Rustdoc JSON

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Alona Enraght-Moony

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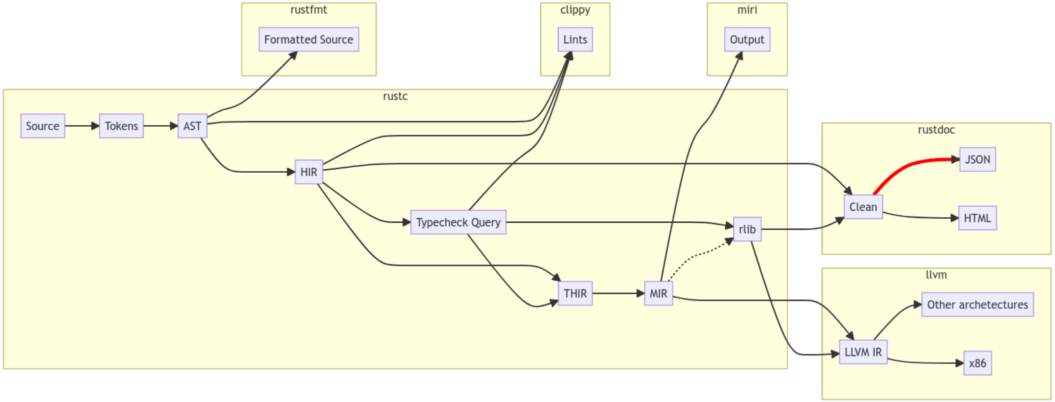
Rustdoc JSON: A small part of a large system



Rust: The 10,000 foot view

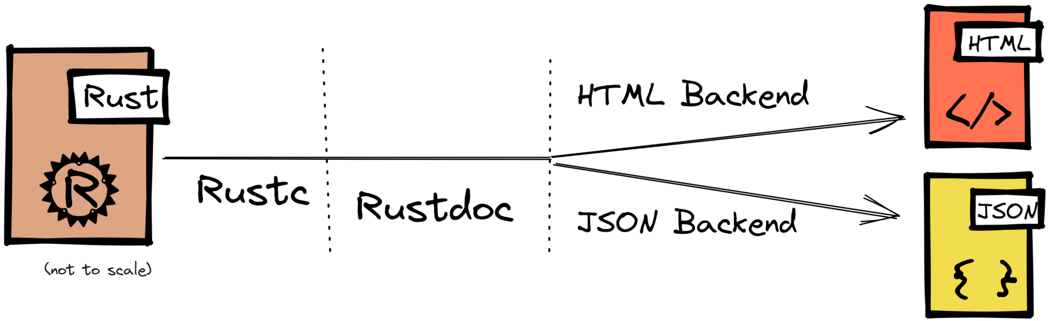
- Originally out of Mozilla, now large multi-org team
- Realty interesting in langugе design, but not the subject of this talk
- Right language for many problems, but **not the one's we face**

Rustdoc: The 10,000 foot view

- Documentation generator for rust
- Sits on top of `rustc`
- Kind of like `godoc`/`pkgsite`
- Kind of like `perldoc`
- `docs.rs` is an equivalent to `pkg.go.dev`/`metacpan.org`

Rustdoc JSON: The 10,000 foot view

- If rustdoc is a rust → HTML compiller, then rustdoc-json is a rust→JSON compiller.
- **Core Insight**: Computers also need docs, but for need a different format.
- Who uses this:
  - roogle
  - `cargo public-api`:
  - `cargo check-external-types`
  - `cargo semver-checks`



The easy case: Crates, Modules and Structs

```
pub struct Foo;
pub mod bar {
    pub struct Baz;
}
```

A simple schema for our simple language

```
enum Item {
    Struct {name: String},
    Module {name: String, items: Vec<Item>},
}
```

```
{
    "kind": "module",
    "name": "somelib",
    "items": [
        {"kind": "struct", "name": "Foo"},
        {
            "kind": "module",
            "name": "bar",
            "items": [{"kind": "struct", "name": "Baz"}]
        }
    ]
}
```

A simple standard library

```rust
pub mod collections {
    pub mod vec { pub struct Vec; }
    pub mod hash_map { pub struct HashMap; }
    pub mod hash_set { pub struct HashSet; }
}
```

- End up having `std::collections::hash_set::HashSet`
- But we want `std::collections::HashSet`

Andrew Koenig/Butler Lampson/David Wheeler to the rescue!

“We can solve any problem by introducing an extra level of indirection.”

```rust
pub mod collections {
    pub mod vec { pub struct Vec; }
    pub mod hash_map { pub struct HashMap; }
    pub mod hash_set { pub struct HashSet; }

    pub use vec::Vec;
    pub use hash_map::HashMap;
    pub use hash_set::HashSet;
}
```

- `std::collections::HashSet` and `std::collections::hash_set::HashSet` now both valid paths.

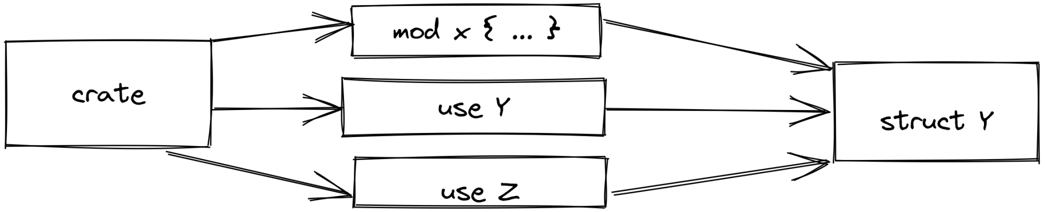
Surely this won't explode into a mountain of complexity

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

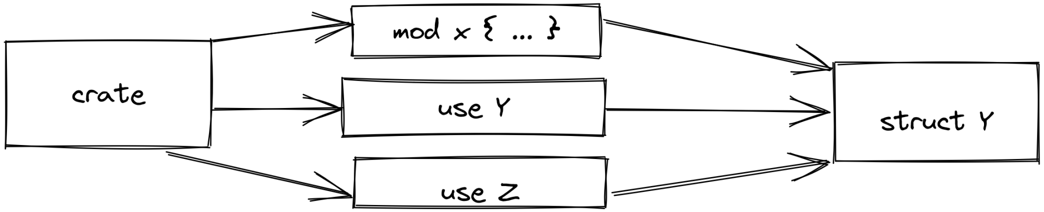
- `somelib::x::Y`, `somelib::Y` and `somelib::Z` all resolve to same item.

Oh no, that's a graph!

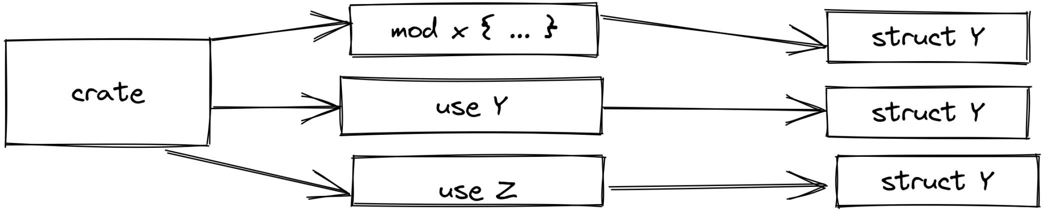
```
pub mod x {
    pub struct Y;
}
pub use x::Y;
pub use x::Y as Z;
```



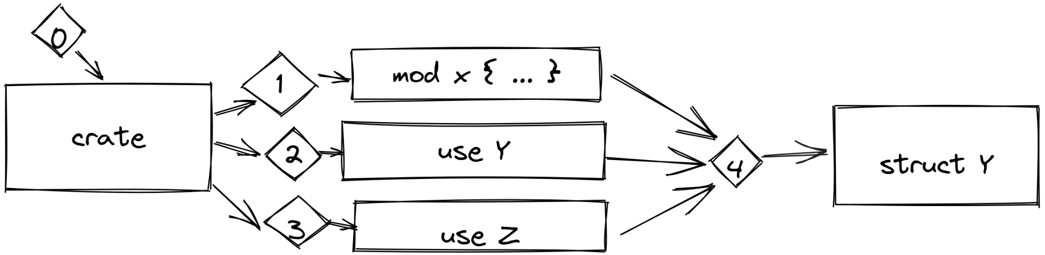
Money doesn't grow on trees, but JSON does



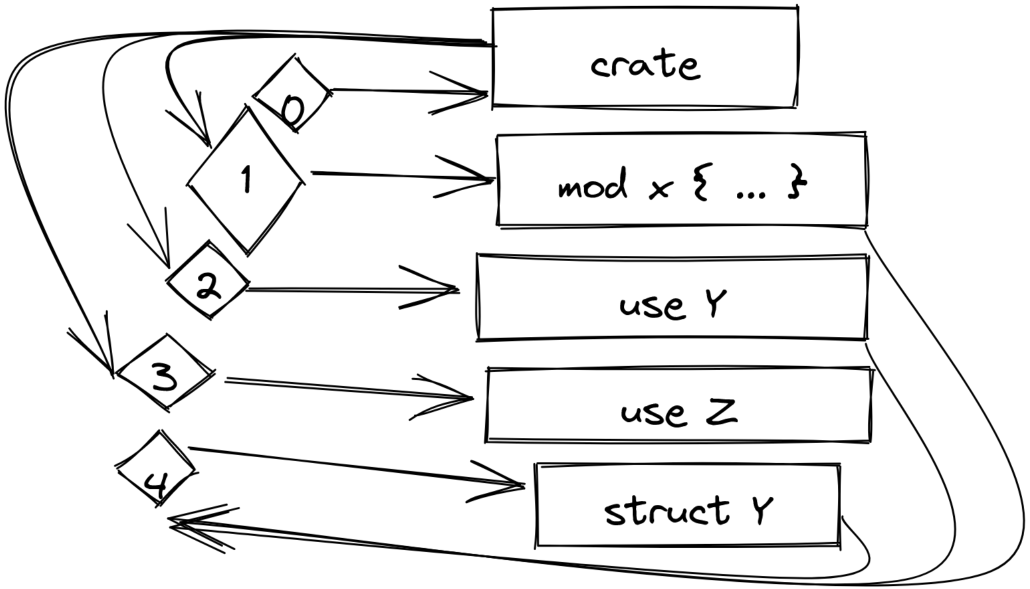
becomes



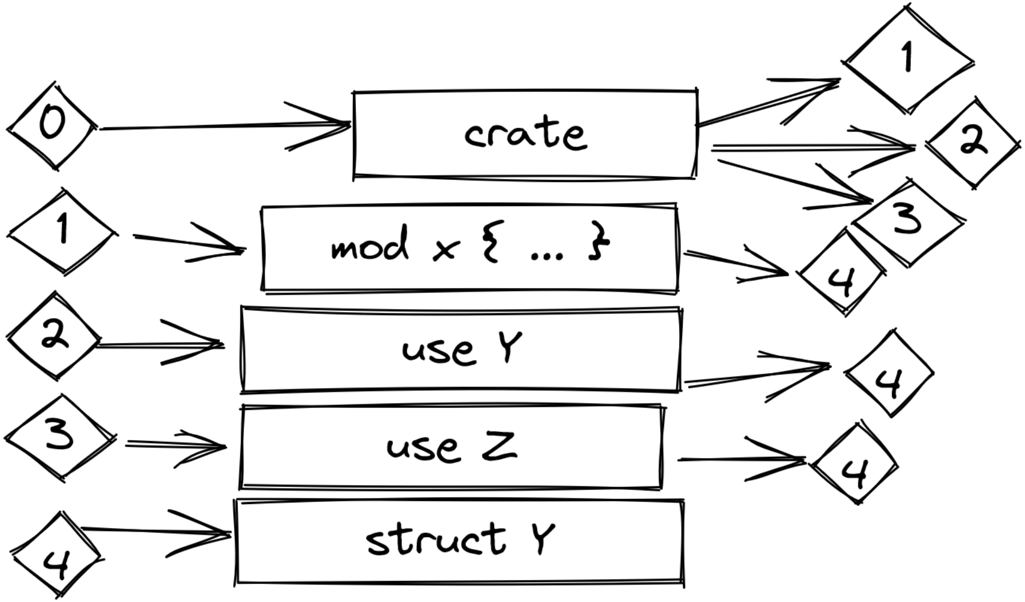
What if we try indirection again?



Rotate a graph in your mind



And like that, we have a map



Obvious JSON Output

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

Other things not covered

- `cfg`/`cfg(doc)`: feature/target dependant API's
- Projections/Normailzation
- Cross-crate ID resolution
- Macros
- Versioning/Evolution
- Testing
- Unnamable Types
- Infinatly long paths
- Maintentenence/Stewardship/Bus Factor
- Stabilization/Unstable features

Conclussion

- Design decissions have unforseen consequences.
- Someone always pays for the complexity.

Thanks

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Links

- Implementation: github.com/rust-lang/rust/tree/master/src/librustdoc/json
- Public API: docs.rs/rustdoc-types/latest/rustdoc_types/
- RFC (now outdated in specifics): rust-lang.github.io/rfcs/2963-rustdoc-json.html
- Bugs: github.com/rust-lang/rust/issues?q=is:Aopen+is:issue+label:A-rustdoc-json

Bonus Slides: Infinatly Long Paths

```rust
pub mod cx {
    pub use super::cx as cx;
    pub struct Cx;
}
```

- `cx::Cx`, `cx::cx::Cx`, `cx::cx::cx::Cx`, .. are all valid.
- So can't map `Path` -> `Item`, would be infinatly large.
- Push complexity to consumers.

Bonus Slides: Unnamable Types

```rust
mod private {
    pub struct Bar;
}
pub fn get_bar() -> private::Bar { private::Bar }
```