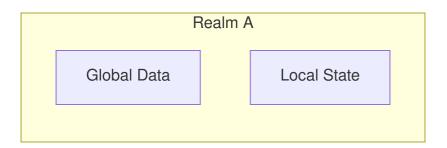
# Interrealm in Gno

A deep dive into Gno's realm system and rules

#### What is a Realm?

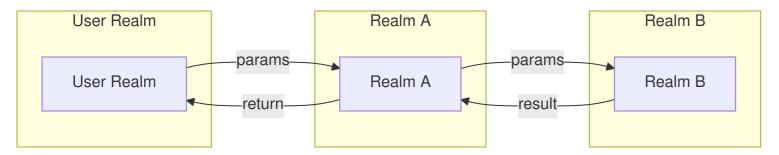
- A realm is an isolated execution and storage context

- Each realm has:
  - Its own state and authority
  - Rules for entry and data modification
- Realms enforce:
  - Security, Traceability and Isolation



#### Interrealm Flow

#### Realm method call



#### Provenance stack

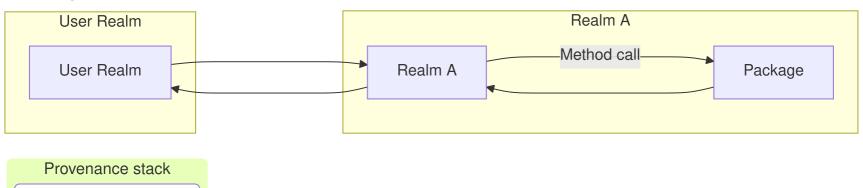
Current Realm: B

Called from: A

Origin: User Realm

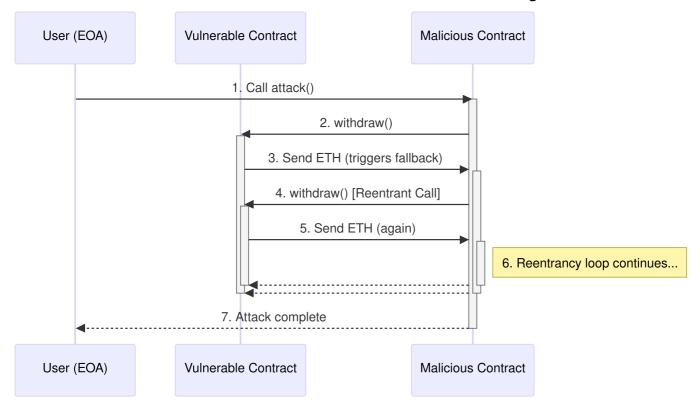
#### **Interrealm Flow**

### Package method call



Current Realm: A
Origin: User Realm

# But it instaure crucial flaw - Reentrency attack

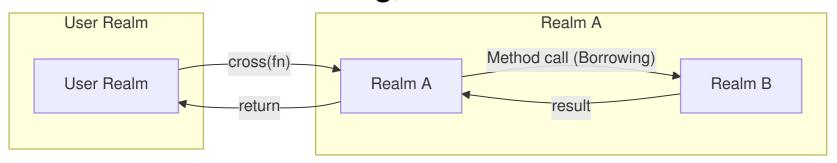


### Let's introduce Borrowing

Less permissive call for a more secure environment.

- **Borrowing** = calling a method on an object in another realm.
- You implicitly visit the object's realm for that method call.
- You can **read and modify** the receiver and its reachable state.
- Limit: You cannot freely create new root-level objects.

# **Interrealm Flow (Borrowing)**



#### Provenance stack

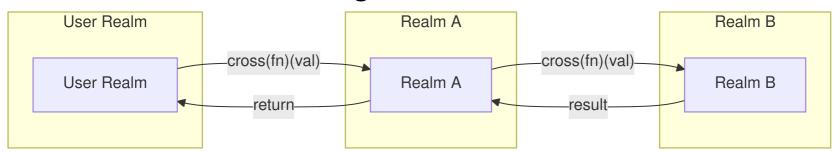
Current Realm: A

Origin: User Realm

### Crossing

- **Explicitly switch** into another realm.
- Crossing = cross(fn)(...) or functions marked with crossing().
- Gain full write access to the realm's global storage like it used to.
- Use for **creating new objects** or performing realm-specific logic.

# **Interrealm Flow (Crossing)**



#### Provenance stack

Current Realm: B

Called from: A

Origin: User Realm

# **Inter-realm Flow (Crossing)**

#### Realm A

```
func CallCreatePost(title, content string) {
    cross(CreatePost)(title, content)
}
```

#### Realm B

```
func CreatePost(title, content string) {
   newPost := Post{
        Title: title,
        Content: content,
   }
   Posts = append(Posts, *newPost)
}
```

# **Rules Summary**

Action	Borrowing	Crossing
Modify existing object	via method call	
Create new unattached object	×	
Implicit realm context change	No (temporary for method)	Yes (permanent inside fn)
Method syntax	obj.Method()	<pre>cross(fn)() + crossing()</pre>

# **Code Example: Borrowing**

```
// In realmB
func (b *Book) SetTitle(new string) {
  b.Title = new // Allowed: borrowing b's realm
}

// In realmA
book := &realmB.Book{}
book.SetTitle("Hello Gno")
```

# **Code Example: Crossing**

```
// In realmB
func CreateUser(name string) {
  crossing()
  user := &User{Name: name}
  users[name] = user // Global storage in realmB
}

// In realmA
cross(realmB.CreateUser)("alice")
```

#### **Best Practices**

- 1. Default to **non-crossing** methods.
- 2. Use **borrowing** for object-specific ops.
- 3. Reserve **crossing** for realm-level state changes.
- 4. Always mark public crossable functions with crossing().

### Summary

- **Realms** = isolated worlds.
- **Borrowing** = temporary, object-scoped access.
- Crossing = explicit realm switch for full access.
- Choose the right approach for **security** and **clarity**.