity

Rust redefines Stupidity

```
let mut var = 0;
let res = function();
```

Rust redefines Stupidity

i32 or **i16** maybe

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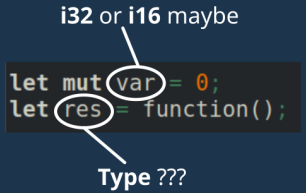

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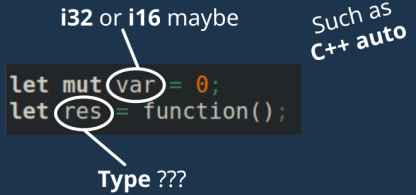

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Such as
C++ auto

By the way

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By the way

```
fn function() -> Shadok{
    Shadok{
        name: String::from("Shadoko"),
        age: 42
    }
}
```

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Using **Variable**

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let mut var = 0;
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As we saw before **Rust is explicit**

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```

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Using **Variable**

```
let mut var = 0;
function(&mut var);
```

As we saw before **Rust is explicit**

Using **Parameter**

```
fn function(var: &mut u32){
    other_function(var);
}
```

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Type ???

Such as **C++ auto**

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But **not** in **this** case ??!!

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Using **Parameter**

```
fn function(var: &mut u32){
    other_function(var);
}
```

But **not** in **this** case ??!!

Does **other_function modifies var** or not ?

Rust redefines Stupidity

The hilarious example of the **NUMA nodes**

Rust redefines Stupidity

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Rust forces to **initialise variables**

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Globaly a **good point** to **prevent mistakes**

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NUMA Node 1

NUMA Node 2

Rust redefines Stupidity

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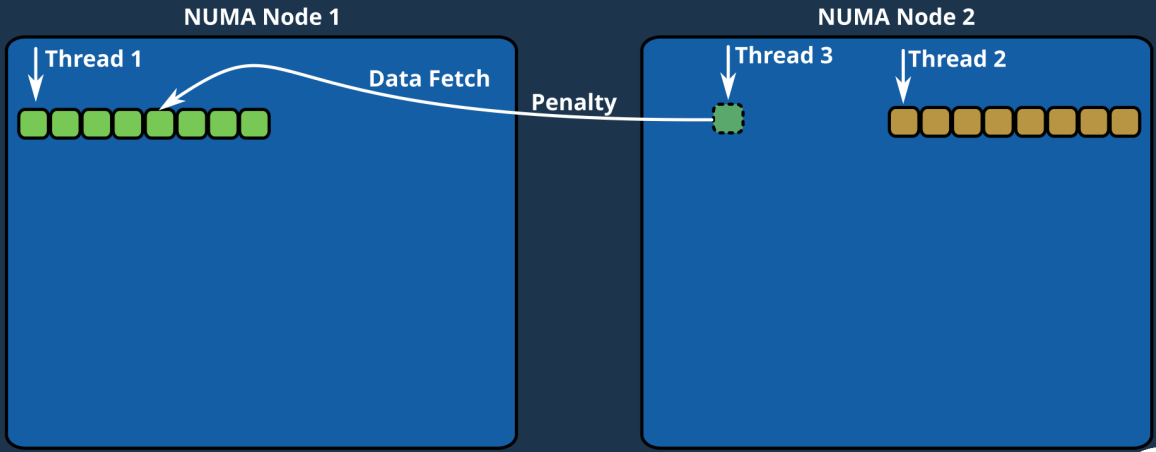

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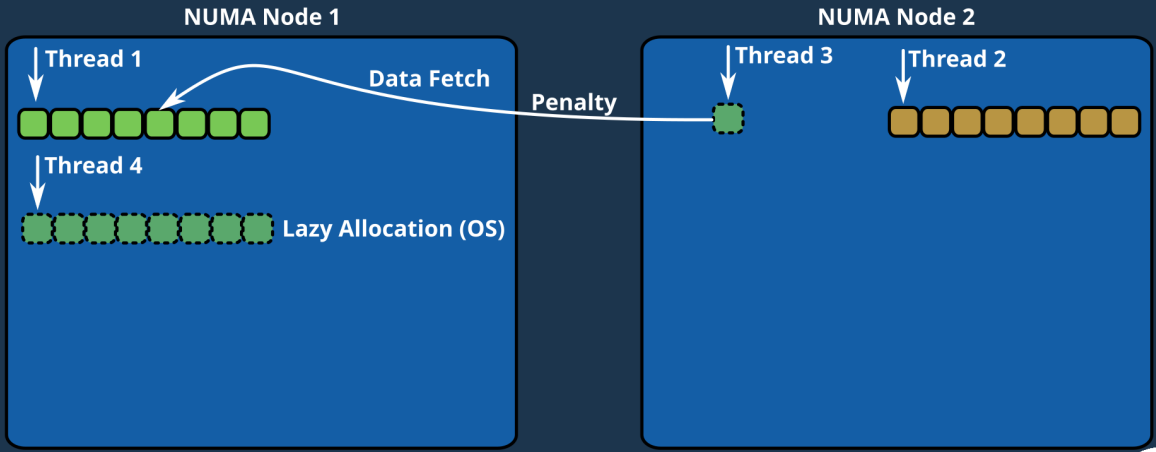

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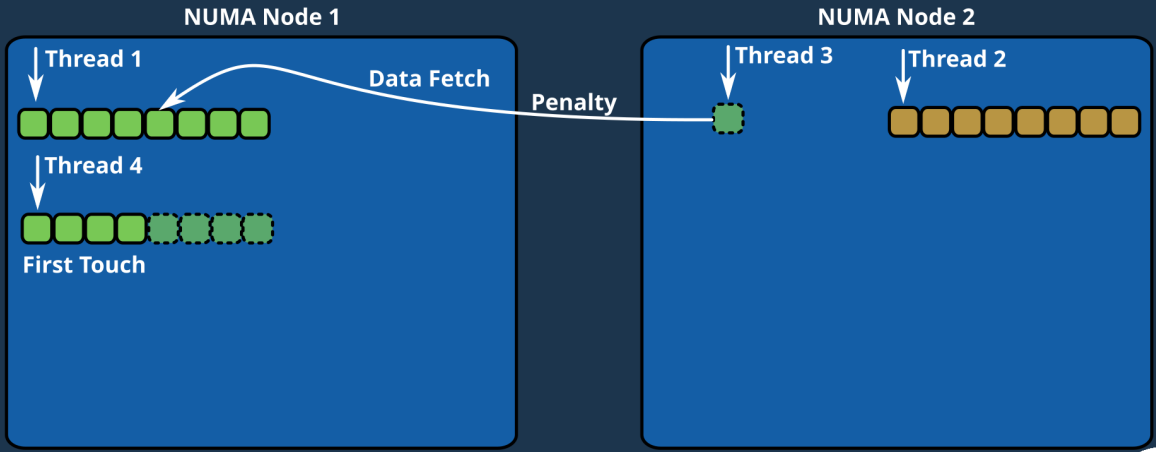

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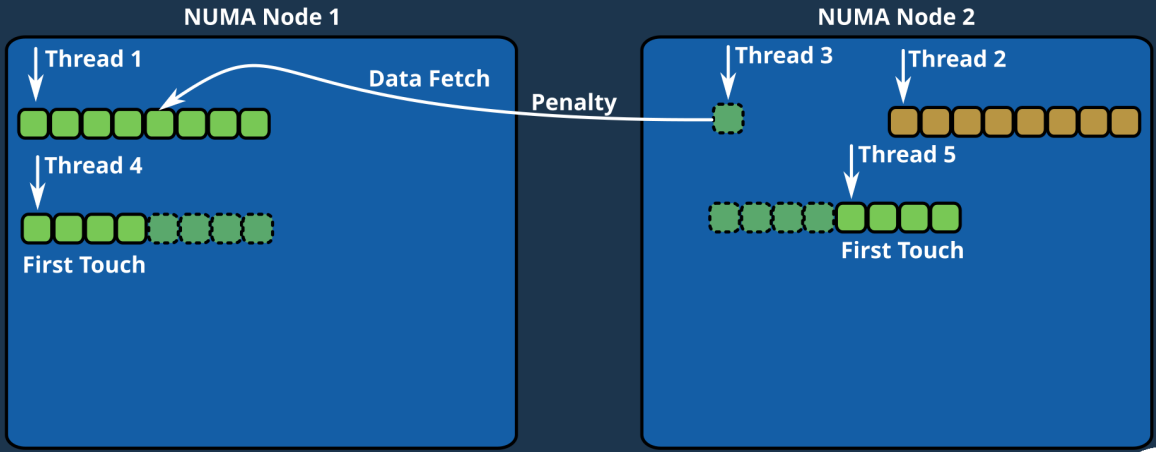

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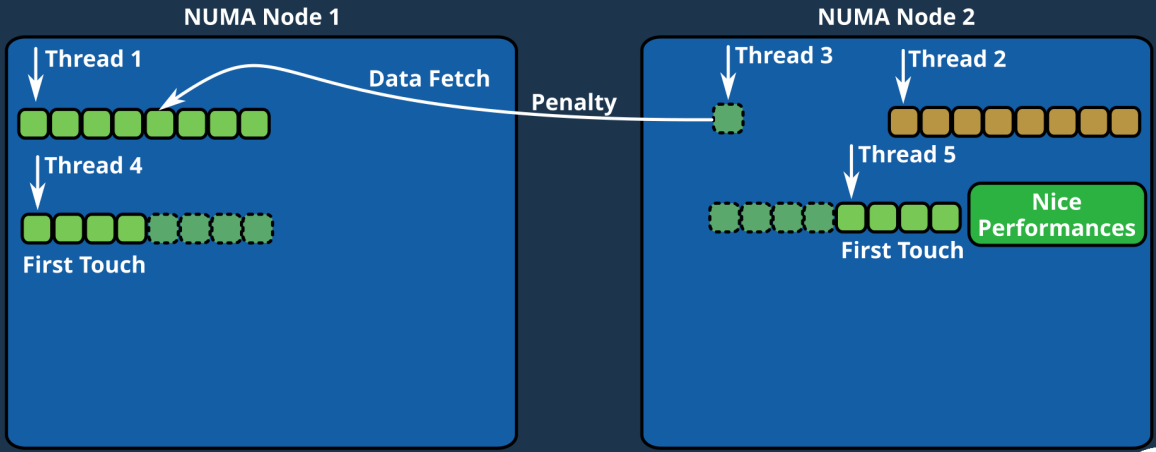

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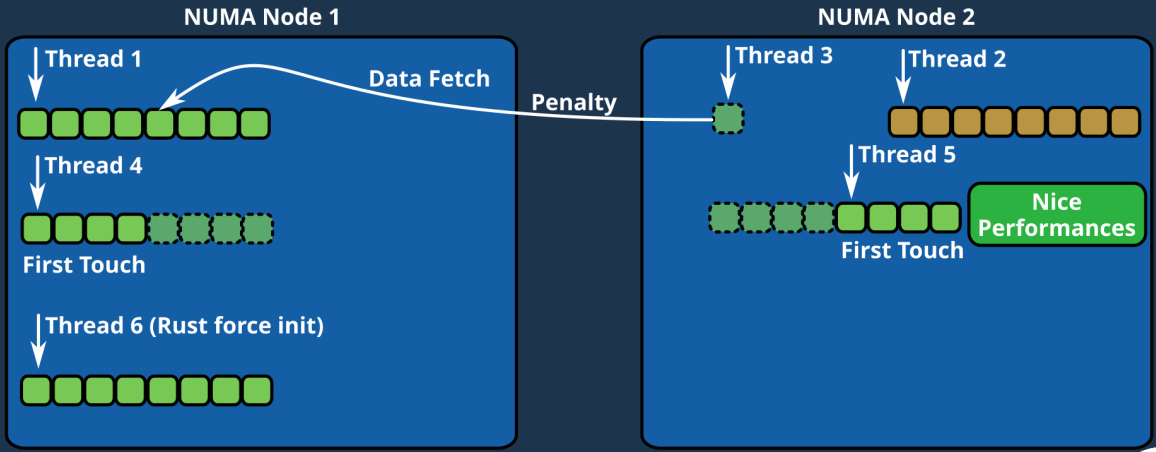

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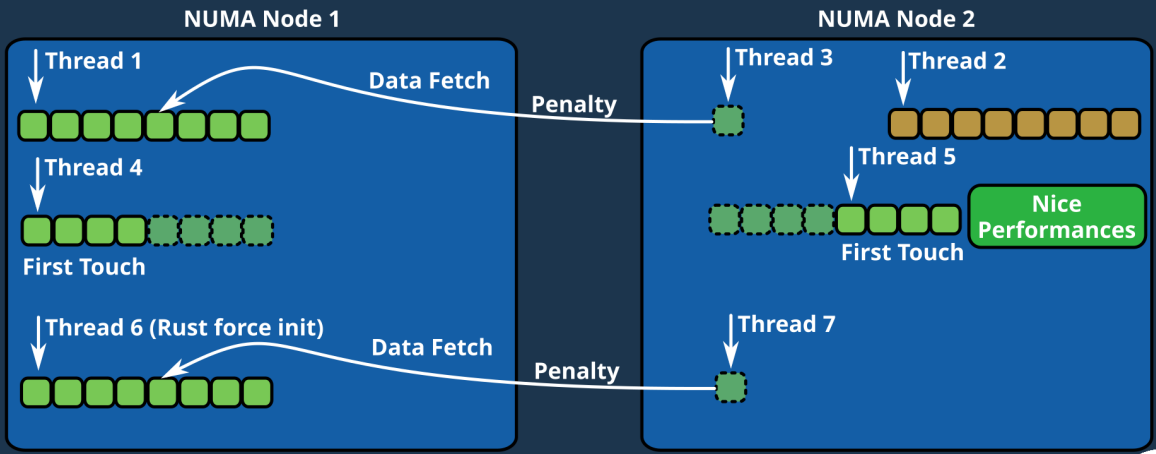

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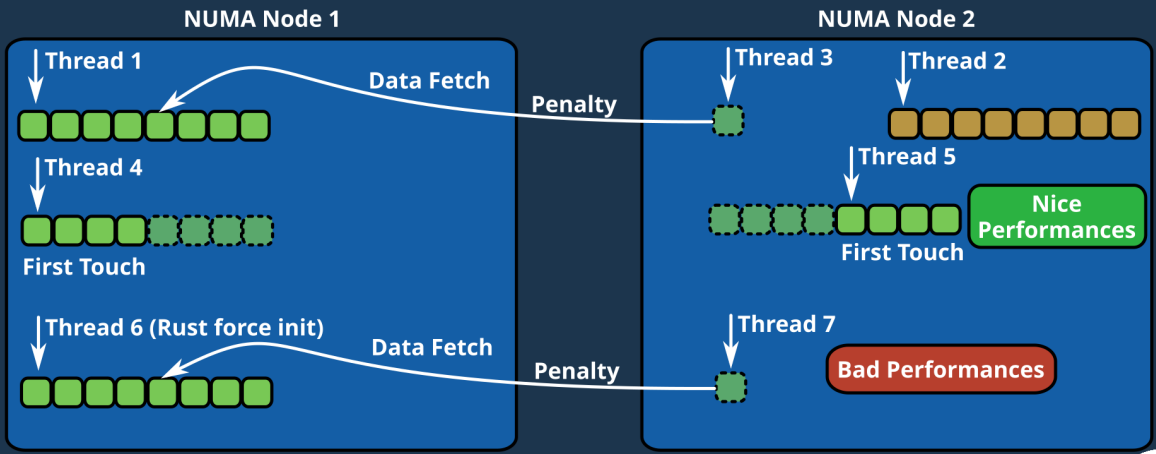

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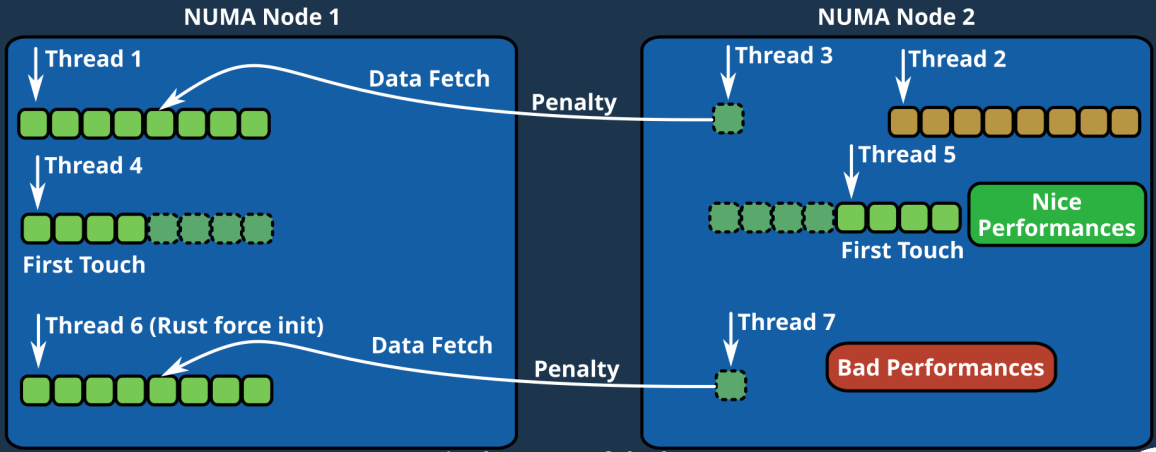

Rust is not finished yet

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- **No library** (supposed to be an ongoing work)
  - **Only static linking** for now except for the **libgcc_s** and **libc**
  - **Crates** are just **configuration** without documentation, **not binary packages**
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- **CPU Computing** not very mature
- **GPU Computing** not mature at all

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- **CPU Computing** not very mature
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fn main(){
»       println!("Hello world !");
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- **13 MB** with Cargo 1.75 (debug)
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- **No library** (supposed to be an ongoing work)
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- After a **15 km long command line** we still get a binary **28x times bigger** than C++

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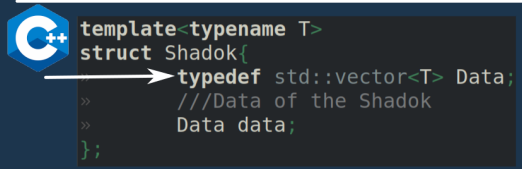

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Rust **Developers** are **aware** of this **issue** and **work on it**

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- **Still** learning
- **Explicit**
- **Less** help
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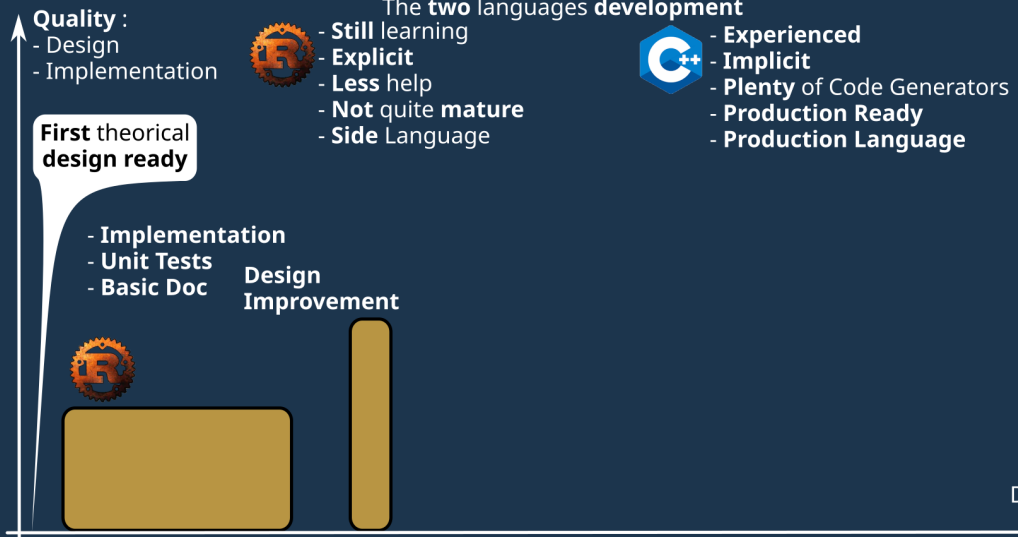

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First theorical **design ready**

- **Implementation**
- **Unit Tests**
- **Basic Doc**

Design Improvement

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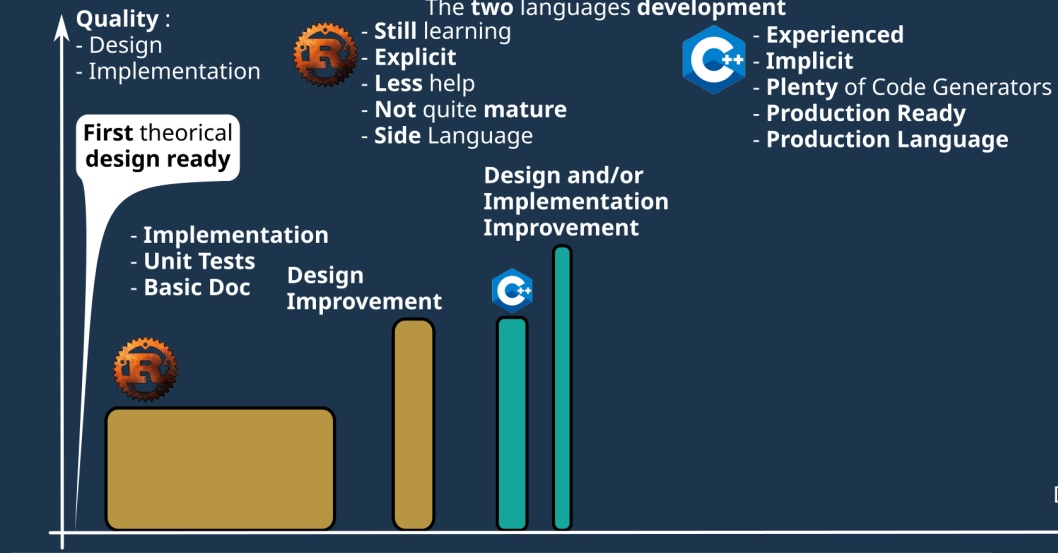

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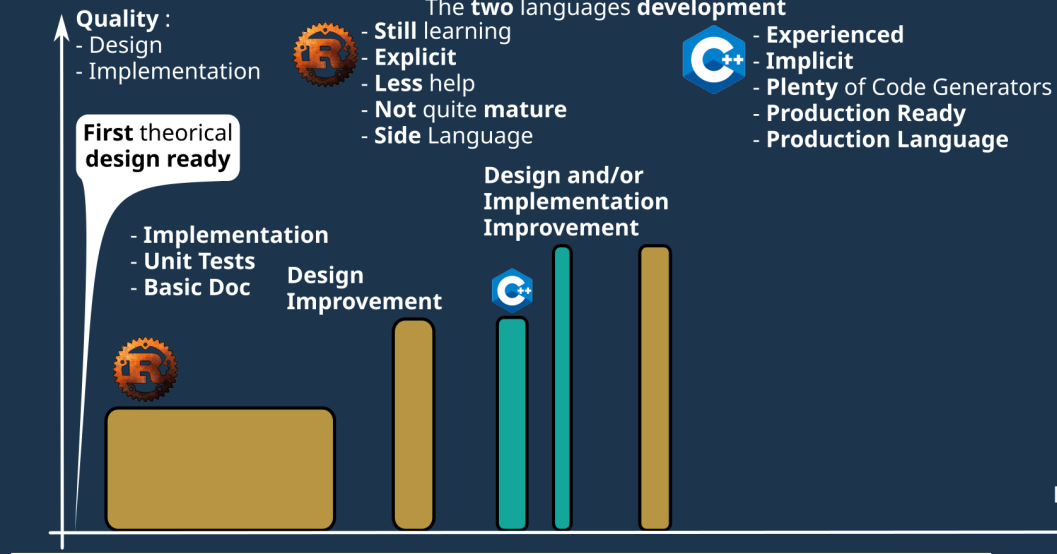

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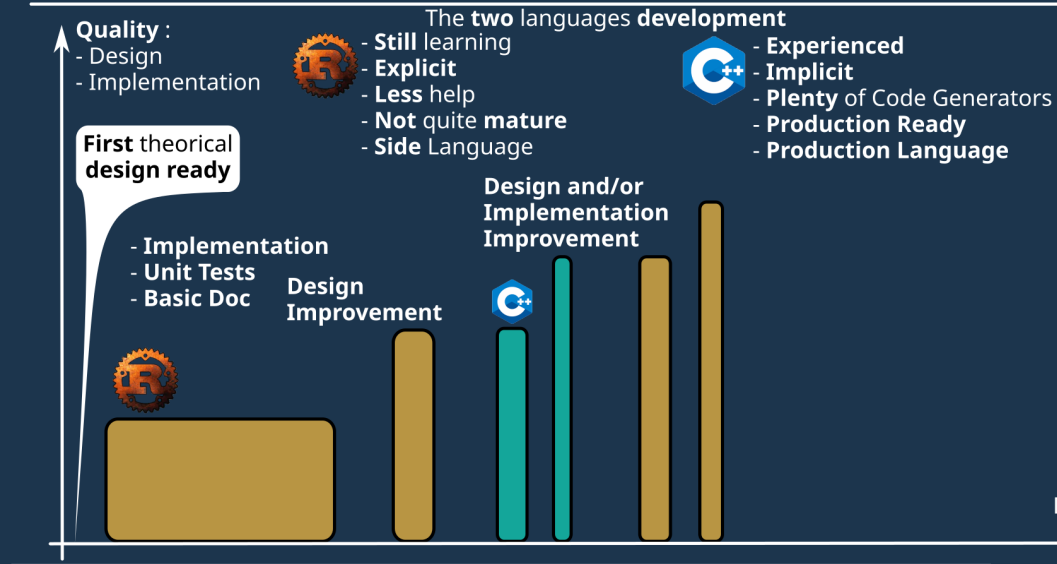

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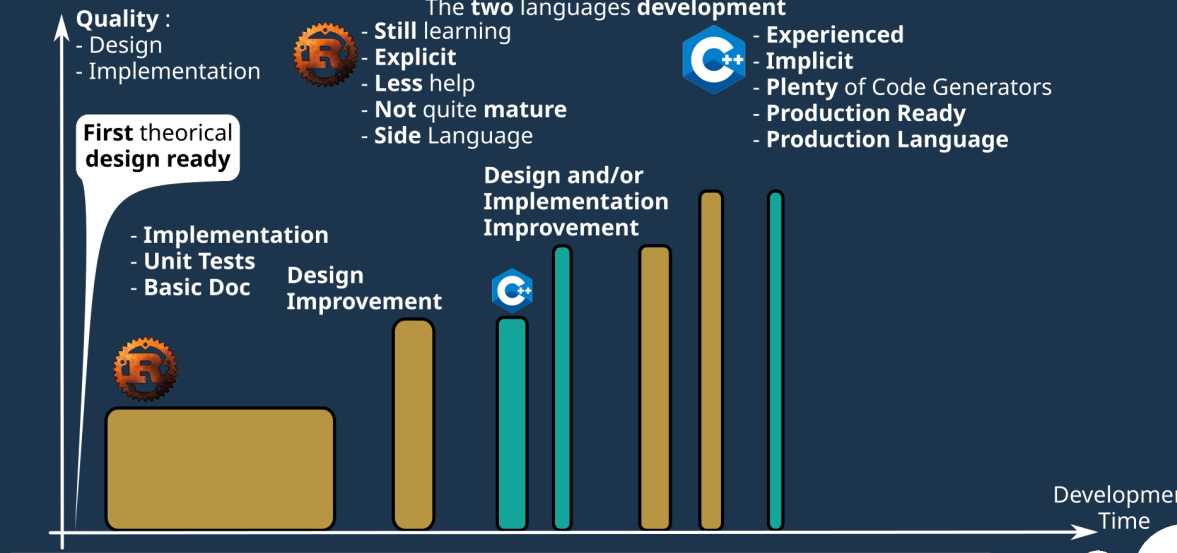

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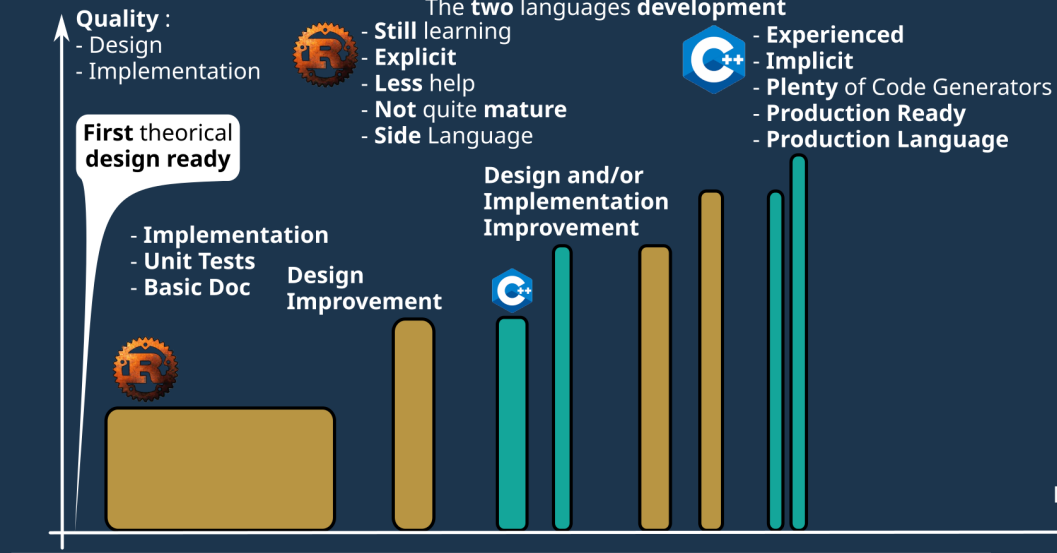

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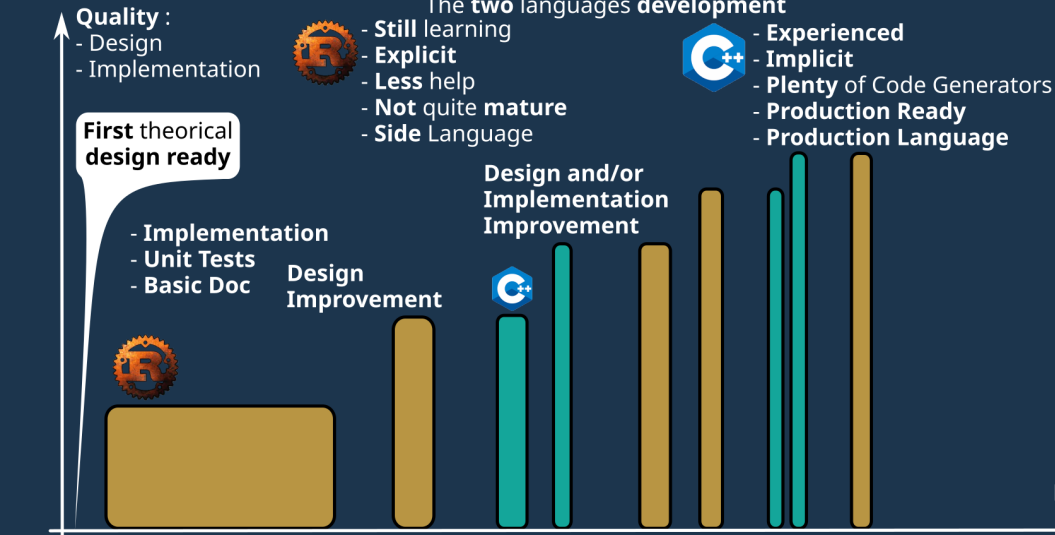

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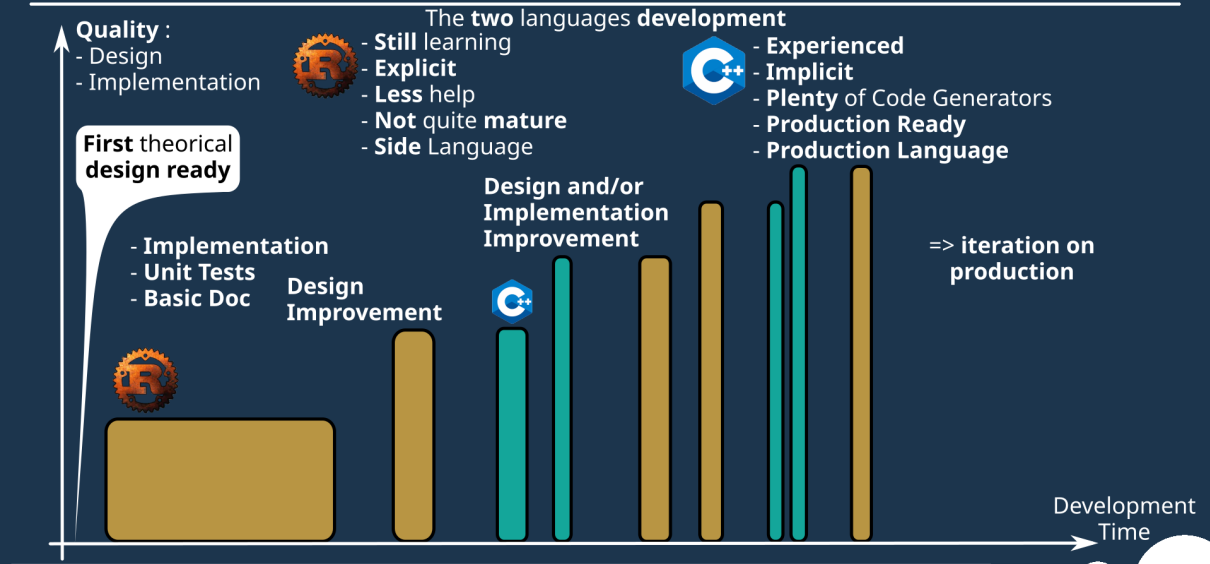

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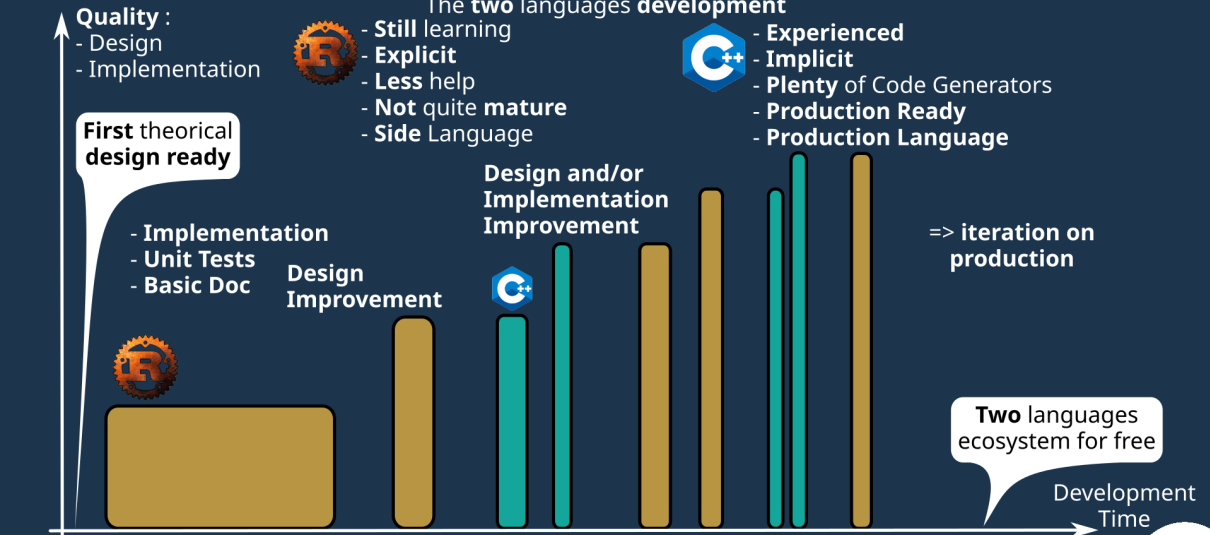

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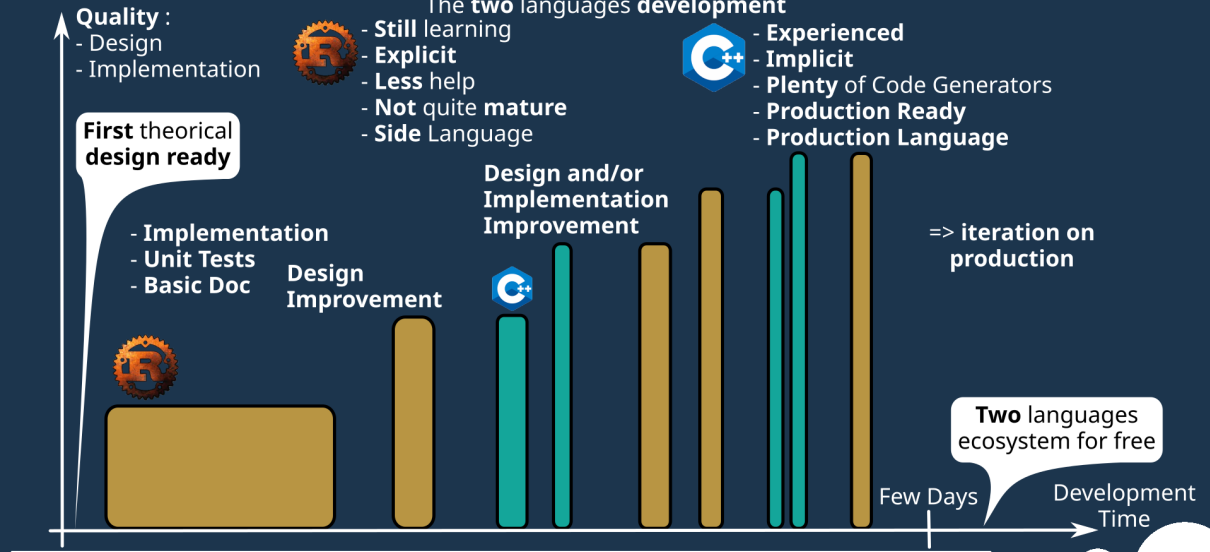

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The **Rust** learning curve is slow but **your design will improve** a lot.
Give it a try.