

# An Overview to Game Development Using Rust

## A Toxic Relationship With Rust

Marti

OmniMeet

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# Where am I?

- 1 What is Bevy?
- 2 Why use Bevy for game development?
- 3 How does Bevy works?
  - ECS Architecture
  - Imagine that you have a cow (Conceptual Example)
  - How Entitis Work in Bevy?
  - Bevy's Rendering Pipeline
  - Resources and Components
  - How to access Resources and Components in Systems?
  - Spawning Entities with Components
- 4 Building a simple game with Bevy.
- 5 Conclusion

# Bevy Game Engine



**Bevy** is an open-source data-driven game engine built in Rust.

- It emphasizes simplicity, modularity, and performance.
- Bevy uses an Entity-Component-System (ECS) architecture.
- It provides a range of features including 2D/3D rendering, audio, input handling, and more.

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# Advantages of Bevy

- **Rust Language:** Memory safety without garbage collection, zero-cost abstractions, and fearless concurrency.
- **ECS Architecture:** Promotes clean code organization, scalability, and high performance through data-oriented design.
- **Cross-Platform:** Deploy to Windows, macOS, Linux, Web (WASM), iOS, and Android from a single codebase.
- **Open Source:** MIT/Apache 2.0 licensed, actively maintained by a vibrant community.
- **Code-Driven:** Pure code workflow with no lock-in to proprietary editors (Official editor in development).
- **Modular Design:** Use only what you need - built as a collection of plugins you can mix and match.

# Bevy vs Other Engines



Godot



Unity



Unreal Engine

- **Lightweight:** Lightweight compared to larger engines.
- **Flexibility:** More control over low-level systems and architecture.
- **Paradigm:** ECS is still not really popular in general.

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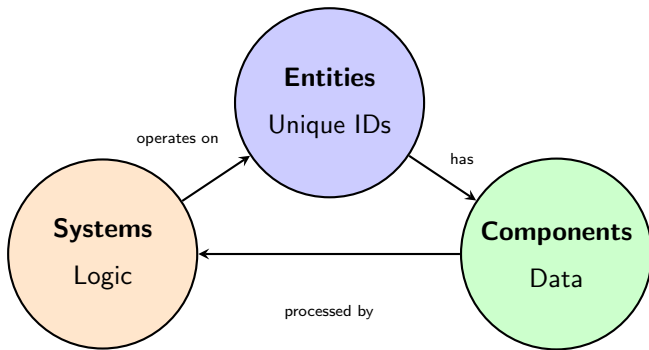
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# Entity-Component-System (ECS)



## Entities

Unique identifiers representing objects in the game world

## Components

Data containers that hold attributes of entities

## Systems

Logic that operates on entities with specific components

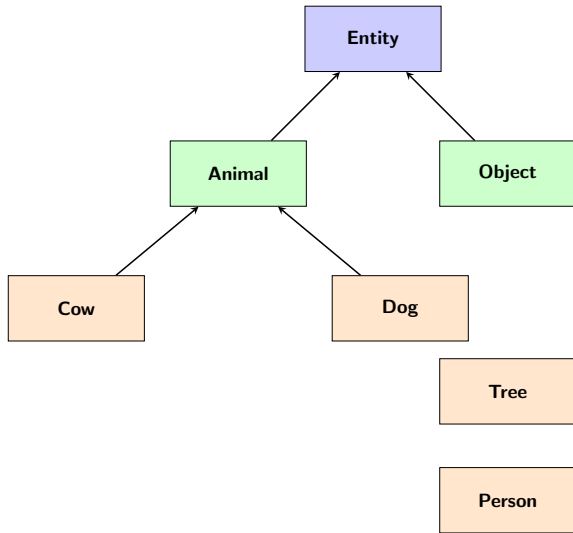
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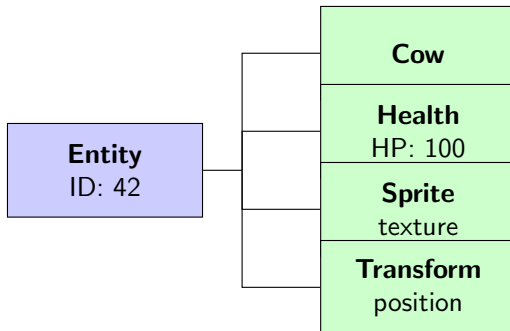
# Traditional OOP Approach

## Shitty Inheritance Hierarchy



# ECS Approach

Nice GIGACHAT and Clean Composition

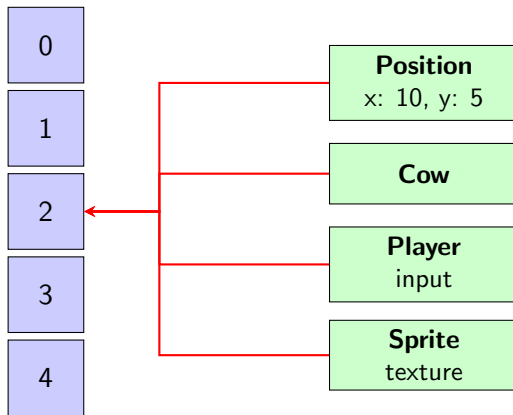


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# Entities in Bevy

## Entity Array



# Outline

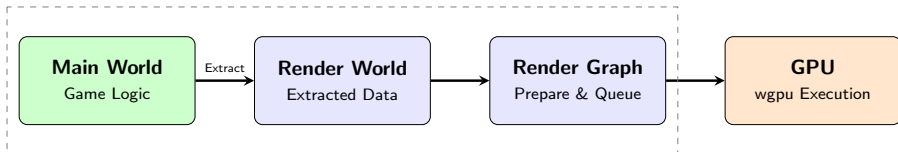
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# Rendering in Bevy

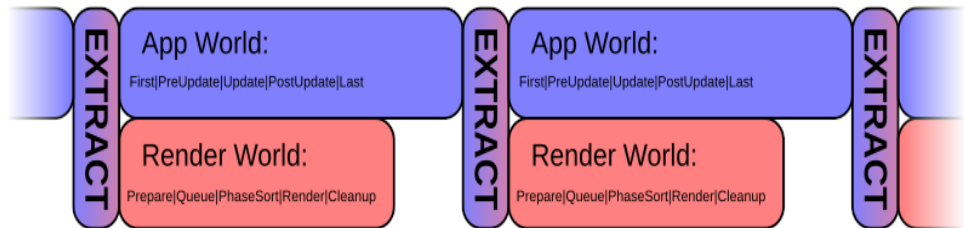
For more info check <https://bevy-cheatbook.github.io/gpu/intro.html>

## CPU Parallel Stages

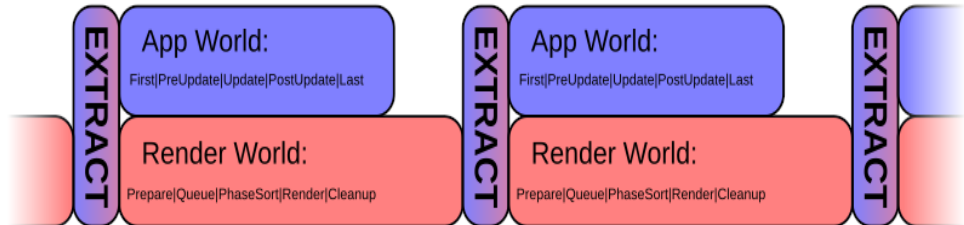


- **Pipelined:** Rendering logic runs in parallel with the next frame's game logic.
- **wgpu:** Modern backend supporting Vulkan, Metal, DX12, and WebGPU.
- **Render Graph:** Modular and customizable rendering passes.

## App-Bound Scenario (app takes longer than render):



## Render-Bound Scenario (render takes longer than app):



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# Resources vs Components

## Components

Data attached to entities

- Attached to specific entities
- Multiple instances exist
- Defines object properties
- Examples: Position, Health, Sprite

## Resources

Global unique data

- Accessible by all systems
- Only one instance exists
- Defines world state
- Examples: Time, Score, AssetServer

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# Creating a Plugin

```
use bevy::prelude::*;

#[derive(Resource, Default)]
struct Score(u32);

pub struct GamePlugin;

impl Plugin for GamePlugin {
    fn build(&self, app: &mut App) {
        app.init_resource::()
            .add_systems(Startup, setup)
            .add_systems(Update, update_score);
    }
}

fn setup() { println!("Game Started"); }
fn update_score(mut score: ResMut<Score>) { score.0 += 1; }
```

# Bevy System Parameters

```
use bevy::prelude::*;
fn my_system(
    mut query: Query<&mut Transform>, // Access Components
    time: Res<Time>, // Access Resource
) {
    for mut transform in query.iter_mut() {
        transform.translation.x += time.delta_seconds() * 100.0;
    }
}
```

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# Creating Entities in Bevy

```
use bevy::prelude::*;  
fn spawn_entity(mut commands: Commands) {  
    commands.spawn((  
        Transform::default(),  
        Sprite::default(),  
        Health(100),  
    ));  
}
```

# Querying Entities in Bevy with some logic

```
fn query_enemies(query: Query<Entity, (With<Health>, Without<Cow>)>>){
    for enemy in query.iter() {
        println!("Found enemy entity: {:?}", enemy);
    }
}
```

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# Building a Simple Game with Bevy

## Gragusi Survivor

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# Thank You!

## Q&A



## Queso y Ambutido