

Cells

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Agenda

Story Time

What are Cells?

Cells In std

Other Cell Crates

Story Time

FFI and JNI

- **Creating Java objects requires JNI**
- **JNI uses identifiers**
- **How to cache?**

What are Cells?

Cells

- **Shareable mutable containers**
- **Borrow checker rules:**
 - You can have several immutable references (&T) to an object OR
 - Only 1 mutable reference (&mut T) to an object
- **Allow you to mutate an object when you have multiple references to it (interior mutability)**
- **Each Cell type has its own limitations to ensure memory safety**

A Brief Refresher

<https://play.rust-lang.org/?version=stable&mode=debug&edition=2021&gist=f4a322b7b57e787a211bb39c1736529d>

Cells In std

Cell Examples

<https://play.rust-lang.org/?version=stable&mode=debug&edition=2021&gist=5fc628cd1b9b02f8e9c13ea71cd5f2e9>

When should we use Cells?

- **Mutating values behind smart pointers (Arc, Rc)**
- **Exposing immutable APIs with hidden mutable implementations**
- **Creating mutable implementations of traits that take &self**
- **Initialising values one time only**

`std::sync`

- `RwLock<T>`
- `Mutex<T>`
- `OnceLock<T>`
- `LazyLock<T, F>`

Examples

<https://play.rust-lang.org/?version=stable&mode=debug&edition=2021&gist=5cd29b2b057edc7e758cdf9e9997cee8>

Other Cell Crate

once_cell

- https://crates.io/crates/once_cell
- Provides two "new" Cell types:
 - `unsync::OnceCell`
 - `sync::OnceCell`
- Can only be assigned to once
- Replacement for `lazy_static` crate
- Has recently been moved into the std lib

Comparison with std

- https://docs.rs/once_cell/1.19.0/once_cell/#comparison-with-std

std types	once_cell types
<code>std::cell::OnceCell</code>	<code>once_cell::unsync::OnceCell</code>
<code>std::cell::LazyCell</code>	<code>once_cell::unsync::Lazy</code>
<code>std::sync::OnceLock</code>	<code>once_cell::sync::OnceCell</code>
<code>std::sync::LazyLock</code>	<code>once_cell::sync::Lazy</code>

What's Missing?

- **The entire `once_cell::race` module is not in `std`**
 - **OnceBool**
 - **OnceBox**
 - **OnceNonZeroUsize**
 - **OnceRef**

Other Cells

Seem to be useful for some more niche cases not covered by std:

- [https://crates.io/crates/async once cell](https://crates.io/crates/async_once_cell)
- [https://crates.io/crates/generic once cell](https://crates.io/crates/generic_once_cell)

These ones are largely replaced by std's OnceCell implementations and are not too popular/not maintained:

- <https://crates.io/crates/lazycell>
- <https://crates.io/crates/lazy-init>
- <https://crates.io/crates/mitochondria>
- <https://github.com/niklasf/double-checked-cell>