

Using React with the Godot Game Engine

Also, adding Javascript to your game for good and sometimes bad reasons

I'm DM!

- I make video games
- I like to make life difficult for myself



I'm DM!



- I make video games

- **I like to make life difficult for myself**

Using React with the Godot Game Engine

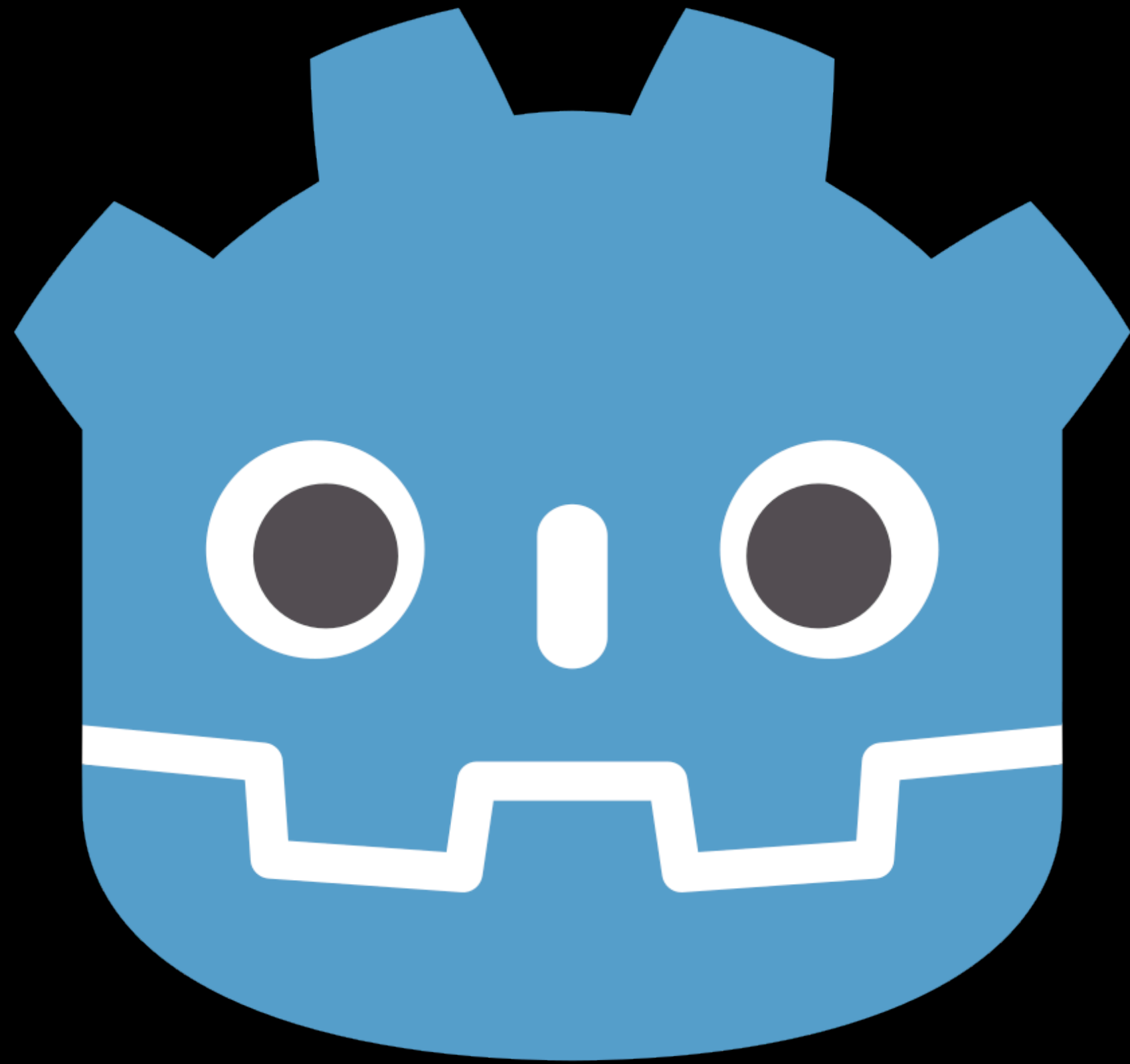


React

The library for web and native user interfaces

[Learn React](#)

[API Reference](#)



GODOT

Game engine

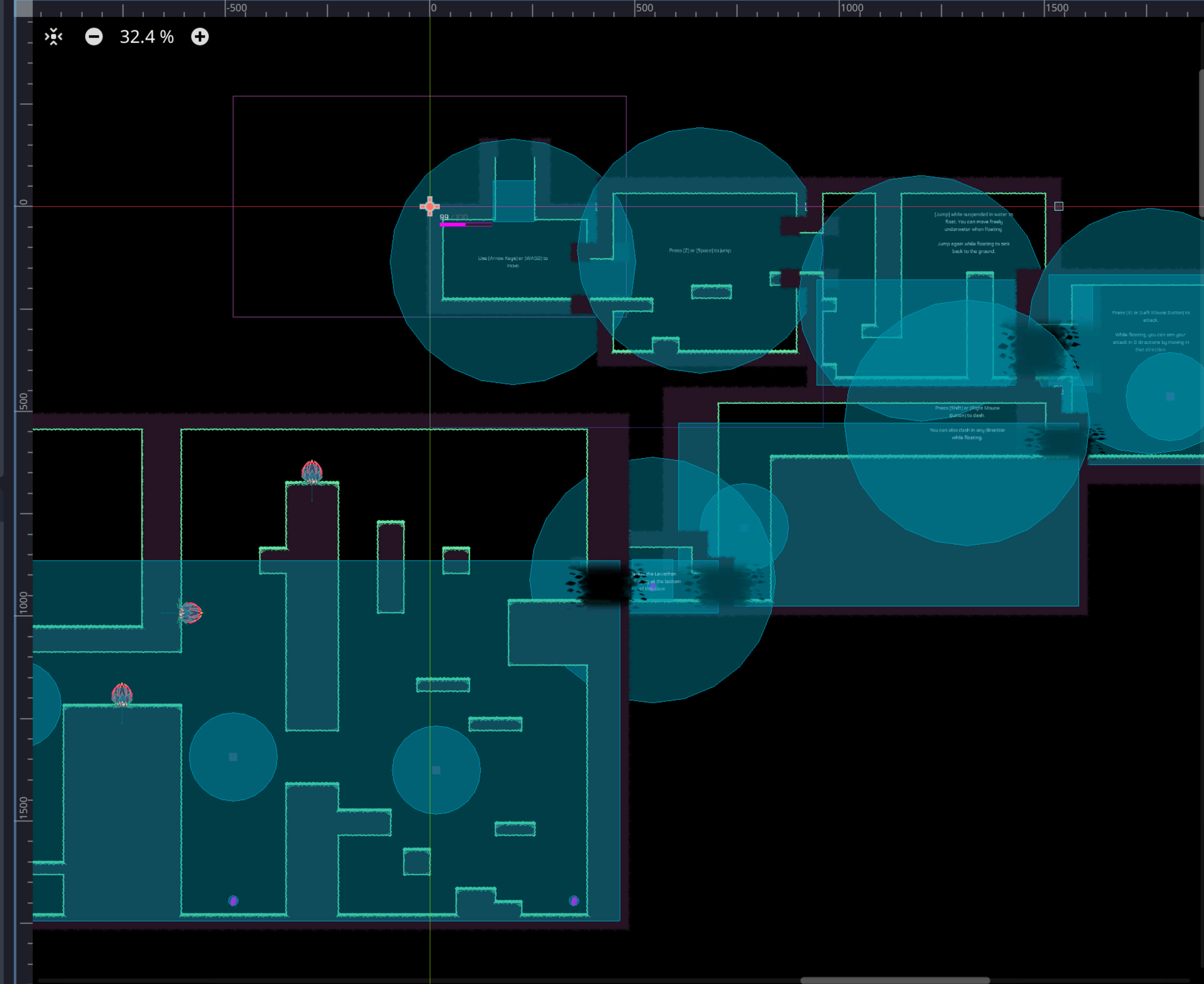
Filter: name, t:t

View

Inspector Node History

world_main

- World
- UI



UI

Node2D

Transform

- Position: x 0 px, y 0 px
- Rotation: 0°
- Scale: x 1, y 1
- Skew: -0°

CanvasItem

- > Visibility
- > Ordering
- > Texture
- > Material

Node

- > Process
- > Editor Description

Script <empty>

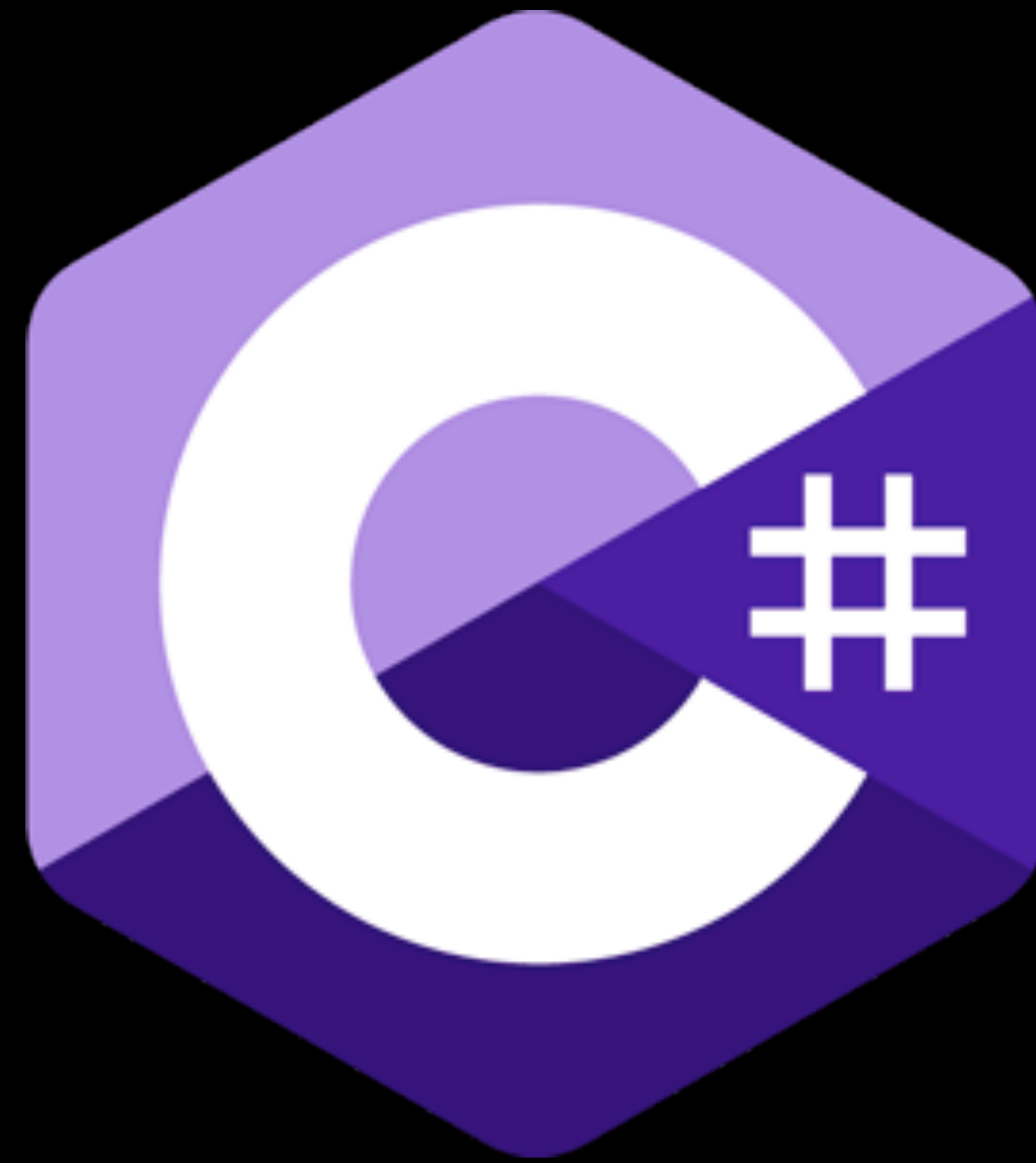
+ Add Metadata

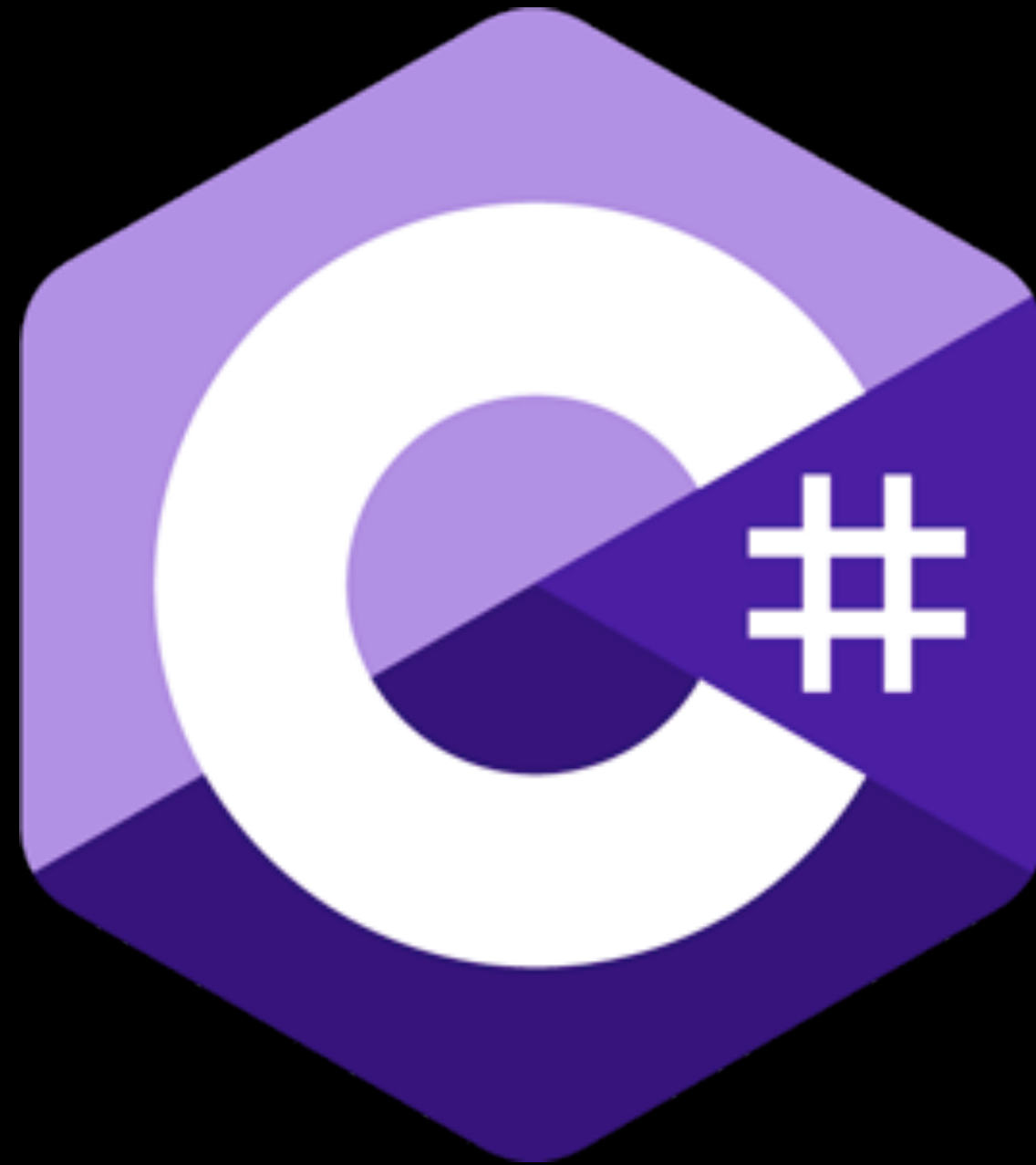
FileSystem

res://

Filter Files

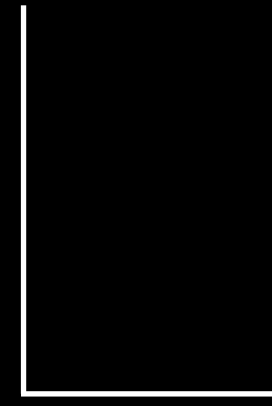
- Favorites:
- res://
 - addons
 - assets
 - common
 - leviathan
 - export_presets.cfg
 - icon.svg
 - main.tscn
 - README.md



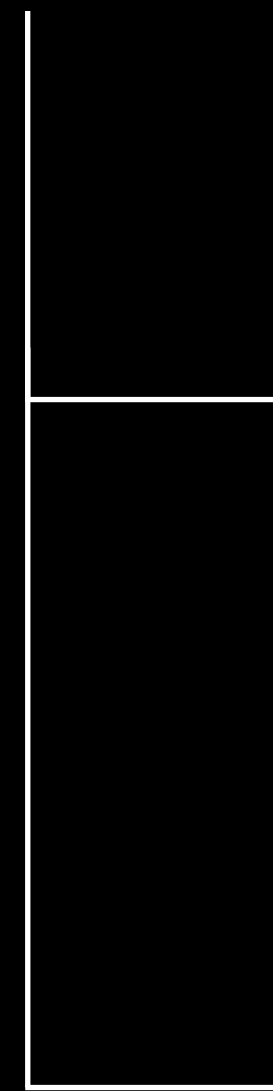


(Yes, it's not Javascript,
we'll get there)

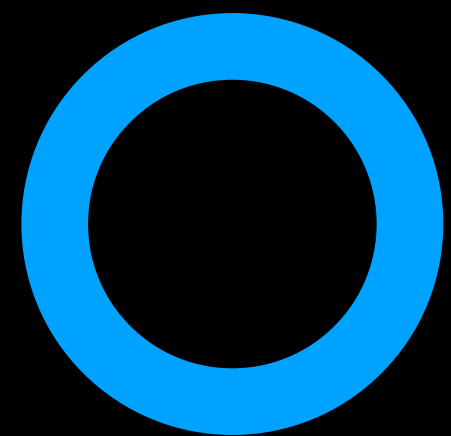
 Scene



 Level



 Player

 Enemy



Control



VBoxContainer



Label



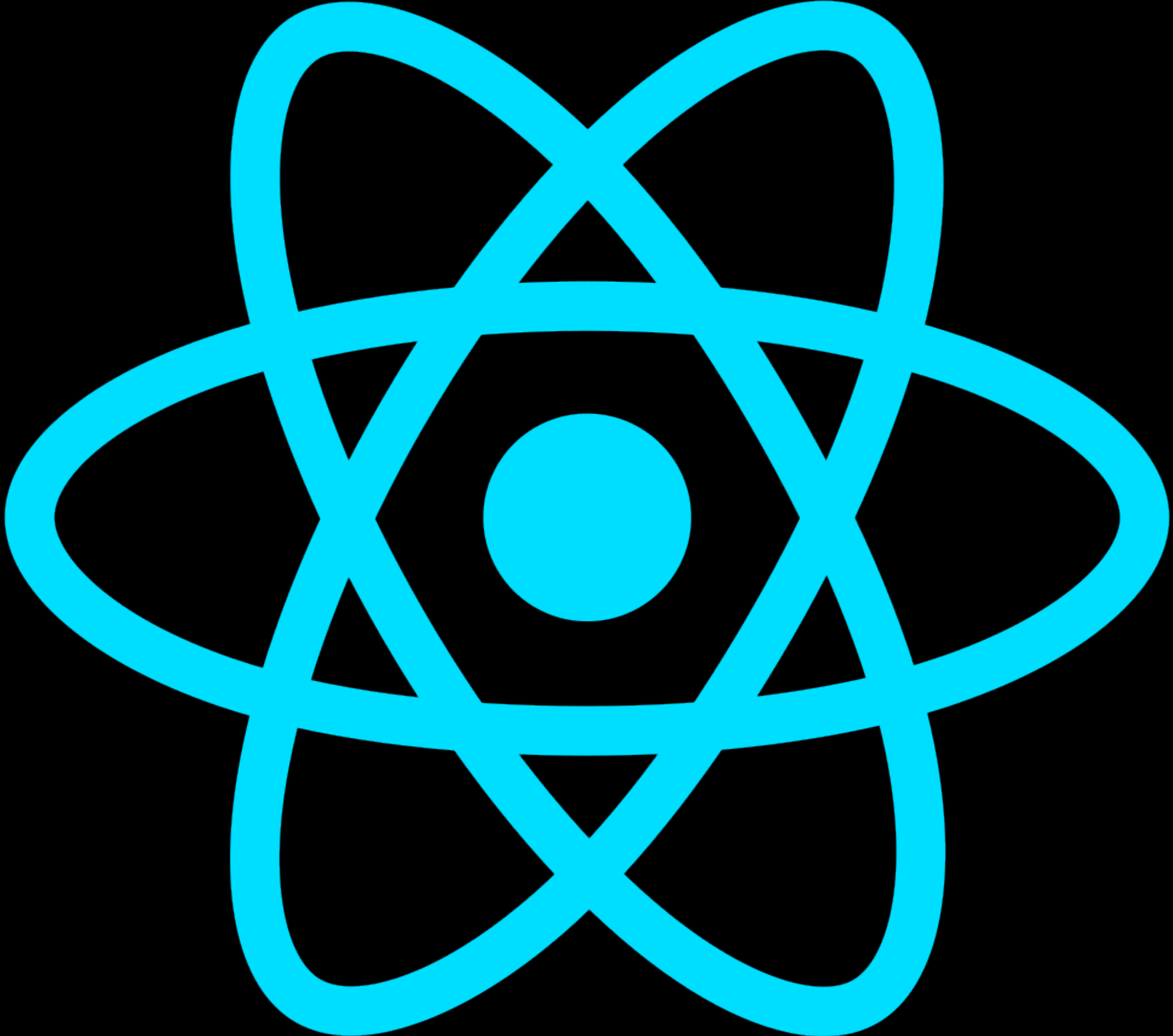
Button

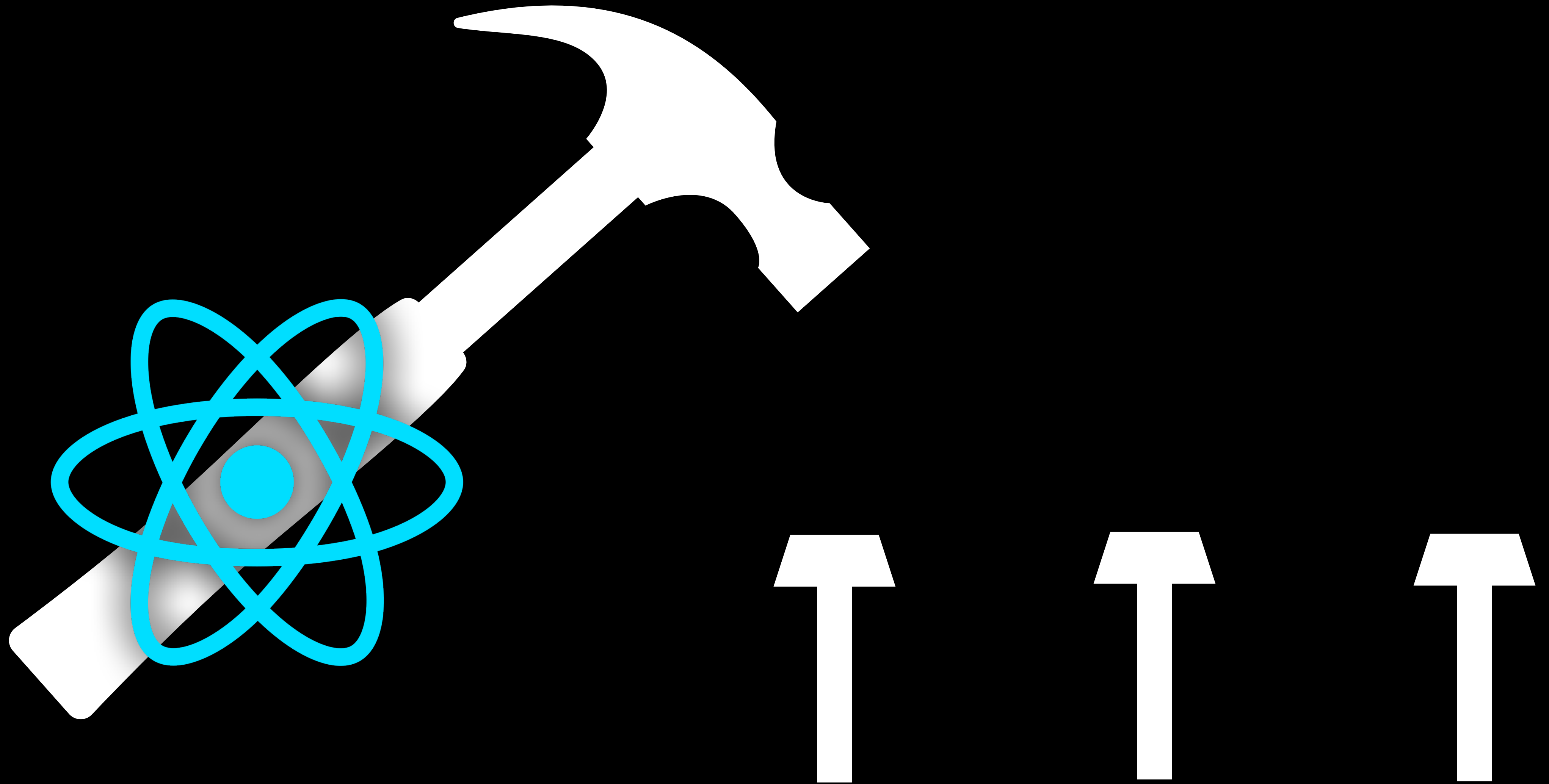


Hello World

Click me

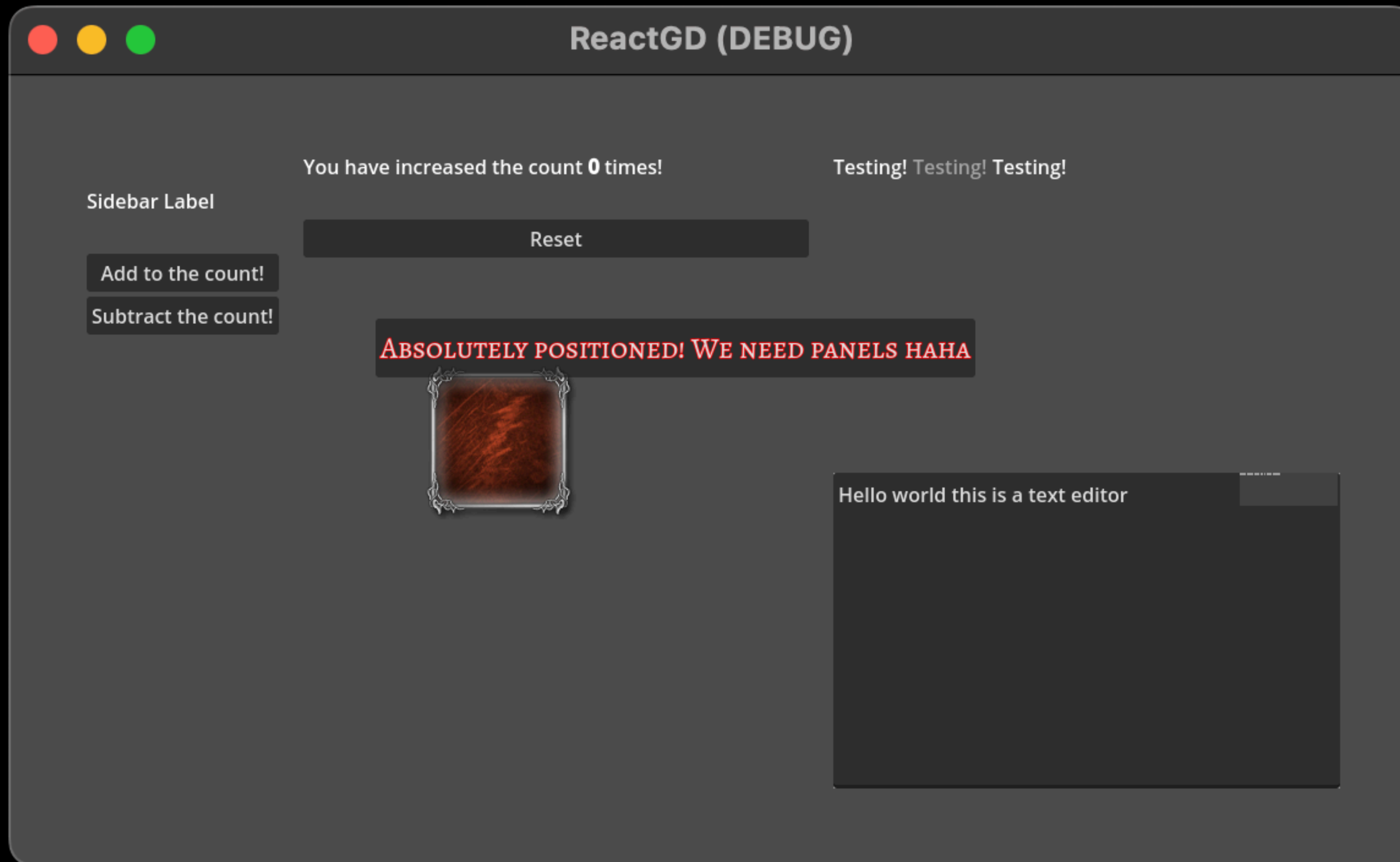
```
<section>
  <div>
    <h1>Hello World</h1>
    <button>Click</button>
  </div>
</section>
```





But we really can just do that

I'll do an actual demo later, right now I'm just saying you can



**Problem: Godot code is written
in C#**

**Solution: Just add Javascript to
your C#!**



V8[®]

Original

100%
Vegetable Juice
FROM CONCENTRATE WITH
ADDED INGREDIENTS

60
CALORIES
PER CAN

2
FULL SERVINGS OF
Vegetables*

NET 11.5 FL. OZ. (340mL)





ClearScript 7

Add scripting to your .NET applications quickly and easily.

```
_engine = new V8ScriptEngine();  
_engine.AddHostType("GD", typeof(GD));  
...  
  
using var file = Godot.FileAccess.Open(  
    "res://app/dist/index.js",  
    Godot.FileAccess.ModeFlags.Read  
);  
_engine.Execute(file.GetAsText());
```

**Ok great! But how does React
talk to the engine?**



React

The library for web and native user interfaces

[Learn React](#)

[API Reference](#)

It's actually two libraries!

- React
- React-DOM

react -> core tools to create components and manage UI state

- Built-in components (Fragment, Suspense)
- Hooks (useEffect, useState)
- Functions (memo, forwardRef)

react-dom -> contains components and methods that can be rendered in a web DOM view

- HTML components (div, p, img)
- Hooks (useFormState)
- Functions (I'm not sure, I've never used them)

React -> Data management

React-dom -> Turns state into UI



**This is called a
renderer!**

More renderers!

- React-native
- React-three-fiber
- React-email
- Redocx

Let's make a renderer for Godot
UI elements!

react-godot !!!

**Ok great! But how does React
talk to the engine?**

react-reconciler

react-reconciler

This is an experimental package for creating custom React renderers.

Its API is not as stable as that of React, React Native, or React DOM, and does not follow the common versioning scheme.

Use it at your own risk.

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**Ok that is way too long to
fit in a slide but it's actually
documented in code**

**[https://www.npmjs.com/package/
@types/react-reconciler](https://www.npmjs.com/package/@types/react-reconciler)**

```
const CustomReconciler = Reconciler({  
  ...  
  createInstance(type, props, root) {  
    ...  
  },  
  // insert many more functions here  
})
```



What do we actually need to implement?

- `createInstance(type, props, rootContainer)`
- `appendChild(parentInstance, child)`
- `removeChild(parentInstance, child)`
- `prepareUpdate(instance, type, prevProps, nextProps)`
- `commitUpdate(instance, updatePayload, type, prevProps, nextProps, internalHandle)`

Step 1: Create a DOM

```
public interface IDom
{
    public Node getNode();
    public void updateProps(JavaScriptObject newProps);

    public void clearChildren();
    public void appendChild(IDom node);
    public void removeChild(IDom node);
}
```



```
public partial class DomNode<T> : IDom
    where T : Godot.Node, new() {
    protected List<IDom> _children;
    protected T _instance;

    public void appendChild(IDom node) {
        _children.Add(node);
        _instance.AddChild(node.getNode());
    }
    public void removeChild(IDom node) {
        _children.Remove(node);
        _instance.RemoveChild(node.getNode());
        node.getNode().QueueFree();
    }
}
```



Step 2: Create the nodes for the DOM

```
public static IDom createElement(string type,
ScriptObject props, Document rootContainer) {
    IDom newNode;
    switch (type.ToLower()) {
        case "button":
            newNode = new DomNode<Button>();
            break;
        ...
    }
    return newNode;
}
```



```
const CustomReconciler = Reconciler({
  ...
  createInstance(type: string, props:
    ComponentProps<any>, rootContainer?: Document) {
    let element: IDom =
Document.createElement(type, props, rootContainer)
    return element
  },
})
```



Step 3: Hook it up to the reconciler API

```
const CustomReconciler = Reconciler({
  appendChild(parentInstance: IDom, child: IDom) {
    parentInstance.appendChild(child)
  },
  removeChild(parentInstance: IDom, child: IDom) {
    parentInstance.removeChild(child)
  },
  ...
})
```



Now `<button>` will create a new `Button` node!

Step 4: Render with the custom reconciler

```
export const render = (element: any, container:
Document = root) => {
  const node = CustomReconciler.createContainer(
    container)
  CustomReconciler.updateContainer(element, node)
}
```

```
render(<button>Click</button>)
```



Ok so it all works now, right?

Nope!

`setTimeout()`

^ This is a problem

setTimeout()

- It's not part of ECMAScript! It's a browser API!
- But React relies on it!
- So we need to make a custom version! In C#!

Oh, all the `setTimeout` calls are with a time of 0, so I can just remove them right?

Nope!

Whyyyyyyyyy?!

Time slicing!

What the heck is time slicing?

- Problem: long renders can cause the app to feel laggy

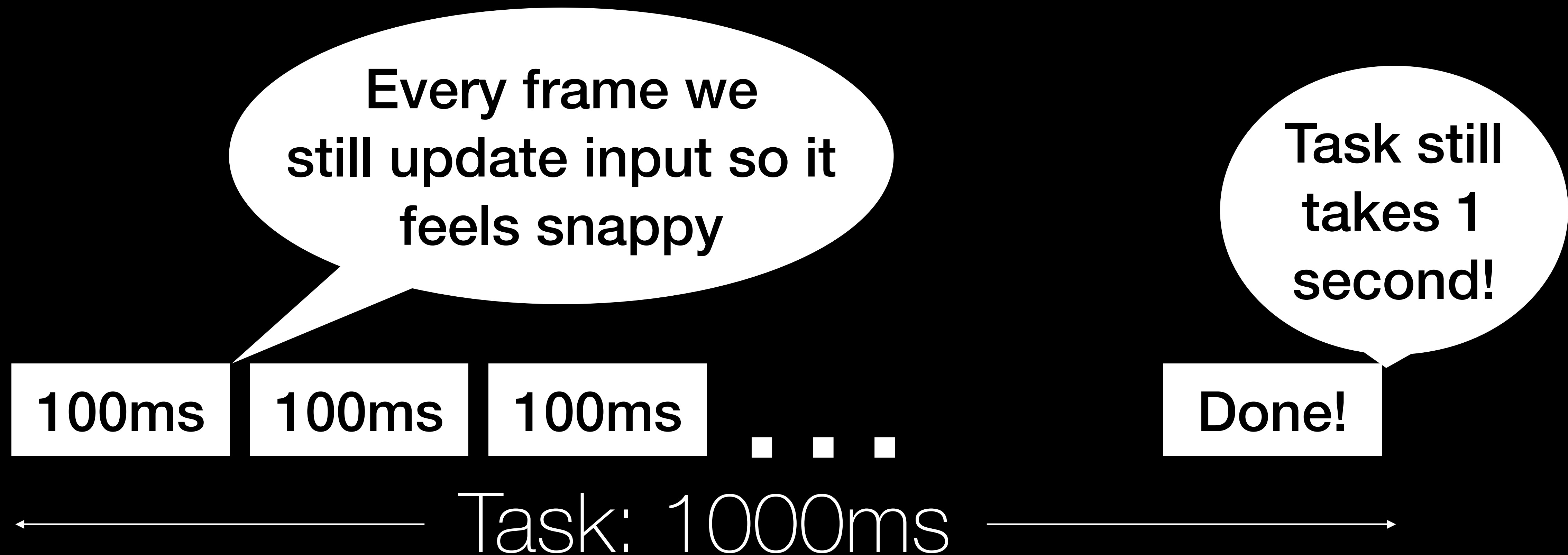
All
input is
frozen for 1
second!

Frame: 1000ms

← Task: 1000ms →

What the heck is time slicing?

- Solution: if a task has taken too long, **pause** and create a new frame and continue next frame!



setImmediate()

“This method is used to break up long running operations and run a callback function immediately after the browser has completed other operations such as events and display updates.”

IE and
Node.JS only

~~setImmediate()~~

“This method is used to break up long running operations and run a callback function immediately after the browser has completed other operations such as events and display updates.”

`setTimeout(task, 0)`

^ Ok but we never actually fixed
the problem???

**This is also a bit too long to fit on
a slide, oops.**

**But someone wrote a setTimeout
implementation in the ClearScript issues so I
didn't have to do it myself: [https://github.com/
microsoft/ClearScript/issues/475](https://github.com/microsoft/ClearScript/issues/475)**

```
let queue = [], nextId = 0, maxId = 1000000000000000000
const getNextId = () => (nextId = (nextId % maxId) + 1)
const add = (entry) => {
  // add a new entry to the queue
}
function set(periodic, func, delay) {
  add({ id, periodic, func, delay, due: now + delay })

  // called in C#
  impl.Schedule(queue[0].due - now)
  return id
}
global.setTimeout = set.bind(undefined, false)
```

```
public async void Schedule(double delay) {
    if (delay < 0) {
        if (_token != null) {
            _token.Cancel();
            _token = null;
        }
    } else if (delay == 0) {
        Schedule(_callback());
    } else {
        _token ??= new System.Threading.CancellationTokenSource();
        try {
            await Task.Delay((int)delay, _token.Token);
            Schedule(_callback());
        } catch (TaskCanceledException) {
            GD.Print("we canceled a task!");
        }
    }
}
```



**Ok after all that does it work
now?**

Yes!!

**“So, DM, did you actually make a
game with all this?”**

No!

(Remember what I said about making my life difficult?)

**This code is 100% not ready for
production**

Thank you!

Demo!

...do I even have any time left for this