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"borrowed value does not live long enough" with a generic function that returns impl trait

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I get an unexpected error from this Rust code:

```
struct Container<a> {  
    x:&a i32,  
}  
  
trait Reply {}  
impl Reply for i32 {}  
  
fn json<T>(_val:&T) -> impl Reply {  
    3  
}  
  
fn f() -> impl Reply {  
    let i = 123;  
    let a = Container { x:&i };  
    json(&a)  
}
```

[Playground](#)

The error is:

```
error[E0597]: `i` does not live long enough  
--> src/libs.rs:14:28  
|  
12 | fn f() -> impl Reply {  
| | ----- opaque type requires that `i` is borrowed for `static`  
13 |     let i = 123;  
14 |     let a = Container { x:&i };  
| |             ^^ borrowed value does not live long enough  
15 |     json(&a)  
16 | }  
| - `i` dropped here while still borrowed
```

Why?

If I change the declaration of `json()` to either of these versions, the code compiles:

```
fn json(val:&Container) -> impl Reply
```

```
fn json<T>(val:&T) -> i32
```

It is only when there is both a type parameter and a returned trait object that the compiler rejects the code.

This is a reduction from a real issue we had with `warp::reply::json()`, but I would prefer to understand it in general.

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edited Sep 17 '19 at 16:48



Shepmaster

305k ● 59 ● 824 ● 1083

asked Sep 17 '19 at 14:05



Daniel Darabos

26.1k ● 9 ● 96 ● 108

I've looked at the first 20 hits for "borrowed value does not live long enough" on Stack Overflow but those didn't help. I didn't check the rest, sorry.

– Daniel Darabos

Sep 17 '19 at 14:08

1

Your privacy looks like your question might be answered by the answers of [Impl trait with generic associated type in return position causes lifetime error](#), especially [this comment](#). If not, please [edit](#) your question to explain the differences. Otherwise, we can mark this question as already answered.

– Shepmaster

Sep 17 '19 at 14:21

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Thanks! It's certainly more relevant than what I have seen before. There are a bunch of differences, but it could be that both cases rest on the same underlying issue. I'm reading through the references in the answers.

– [Daniel Darabos](#)

Sep 17 '19 at 14:32

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When the arguments and the return type of a function are generic, the Rust compiler assumes that the return type could, potentially, borrow the arguments. That's why it assumes that `f()` returns a value referencing the local variable `i`.

I'm not entirely sure, but I think this is desired, because someone could implement `Reply` for a type where this would be problematic.

EDIT: This doesn't work because of a bug. It has already been reported on GitHub.

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[edited Sep 17 '19 at 19:36](#)

answered Sep 17 '19 at 16:45



[Alos](#)

4,380 ● 4 ● 21 ● 36

the Rust compiler assumes that the return type could, potentially, borrow the arguments — please enhance your answer to explain why `impl Reply + 'static` doesn't work.

– [Shepmaster](#)

Sep 17 '19 at 16:49

I tried implementing a function that returns such a `Reply` but failed! Haha! Yeah, that doesn't prove anything. Is this behavior documented somewhere?

– [Daniel Darabos](#)

Sep 17 '19 at 17:15

One more thing though that I forgot to mention in the question. This only fails to compile when `Container` contains a `borrow`. If it contains a plain `i32`, it works. Why does the compiler not worry that `Reply` could hold a reference to `a`? Why only worry about `i`? Thanks a lot!

– [Daniel Darabos](#)

Sep 17 '19 at 17:19

@DanielDarabos that's interesting. However, it only fails if the borrow references a local variable: `let a = Container { x: &123 }` works.

– [Alos](#)

Sep 17 '19 at 18:42

@Shepmaster I don't know, maybe someone who knows more about how the compiler works can answer this. Maybe this is indeed a bug.

– [Alos](#)

Sep 17 '19 at 18:50

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