Rust et la notion d'appartenance ("ownership")

VISI401 -
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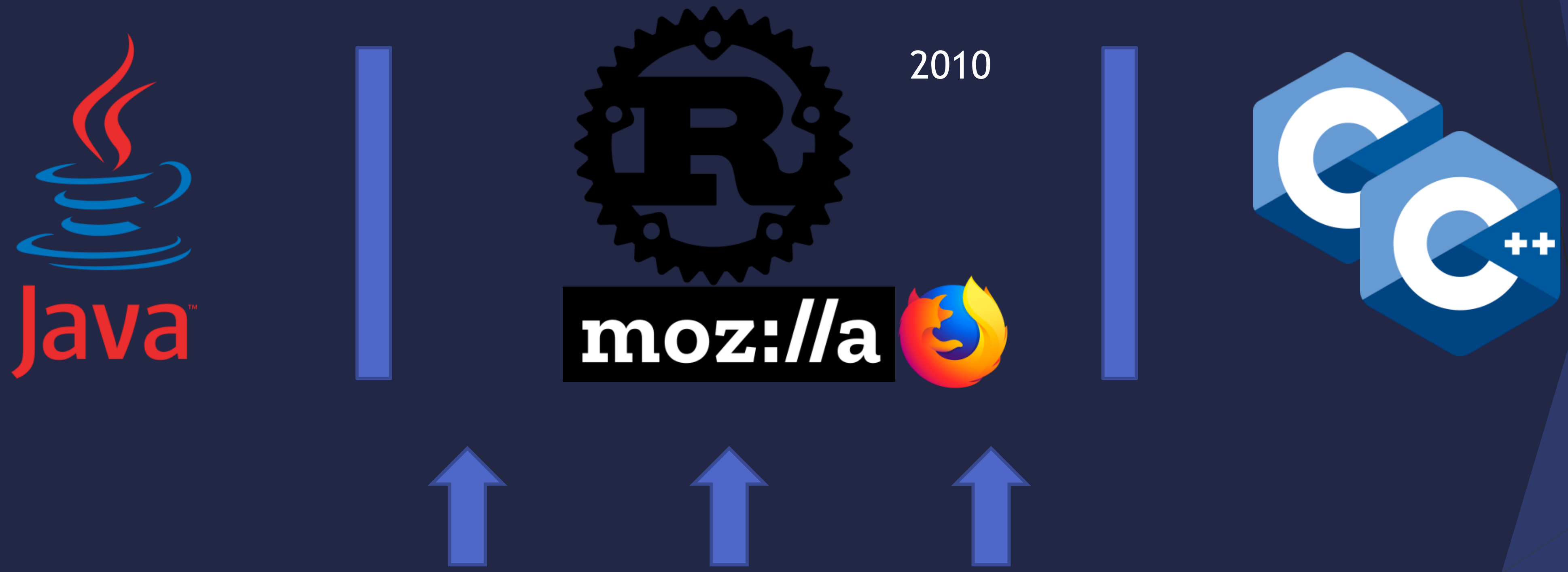
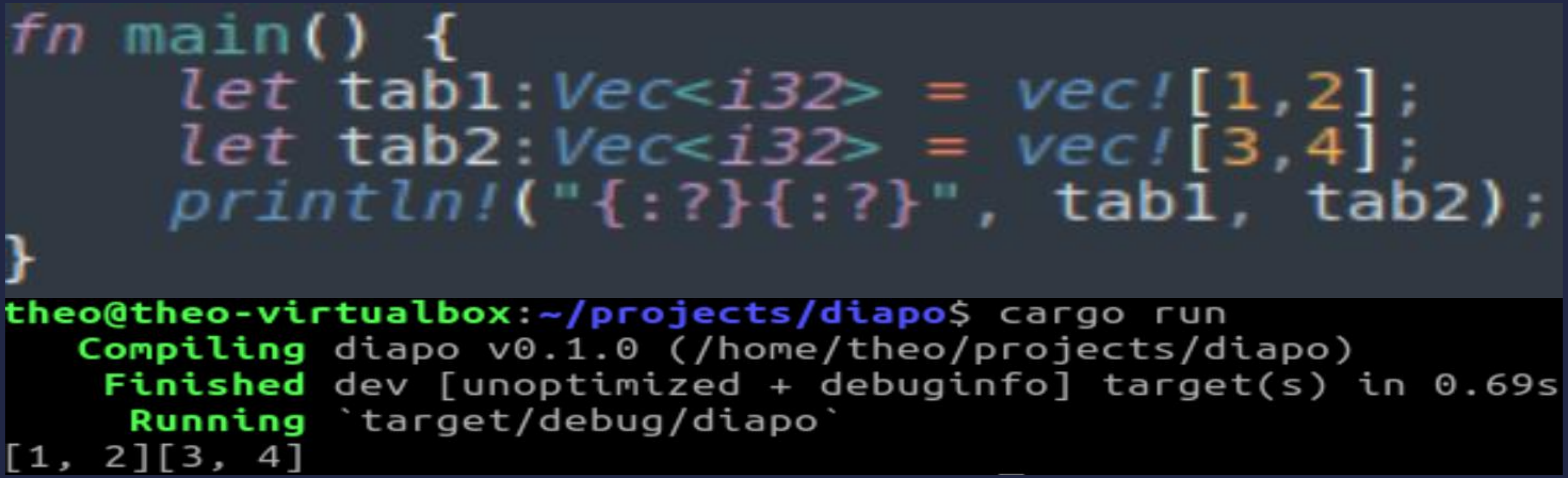
Résumé

- Rust
- Principe d’Ownership
- Variables mutables / non mutables
- Notion de Lifetime

Rust



Principe d’Ownership

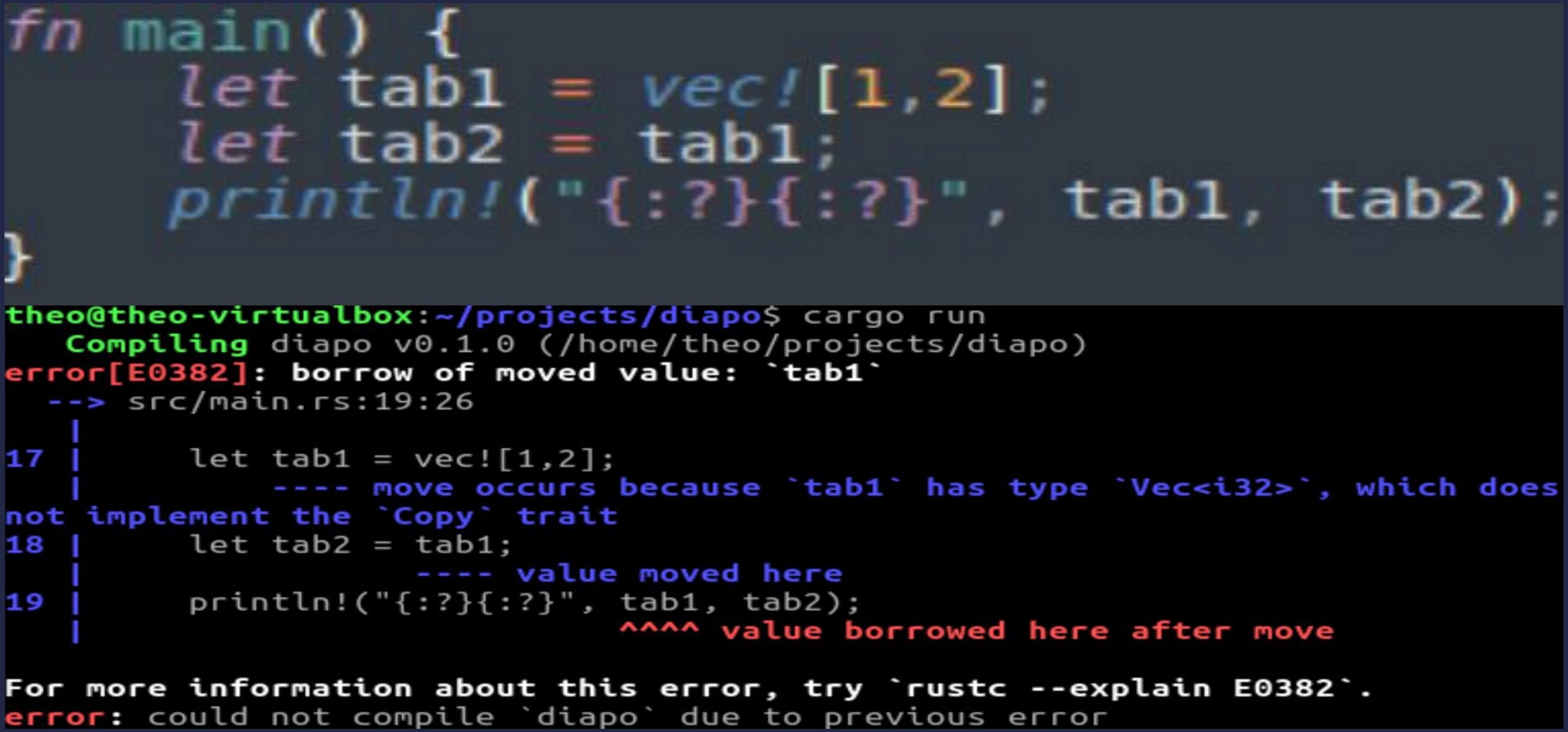


```
fn main() {
    let tab1:Vec<i32> = vec![1,2];
    let tab2:Vec<i32> = vec![3,4];
    println!("{:?}{:?}", tab1, tab2);
}
```

```
theo@theo-virtualbox:~/projects/diapo$ cargo run
   Compiling diapo v0.1.0 (/home/theo/projects/diapo)
    Finished dev [unoptimized + debuginfo] target(s) in 0.69s
     Running `target/debug/diapo`
[1, 2][3, 4]
```

✓

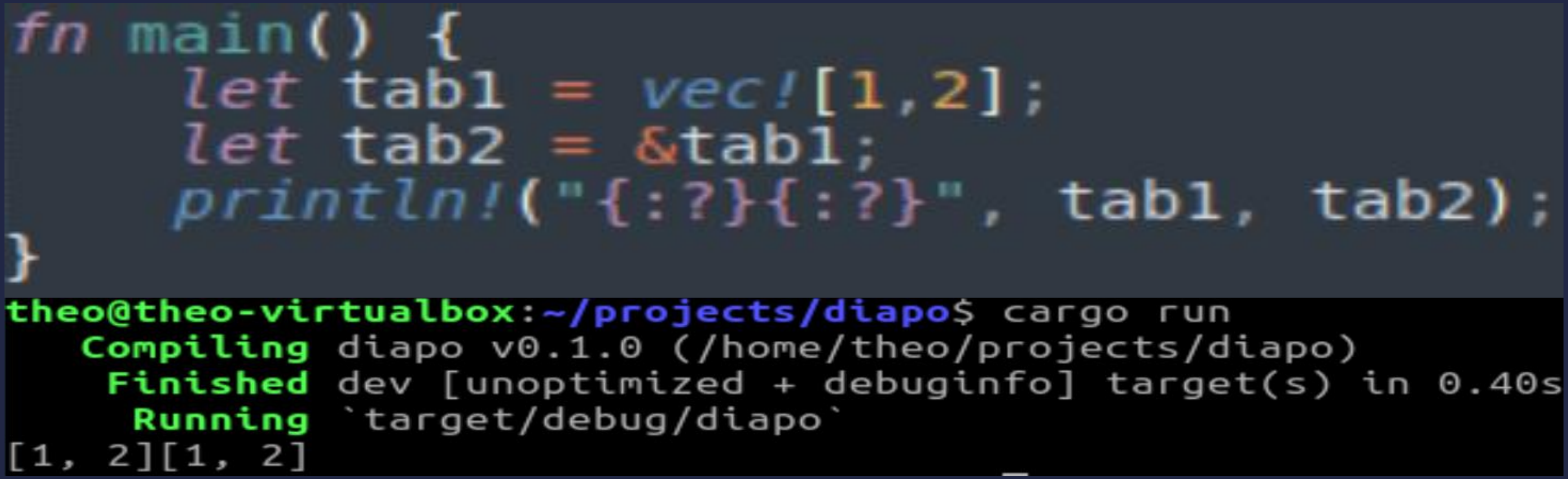
Principe d'Ownership



```
fn main() {
    let tab1 = vec![1,2];
    let tab2 = tab1;
    println!("{:?}{:?}", tab1, tab2);
}
```

```
theo@theo-virtualbox:~/projects/diapo$ cargo run
   Compiling diapo v0.1.0 (/home/theo/projects/diapo)
error[E0382]: borrow of moved value: `tab1`
  --> src/main.rs:19:26
   |
17 |     let tab1 = vec![1,2];
   |         ---- move occurs because `tab1` has type `Vec<i32>`, which does
not implement the `Copy` trait
18 |     let tab2 = tab1;
   |                ---- value moved here
19 |     println!("{:?}{:?}", tab1, tab2);
   |                          ^^^^ value borrowed here after move

For more information about this error, try `rustc --explain E0382`.
error: could not compile `diapo` due to previous error
```

Principe d’Ownership

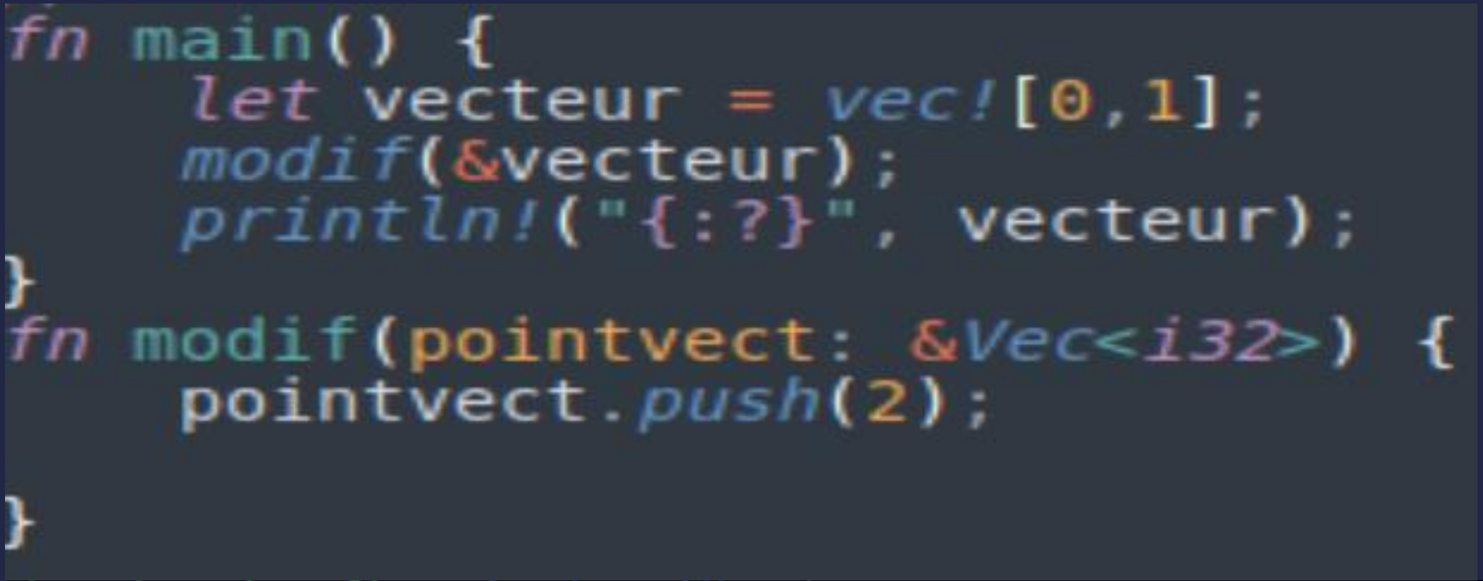


```
fn main() {
    let tab1 = vec![1,2];
    let tab2 = &tab1;
    println!("{:?}{:?}", tab1, tab2);
}
```

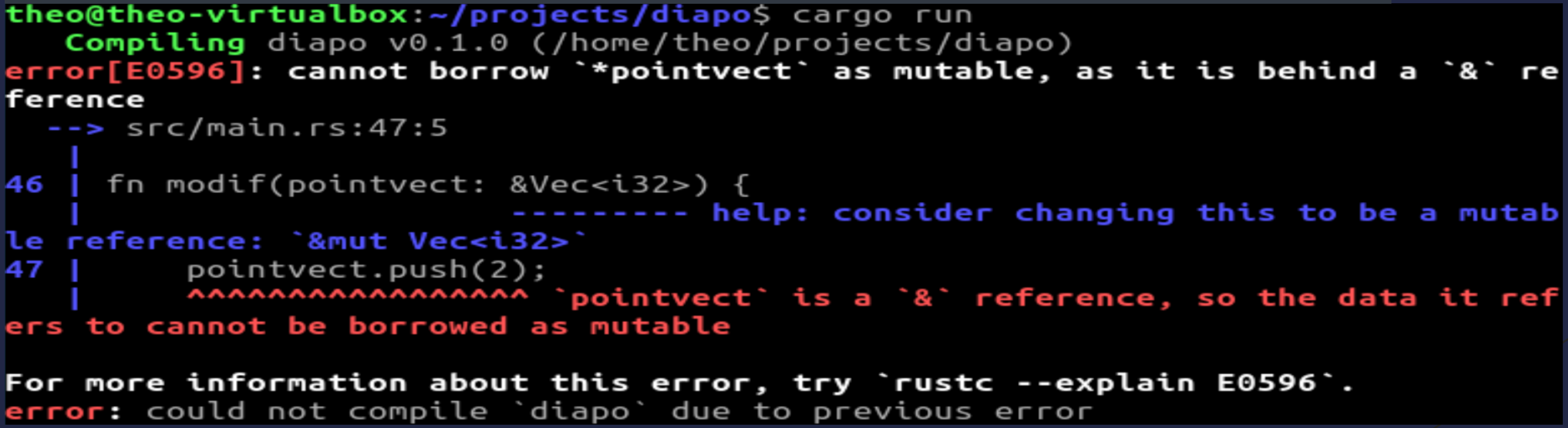
```
theo@theo-virtualbox:~/projects/diapo$ cargo run
   Compiling diapo v0.1.0 (/home/theo/projects/diapo)
    Finished dev [unoptimized + debuginfo] target(s) in 0.40s
     Running `target/debug/diapo`
[1, 2][1, 2]
```

✓

Variable mutable / non mutable

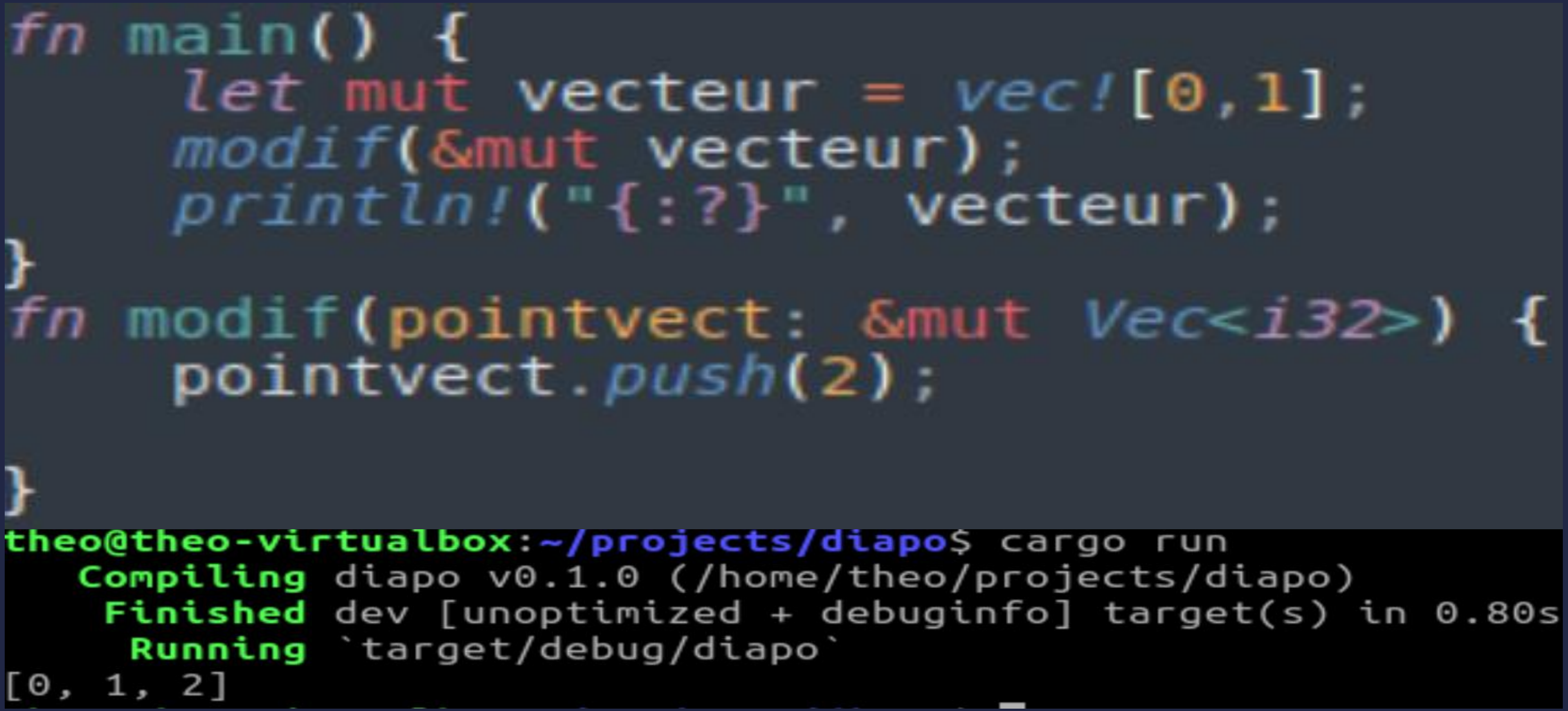


```
fn main() {
    let vecteur = vec![0,1];
    modif(&vecteur);
    println!("{:?}", vecteur);
}
fn modif(pointvect: &Vec<i32>) {
    pointvect.push(2);

}
```



```
theo@theo-virtualbox:~/projects/diapo$ cargo run
   Compiling diapo v0.1.0 (/home/theo/projects/diapo)
error[E0596]: cannot borrow `*pointvect` as mutable, as it is behind a `&` re
ference
  --> src/main.rs:47:5
   |
46 | fn modif(pointvect: &Vec<i32>) {
   |                     --------- help: consider changing this to be a mutab
le reference: `&mut Vec<i32>`
47 |     pointvect.push(2);
   |     ^^^^^^^^^^^^^^^^^ `pointvect` is a `&` reference, so the data it ref
ers to cannot be borrowed as mutable

For more information about this error, try `rustc --explain E0596`.
error: could not compile `diapo` due to previous error
```

Variable mutable / non mutable

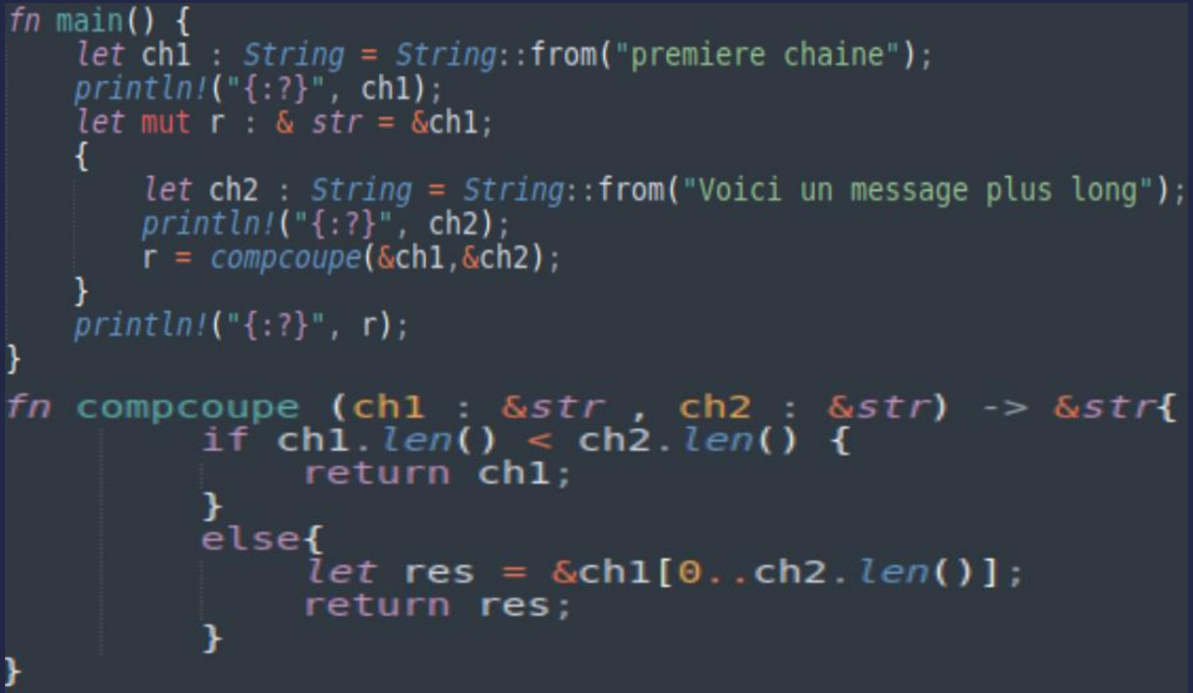


```
fn main() {
     let mut vecteur = vec![0,1];
     modif(&mut vecteur);
     println!("{:?}", vecteur);
}
fn modif(pointvect: &mut Vec<i32>) {
     pointvect.push(2);

}
```

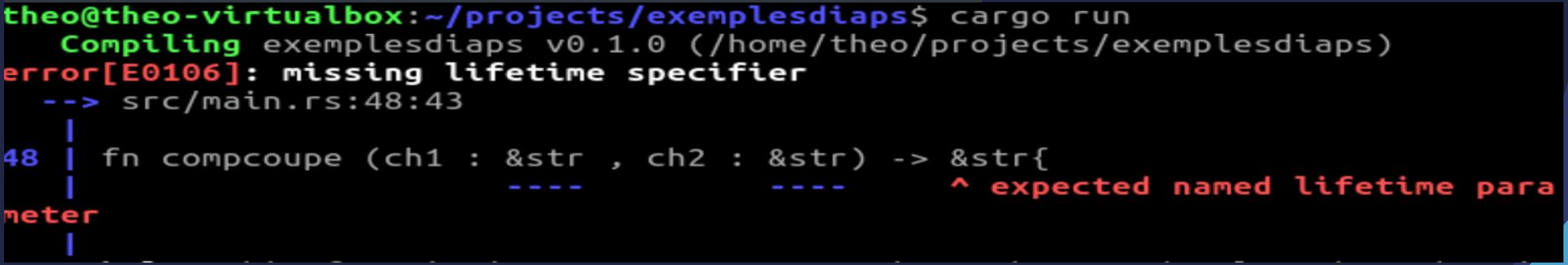
```
theo@theo-virtualbox:~/projects/diapo$ cargo run
   Compiling diapo v0.1.0 (/home/theo/projects/diapo)
    Finished dev [unoptimized + debuginfo] target(s) in 0.80s
     Running `target/debug/diapo`
[0, 1, 2]
```

✓

Lifetime

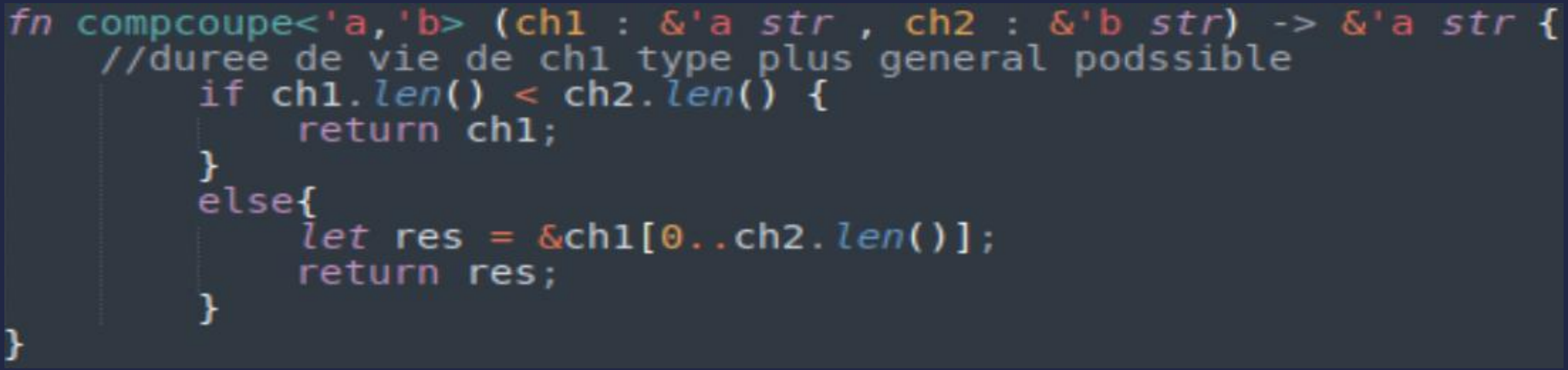


```rust
fn main() {
    let ch1 : String = String::from("premiere chaine");
    println!("{:?}", ch1);
    let mut r : & str = &ch1;
    {
        let ch2 : String = String::from("Voici un message plus long");
        println!("{:?}", ch2);
        r = compcoupe(&ch1,&ch2);
    }
    println!("{:?}", r);
}
fn compcoupe (ch1 : &str , ch2 : &str) -> &str{
        if ch1.len() < ch2.len() {
            return ch1;
        }
        else{
            let res = &ch1[0..ch2.len()];
            return res;
        }
}
```



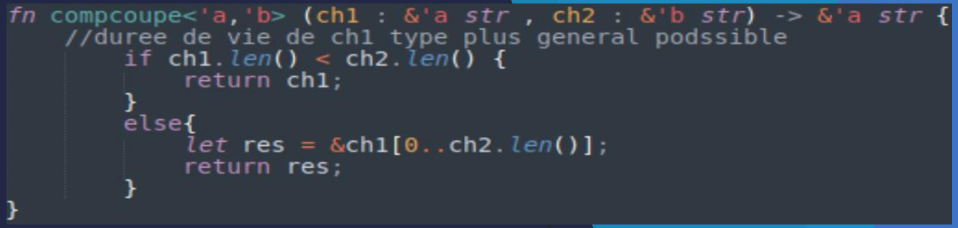
```
theo@theo-virtualbox:~/projects/exemplesdiaps$ cargo run
   Compiling exemplesdiaps v0.1.0 (/home/theo/projects/exemplesdiaps)
error[E0106]: missing lifetime specifier
  --> src/main.rs:48:43
   |
48 | fn compcoupe (ch1 : &str , ch2 : &str) -> &str{
   |                     ----             ----    ^ expected named lifetime para
meter
   |
```

Lifetime

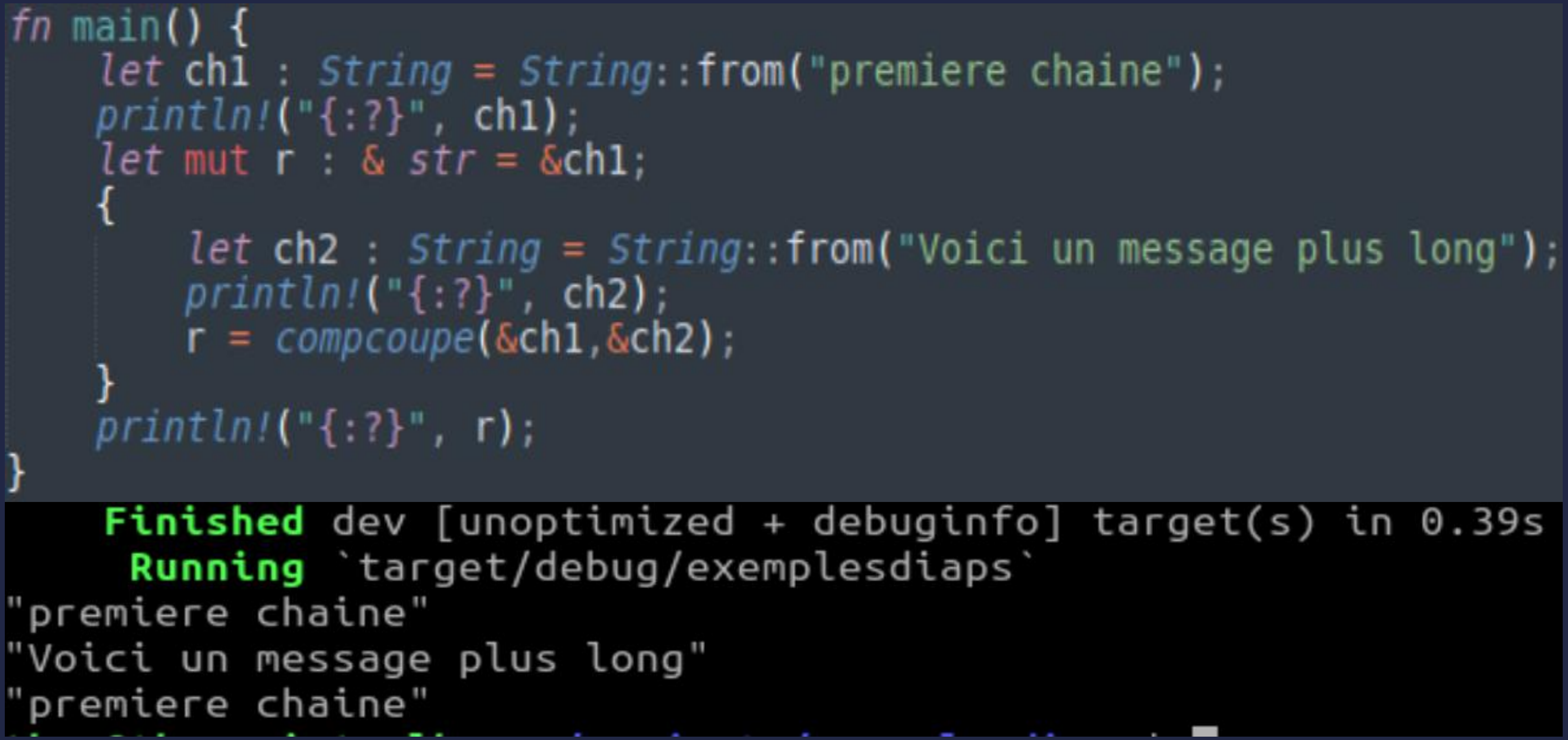


```
fn compcoupe<'a,'b> (ch1 : &'a str , ch2 : &'b str) -> &'a str {
    //duree de vie de ch1 type plus general podssible
        if ch1.len() < ch2.len() {
            return ch1;
        }
        else{
            let res = &ch1[0..ch2.len()];
            return res;
        }
}
```

Lifetime



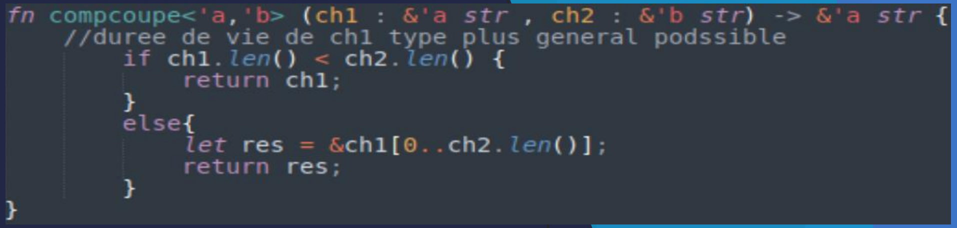
```
fn compcoupe<'a,'b> (ch1 : &'a str , ch2 : &'b str) -> &'a str {
    //duree de vie de ch1 type plus general podssible
        if ch1.len() < ch2.len() {
            return ch1;
        }
        else{
            let res = &ch1[0..ch2.len()];
            return res;
        }
}
```



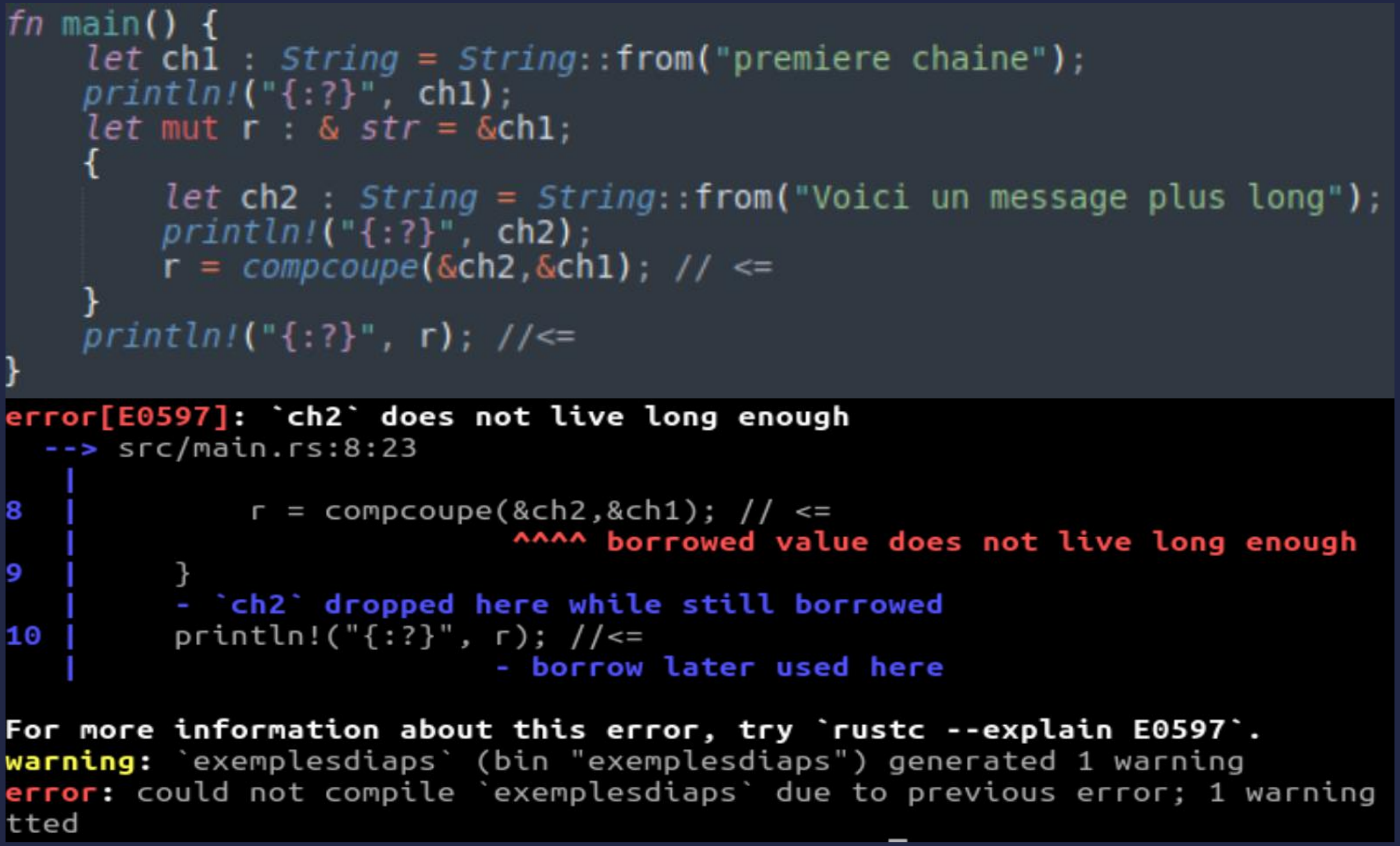
```
fn main() {
    let ch1 : String = String::from("premiere chaine");
    println!("{:?}", ch1);
    let mut r : & str = &ch1;
    {
        let ch2 : String = String::from("Voici un message plus long");
        println!("{:?}", ch2);
        r = compcoupe(&ch1,&ch2);
    }
    println!("{:?}", r);
}
```

```
    Finished dev [unoptimized + debuginfo] target(s) in 0.39s
     Running `target/debug/exemplesdiaps`
"premiere chaine"
"Voici un message plus long"
"premiere chaine"
```

Lifetime



```
fn compcoupe<'a,'b> (ch1 : &'a str , ch2 : &'b str) -> &'a str {
    //duree de vie de ch1 type plus general podssible
        if ch1.len() < ch2.len() {
            return ch1;
        }
        else{
            let res = &ch1[0..ch2.len()];
            return res;
        }
}
```



```
fn main() {
    let ch1 : String = String::from("premiere chaine");
    println!("{:?}", ch1);
    let mut r : & str = &ch1;
    {
        let ch2 : String = String::from("Voici un message plus long");
        println!("{:?}", ch2);
        r = compcoupe(&ch2,&ch1); // <=
    }
    println!("{:?}", r); //<=
}
```

```
error[E0597]: `ch2` does not live long enough
  --> src/main.rs:8:23
   |
8  |         r = compcoupe(&ch2,&ch1); // <=
   |                       ^^^^ borrowed value does not live long enough
9  |     }
   |     - `ch2` dropped here while still borrowed
10 |     println!("{:?}", r); //<=
   |                      - borrow later used here

For more information about this error, try `rustc --explain E0597`.
warning: `exemplesdiaps` (bin "exemplesdiaps") generated 1 warning
error: could not compile `exemplesdiaps` due to previous error; 1 warning
tted
```

Conclusion