Creating Parsers with Rust nom Crate

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What is this talk about?

Raising awareness of the nom crate

Will provide overview and code samples

Encourage you to read the full documentation

What is nom?

A parsing toolkit for Rust.

It is a parser library.

- A parser combinator library.
- A system for creating complex parsers by combining simple parsers.

Great replacement for using regular expressions :P

- Nom parsers are Rust functions
- Nom is NOT based on grammars or generators

`Parser` **Trait**

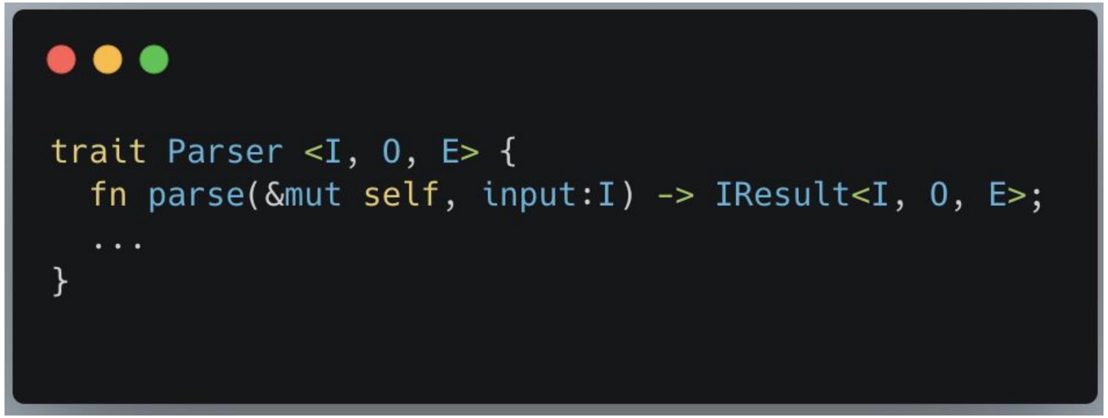
All nom parsers fulfill the parser trait

    This describes the execution of a single parse

Parser trait is automatically implemented for any function that returns an `IResult`

3 generic types

- Input
- Output
- Error

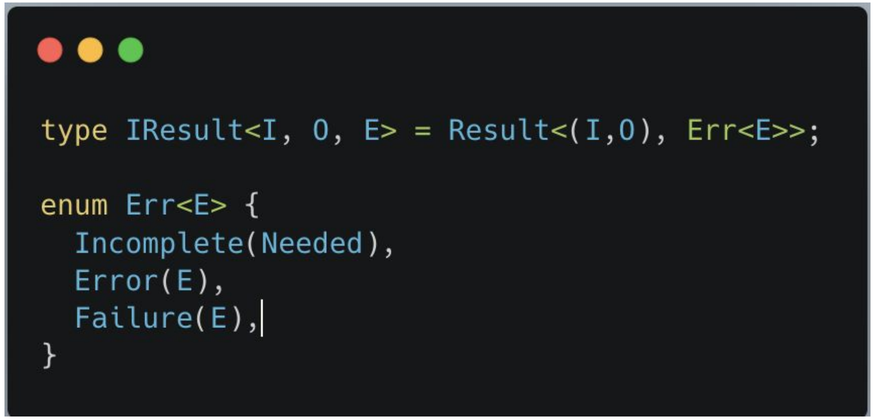


```
trait Parser <I, O, E> {
  fn parse(&mut self, input:I) -> IResult<I, O, E>;
  ...
}
```

`IResult` **Type**

Generic type that encodes the result of the parser

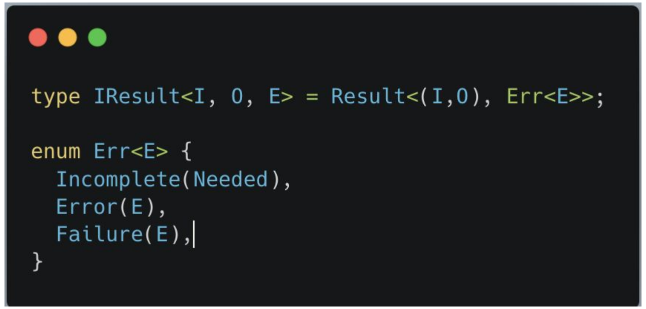
Allows for flexible error handling in parsing



```
type IResult<I, O, E> = Result<(I,O), Err<E>>;

enum Err<E> {
  Incomplete(Needed),
  Error(E),
  Failure(E),
}
```

Possible Parse Outcomes



```
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}
```

Success: `Ok((I, O))`

- Parse succeeded
- Returns output (specific to parser) and returns unparsed tail of the input

Error: `Err(nom::Err::Error(E))`

- Parser encountered an error
- How the errors are handled is key to nom’s ability to allow components to be combined

Failure: `Err(nom::Err::Failure(E))`

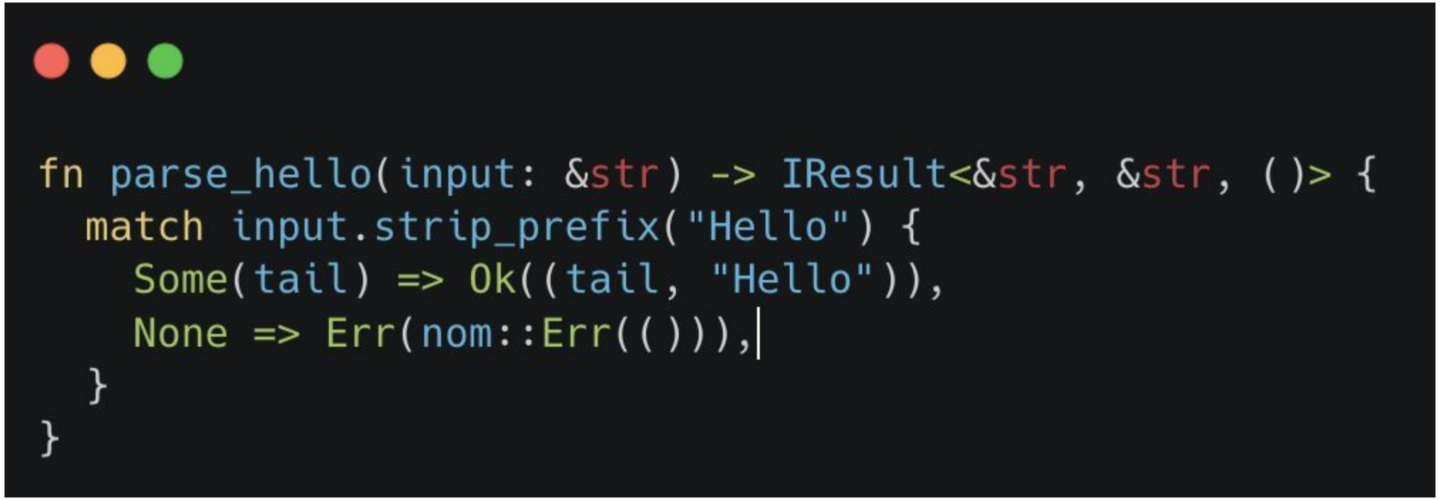
- Parser encountered an unrecoverable error

Incomplete: `Err(nom::Err::Incomplete(Needed))`

- Parser did not have enough information to succeed
- Only relevant to streaming parsers

Basic Parser

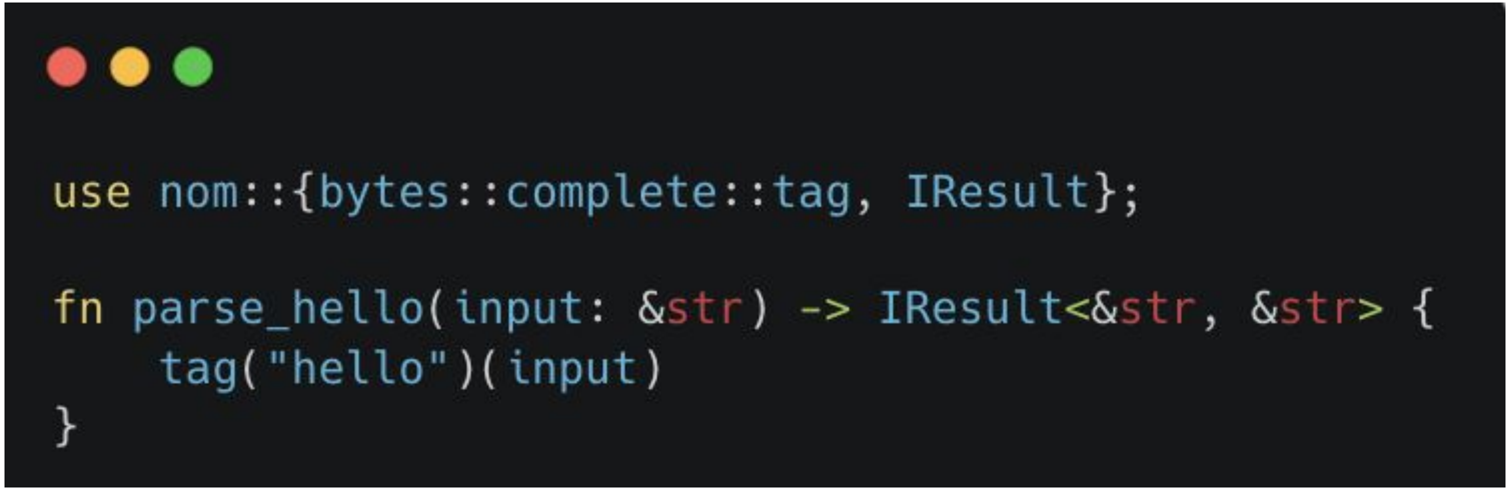
Success: parse the word “Hello”



```rust
fn parse_hello(input: &str) -> IResult<&str, &str, ()> {
  match input.strip_prefix("Hello") {
    Some(tail) => Ok((tail, "Hello")),
    None => Err(nom::Err(())),
  }
}
```

Nom parsers provided

Same Hello parser written using tag combinator parser



```rust
use nom::{bytes::complete::tag, IResult};

fn parse_hello(input: &str) -> IResult<&str, &str> {
    tag("hello")(input)
}
```

Built-in performance optimisations

Zero-copy parsing and streaming

- The data is not copied during parsing, leading to significant performance improvements

Why use nom?

Applications of nom

- Parsing binary formats
- Parsing text-based protocols
- Parsing configuration files

Resources for learning more about nom and parsing in Rust

- https://crates.io/crates/nom#why-use-nom