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How to shorten the lifetime of each item in Intolterator?

Asked 2 years, 11 months ago

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The following is the code:

```
struct A;

fn f<'a, I>(default_args: I)
where
    I: IntoIterator<Item = &'a A>,
{
    {
        let a1 = A;
        let more_args = [&a1];
        {
            let i = default_args.into_iter();
            let i = i.chain(more_args);
            // I will use `i` here.
        }
    }
    // I will NOT use `*_args` here.
}
```

The following is error:

```
error[E0597]: `a1` does not live long enough
 --> src\main.rs:27:26
  |
21 | fn f<'a, I>(default_args: I)
  |      -- lifetime `'a` defined here
...
27 |         let more_args = [&a1];
  |                           ^^^ borrowed value does not live long enough
...
30 |             let i = i.chain(more_args);
  |                     ----------------- argument requires that `a1` is borrowed for `'a`
...
33 |     }
  |     - `a1` dropped here while still borrowed

For more information about this error, try `rustc --explain E0597`.
```

I want to get a new `default_args_2` from `default_args`, where the `Item` inside `default_args_2` has a shorter lifetime, as long as it valid inside the function.

- rust

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You can add a little (almost) noop `.map(|v| v)`:

```
let i = default_args.into_iter().map(|v| v);
```

The problem was that the iterator item types have to match, and therefore the chained iterator has to also yield `&'a T`, which it does not (it yields a shorter lifetime).

Since you don't really need to use the items for `'a`, the trick of the noop `map()` is to insert a subtyping point: Now, the closure inside `map()` (conceptually) converts the `&'a T`, to a `&'shorter_lifetime T`, which is fine since `'a: 'shorter_lifetime`, but now the chained iterator can produce the desired item type.

Putting it differently, you cannot convert `impl Iterator<Item = &'a T>` into `impl Iterator<Item = &'shorter_lifetime T>` (as it may not be covariant over the lifetime), but you can convert `&'a T` to `&'shorter_lifetime T`, and we use that fact because from the outside we have `impl Iterator<Item = &'a T>`, but inside `map()`'s closure we got `&'a T`.

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