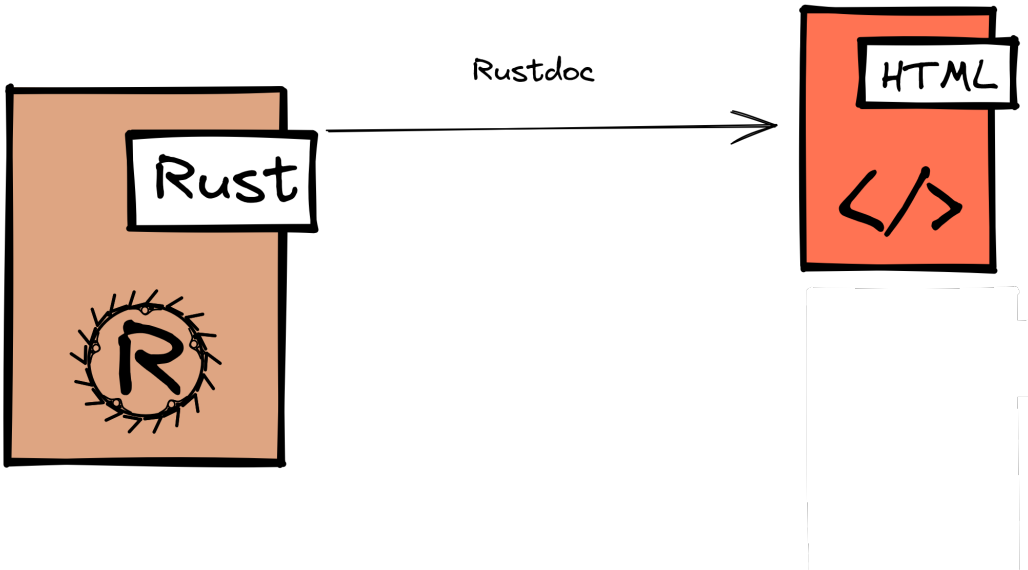
Rustdoc JSON

adotinthevoid.github.io/talks/rustdoc-json.pdf

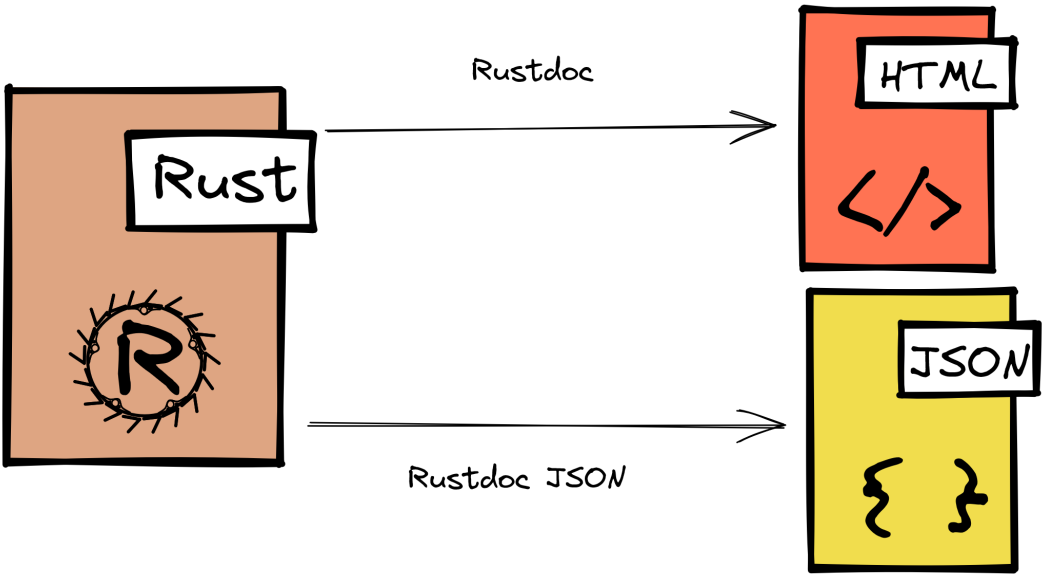
Nixon Enraght-Moony

2022-10-26

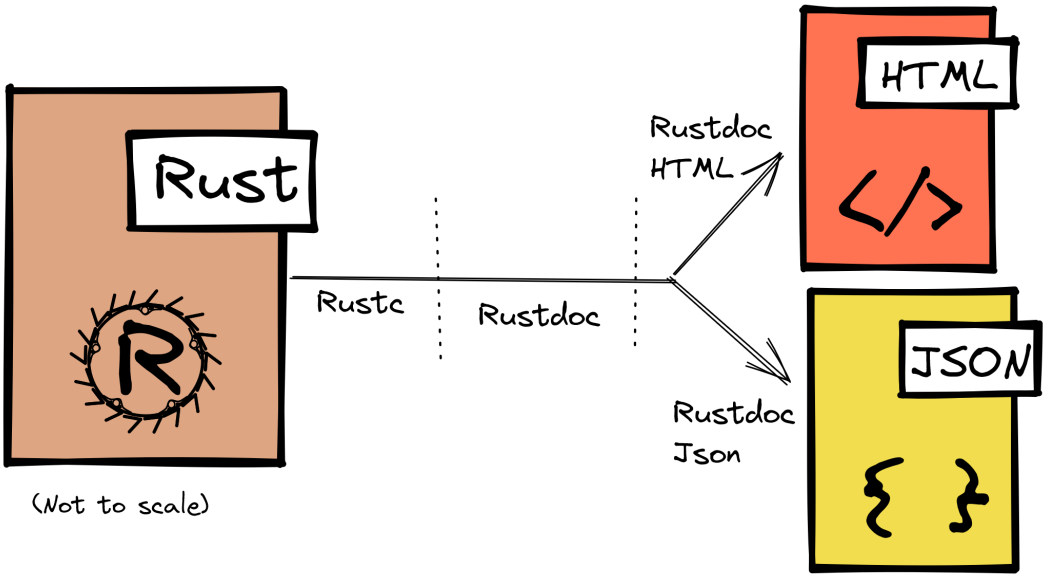
What is this?



What is this?



What is this?


Rust
Rustc
Rustdoc
Rustdoc
HTML
HTML
Rustdoc
Json
JSON
(Not to scale)

Users: Roogle

Users: cargo-check-external-types

```
$ cat src/lib.rs
pub fn uh_oh(x: otherlib::ExternalStruct) {}

$ cargo +nightly-2022-07-25 check-external-types
Running rustdoc to produce json doc output...
Examining all public types...
error: Unapproved external type `otherlib::ExternalStruct` referenced in public API
1 errors emitted
$
```

Users: cargo-semver-check

```
    Starting 8 checks, version 0.1.0 -> 0.1.0 (no change)
        PASS [   0.000s]       major        enum_missing
        FAIL [   0.000s]       major        enum_variant_added
        PASS [   0.000s]       major        enum_variant_missing
        PASS [   0.000s]       major        struct_marked_non_exhaustive
        PASS [   0.000s]       major        struct_missing
        PASS [   0.000s]       major        struct_pub_field_missing
        PASS [   0.000s]       major        unit_struct_changed_kind
        PASS [   0.000s]       major        variant_marked_non_exhaustive
     Summary [   0.003s] 8 checks run: 7 passed, 1 failed, 0 skipped

--- failure enum_variant_added: enum variant added on exhaustive enum ---

Description:
A publicly-visible enum without #[non_exhaustive] has a new variant.
       ref: https://doc.rust-lang.org/cargo/reference/semver.html#enum-variant-new
      impl: https://github.com/obi1kenobi/cargo-semver-check/tree/v0.4.1/src/queries/enum_variant_added.ron

Failed in:
  variant EnumWithNewVariant:NewVariant in src/test_cases/enum_variant_added.rs:5

      Final [   0.003s] semver requires new major version: 1 major and 0 minor checks failed
```

Just Use Rustc

```
rustup component add rust-src rustc-dev llvm-tools-preview
```

Just Use Rustc: Imports

```
#![feature(rustc_private)]

extern crate rustc_error_codes;
extern crate rustc_errors;
extern crate rustc_hash;
extern crate rustc_hir;
extern crate rustc_interface;
extern crate rustc_session;
extern crate rustc_span;

use std::{path, process, str};

use rustc_errors::registry;
use rustc_session::config;
use rustc_span::symbol::Symbol;
```

Just Use Rustc: Find Sysroot

```rust
fn main() {
    let path: path::PathBuf = std::env::args().nth(1).unwrap().into();

    let out = process::Command::new("rustc")
        // $HOME/.rustup/toolchains/nightly-x86_64-unknown-linux-gnu
        .arg("--print=sysroot")
        .current_dir(".")
        .output()
        .unwrap();
    let sysroot = str::from_utf8(&out.stdout).unwrap().trim();
```

Just Use Rustc: Config

```
let config = rustc_interface::Config {
    opts: config::Options {
        maybe_sysroot: Some(path::PathBuf::from(sysroot)),
        ..config::Options::default()
    },
    registry: registry::Registry::new(&rustc_error_codes::DIAGNOSTICS),
    input: config::Input::File(path),
```

Just Use Rustc: More Config

```
        lint_caps: rustc_hash::FxHashMap::default(),
        crate_cfg: rustc_hash::FxHashSet::default(),
        crate_check_cfg: config::CheckCfg::default(),
        input_path: None,
        output_dir: None,
        output_file: None,
        file_loader: None,
        parse_sess_created: None,
        register_lints: None,
        override_queries: None,
        make_codegen_backend: None,
    };
```

Just Use Rustc: Session Globals and Tcx

```
// rustc_interface::interface::Compiler
rustc_interface::run_compiler(config, |compiler| {
    // rustc_interface::queries::Queries
    compiler.enter(|querys| {
        // rustc_middle::ty::context::TyCtxt
        querys.global_ctxt().unwrap().take().enter(|tcx| {
```

Just Use Rustc: Query HIR

```
let demo_fn_sym = Symbol::intern("demo_fn");

let hir_crate = tcx.hir();
for id in hir_crate.items() {
    let item = hir_crate.item(id);
    if let rustc_hir::ItemKind::Fn(sig, _gen, _body_id) = &item.kind {
        if item.ident.name == demo_fn_sym {
            println!("{sig:?}");
        }
    }
}
```

Just Use Rustc: Input

```rust
pub fn demo_fn(x: i32, y: i32) -> i32 {
    x + y
}
```

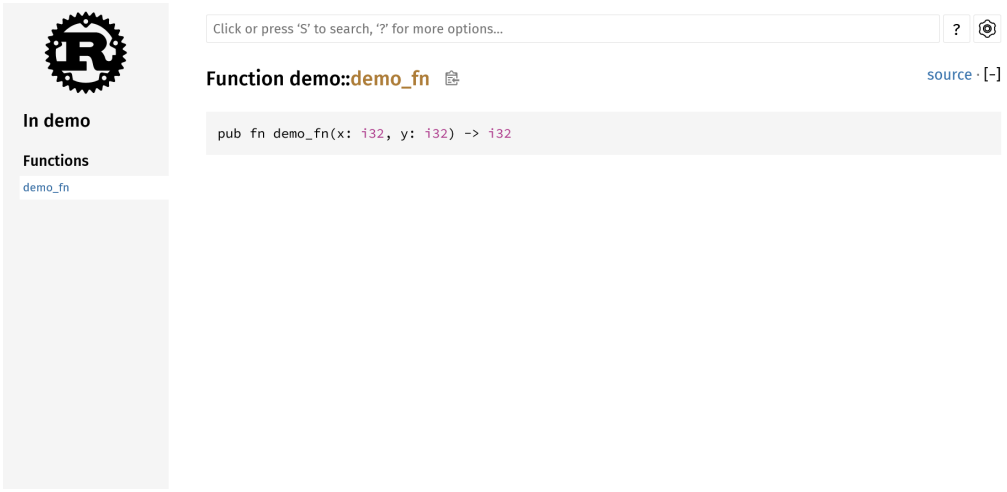
Just Use Rustc: Result

```
FnSig { header: FnHeader { unsafety: Normal, constness: NotConst, asyncness
Async, abi: Rust }, decl: FnDecl { inputs: [Ty { hir_id: HirId { owner: Own
{ def_id: DefId(0:3 ~ demo[52ed]::demo_fn) }, local_id: 12 }, kind: Path(Re
d(None, Path { span: demo.rs:1:15: 1:18 (#0), res: PrimTy(Int(I32)), segmen
PathSegment { ident: i32#0, hir_id: HirId { owner: OwnerId { def_id: DefId
 demo[52ed]::demo_fn) }, local_id: 13 }, res: PrimTy(Int(I32)), args: None
r_args: false }] })), span: demo.rs:1:15: 1:18 (#0) }, Ty { hir_id: HirId {
r: OwnerId { def_id: DefId(0:3 ~ demo[52ed]::demo_fn) }, local_id: 14 }, ki
ath(Resolved(None, Path { span: demo.rs:1:23: 1:26 (#0), res: PrimTy(Int(I3
segments: [PathSegment { ident: i32#0, hir_id: HirId { owner: OwnerId { def
DefId(0:3 ~ demo[52ed]::demo_fn) }, local_id: 15 }, res: PrimTy(Int(I32)),
 None, infer_args: false }] })), span: demo.rs:1:23: 1:26 (#0) }], output:
n(Ty { hir_id: HirId { owner: OwnerId { def_id: DefId(0:3 ~ demo[52ed]::den
 }, local_id: 16 }, kind: Path(Resolved(None, Path { span: demo.rs:1:31: 1
0), res: PrimTy(Int(I32)), segments: [PathSegment { ident: i32#0, hir_id: H
{ owner: OwnerId { def_id: DefId(0:3 ~ demo[52ed]::demo_fn) }, local_id: 17
es: PrimTy(Int(I32)), args: None, infer_args: false }] })), span: demo.rs:1
```

Just Use Rustc: Result

```
FnSig {
    header: FnHeader {
        unsafety: Normal,
        constness: NotConst,
        asyncness: NotAsync,
        abi: Rust,
    },
    inputs: [
        Ty { kind: PrimTy(Int(I32)) },
        Ty { kind: PrimTy(Int(I32)) },
    ],
    output: Return( Ty { kind: PrimTy(Int(I32)) }),
    c_variadic: false,
    implicit_self: None,
};
```

Just Use ~~Rustc~~ Rustdoc



Just Use ~~Rustc~~ Rustdoc

```
<pre class="rust fn">
  <code>
    pub fn demo_fn(x:
    <a
      class="primitive"
      href="https://doc.rust-lang.org/nightly/std/primitive.i32.html"
    >i32</a>, y:
    <a
      class="primitive"
      href="https://doc.rust-lang.org/nightly/std/primitive.i32.html"
    >i32</a>) -&gt;
    <a
      class="primitive"
      href="https://doc.rust-lang.org/nightly/std/primitive.i32.html"
    >i32</a>
  </code>
</pre>
```

Just Use ~~Rustc~~ ~~Rustdoc~~ Rustdoc JSON

```
rustdoc +nightly demo.rs -Z unstable-options --output-format json
oj -p 100.3 -x "$.index[?(@.name=='demo_fn')].inner" ./doc/demo.json
```


```
{
  "decl": {
    "c_variadic": false,
    "inputs": [
      ["x", {"inner": "i32", "kind": "primitive"}],
      ["y", {"inner": "i32", "kind": "primitive"}]
    ],
    "output": {"inner": "i32", "kind": "primitive"}
  },
  "generics": {"params": [], "where_predicates": []},
  "header": {"abi": "Rust", "async": false, "const": false, "unsafe": fals
}
```

Format: Item

```rust
pub struct Item {
    pub id: Id,
    pub name: Option<String>,
    pub docs: Option<String>,
    pub inner: ItemEnum,
}
```

(All of these are simplified for clarity)

Format: ItemEnum

```
pub enum ItemEnum {
    Module(Module),
    Import(Import),
    Struct(Struct),
    StructField(Type),
    Enum(Enum),
    Variant(Variant),
    Function(Function),
    Trait(Trait),
    Method(Method),
    Impl(Impl),
    Typedef(Typedef),
    Constant(Constant),
}
```

Format: Function / Method

```rust
pub struct Function {
    pub decl: FnDecl,
    pub generics: Generics,
    pub header: Header,
}
pub struct Method {
    pub decl: FnDecl,
    pub generics: Generics,
    pub header: Header,
    pub has_body: bool,
}
pub struct Header {
    pub const_: bool,
    pub unsafe_: bool,
    pub async_: bool,
    pub abi: Abi,
}
```

Format: FnDecl

```
pub struct FnDecl {
    pub inputs: Vec<(String, Type)>,
    pub output: Option<Type>,
    pub c_variadic: bool,
}
```

Format: Type

```
pub enum Type {
    ResolvedPath(Path),
    DynTrait(DynTrait),
    Generic(String),
    Primitive(String),
    FunctionPointer(Box<FunctionPointer>),
    Tuple(Vec<Type>),
    Slice(Box<Type>),
    Array { ... },
    ImplTrait(Vec<GenericBound>),
    Infer,
    RawPointer { ... },
    BorrowedRef { ... },
    QualifiedPath { ... },
}
```

Format: Type Continued

```
Array {
    type_: Box<Type>,
    len: String,
},
RawPointer {
    mutable: bool,
    type_: Box<Type>,
},
QualifiedPath {
    name: String,
    args: Box<GenericArgs>,
    self_type: Box<Type>,
    trait_: Path,
}
```

These should probably be structs.

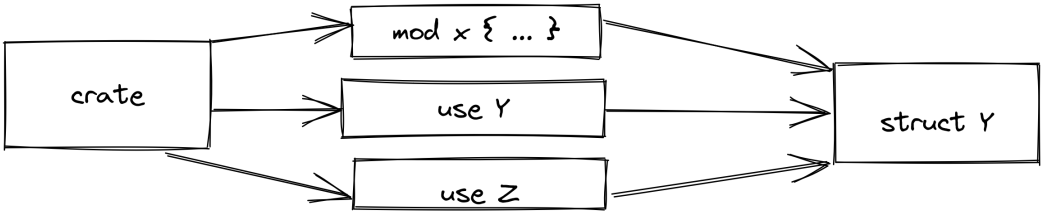
Format: Module / Crate

```rust
pub struct Module {
    pub items: Vec<Id>,
}

pub struct Id(pub String);

pub struct Crate {
    pub root: Id,
    pub index: HashMap<Id, Item>,
    pub format_version: u32,
}
```

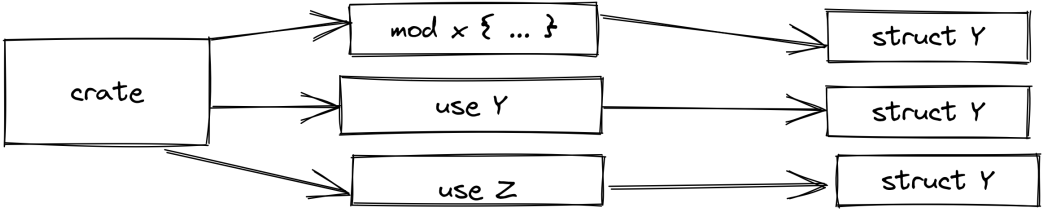
Why the IDs? Graphs

```
pub mod x {
    pub struct Y;
}
pub use x::Y;
pub use x::Y as Z;
```

Why the IDs? Graphs



Why the IDs? Graphs



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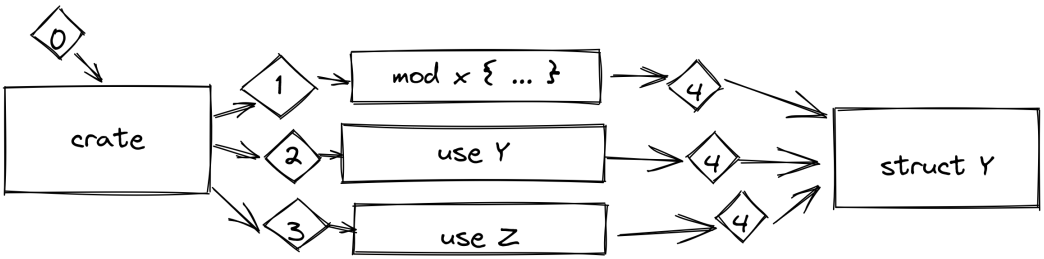

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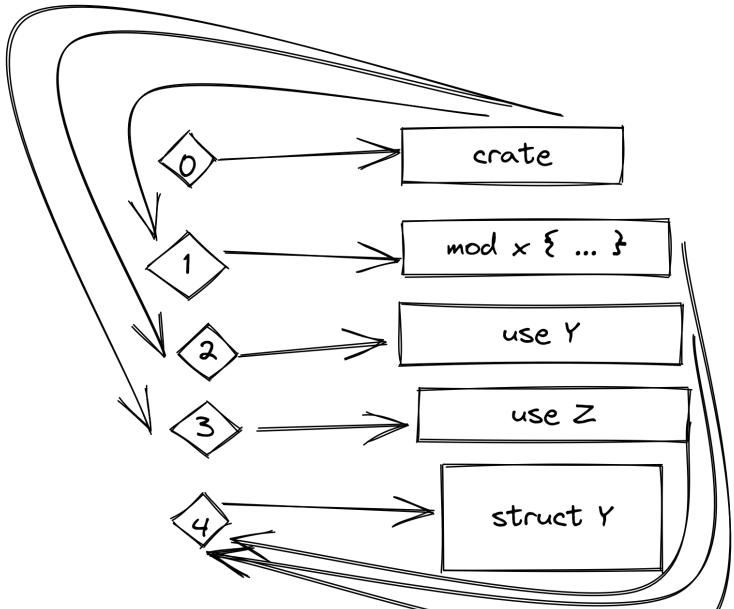

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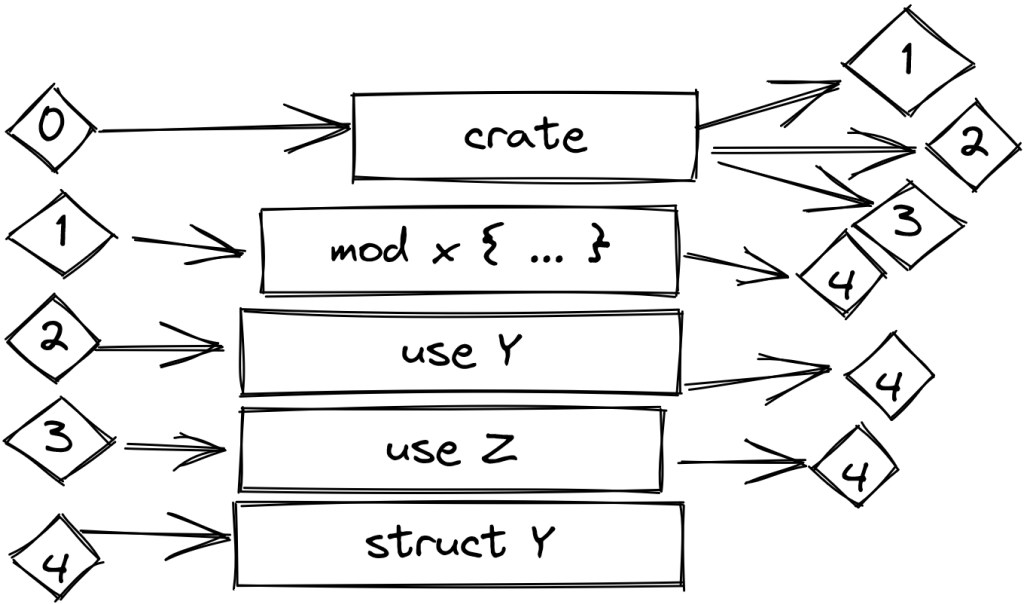

Why the IDs? Graphs

```
pub mod x {
    pub struct Y;
}
pub use x::Y;
pub use x::Y as Z;
```

JSON Output


```
{
"index": {
 "0": {
  "inner": {"items": ["1", "2", "3"]},
  "kind": "module",
  "name": "cratename"
 },
 "1": {"inner": {"items": ["4"]}, "kind": "module", "name": "x"},
 "2": {"inner": {"id": "4", "name": "Y"}, "kind": "import", "name": null},
 "3": {"inner": {"id": "4", "name": "Z"}, "kind": "import", "name": null},
 "4": {"inner": {}, "kind": "struct", "name": "Y"}
},
"root": "0"
}
```

Questions

Thanks

Alex Kladov, Didrik Nordström, Guillaume Gomez, Jacob Hoffman-Andrews, Joseph Ryan, Joshua Nelson, León Orell Valerian Liehr, Luca Palmieri, Martin Nordholts, Michael Goulet, Michael Howell, Noah Lev, QuietMisdreavus, Rune Tynan, Tyler Mandry, Urgau
Excalidraw icons by xxxDeveloper.

Code

- `src/librustdoc/json`
- `src/rustdoc-json-types`
- `src/tools/jsondocck`
- `src/tools/jsondoclint`
- docs.rs/rustdoc-types/

Contact

- `nixon.emoony@gmail.com`