

# Godot Engine 4.0 (Beta)

A completely free XR creation platform



Speaker: Patrick Reiter Horn



**GODOT**

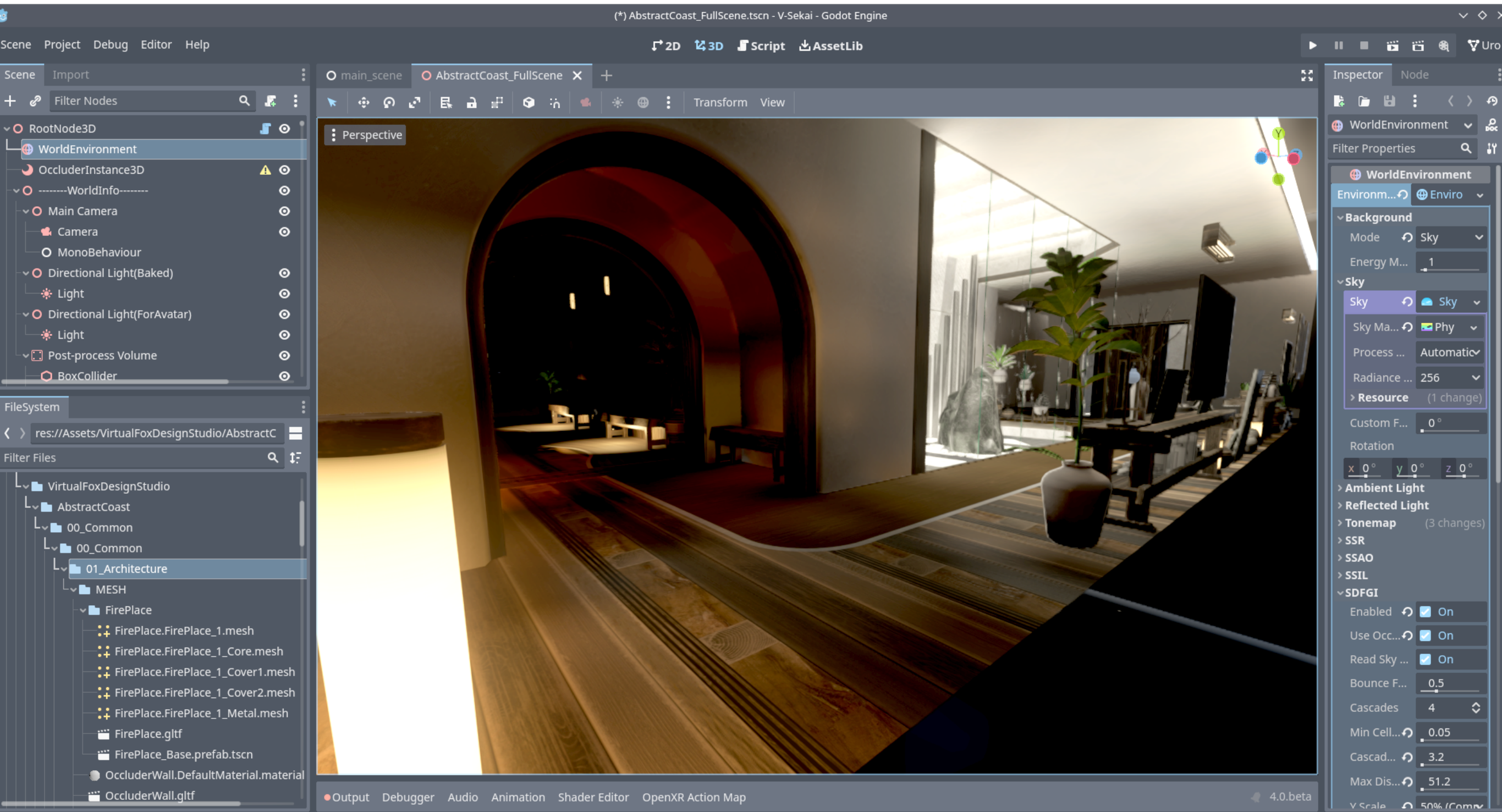
**FOSS XR 2022**

October 6, 2022



**V-Sekai**

# What is Godot?



*AbstractCoast by Lura*

# What is Godot?

- ❖ Simply put, a Game Engine
- ❖ © 2007-2022 Juan Linietsky, Ariel Manzur and contributors
- ❖ 15 years old, open source (MIT) since 2014
- ❖ Goals similar to commercial incumbents
  - ❖ Unreal Engine (3D)
  - ❖ Unity (3D)
  - ❖ GameMaker (2D)

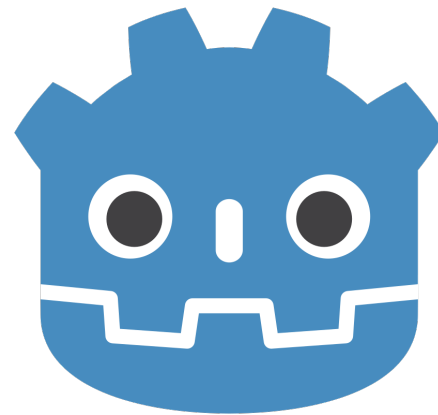
# Godot development community

- ❖ Open source (MIT)
- ❖ Public development:
  - ❖ GitHub for issues, proposals and pull requests.
  - ❖ AssetLib backed by git repos; GDExtension provides a clean ABI
  - ❖ Active discord for users. Many engine devs are active here.
  - ❖ Public developer RocketChat and Jitsi
- ❖ Fastest growing Game Engine (GMTK 2022 Game Jam data)



# Up to date standards

- ❖ Vulkan-native renderer
- ❖ Built-in OpenXR
- ❖ Linux: Wayland support? (WIP, [PR #57025](#))
- ❖ Windows: Direct3D 12? (WIP, [PR #64304](#))
- ❖ macOS / iOS: MoltenVK
- ❖ Localization: Harfbuzz, full Unicode, RTL
- ❖ Compatibility: OpenGL ES 3, WebGL2, WebXR
  - ❖ Even supports BSD



# GODOT

Game engine

**“The game engine you've been waiting for.**

*“Godot provides a huge set of common tools, so you can just focus on making your game without reinventing the wheel.*

*“Godot is completely free and open-source under the very permissive MIT license. No strings attached, no royalties, nothing. Your game is yours, down to the last line of engine code.”*

*–godotengine.org*

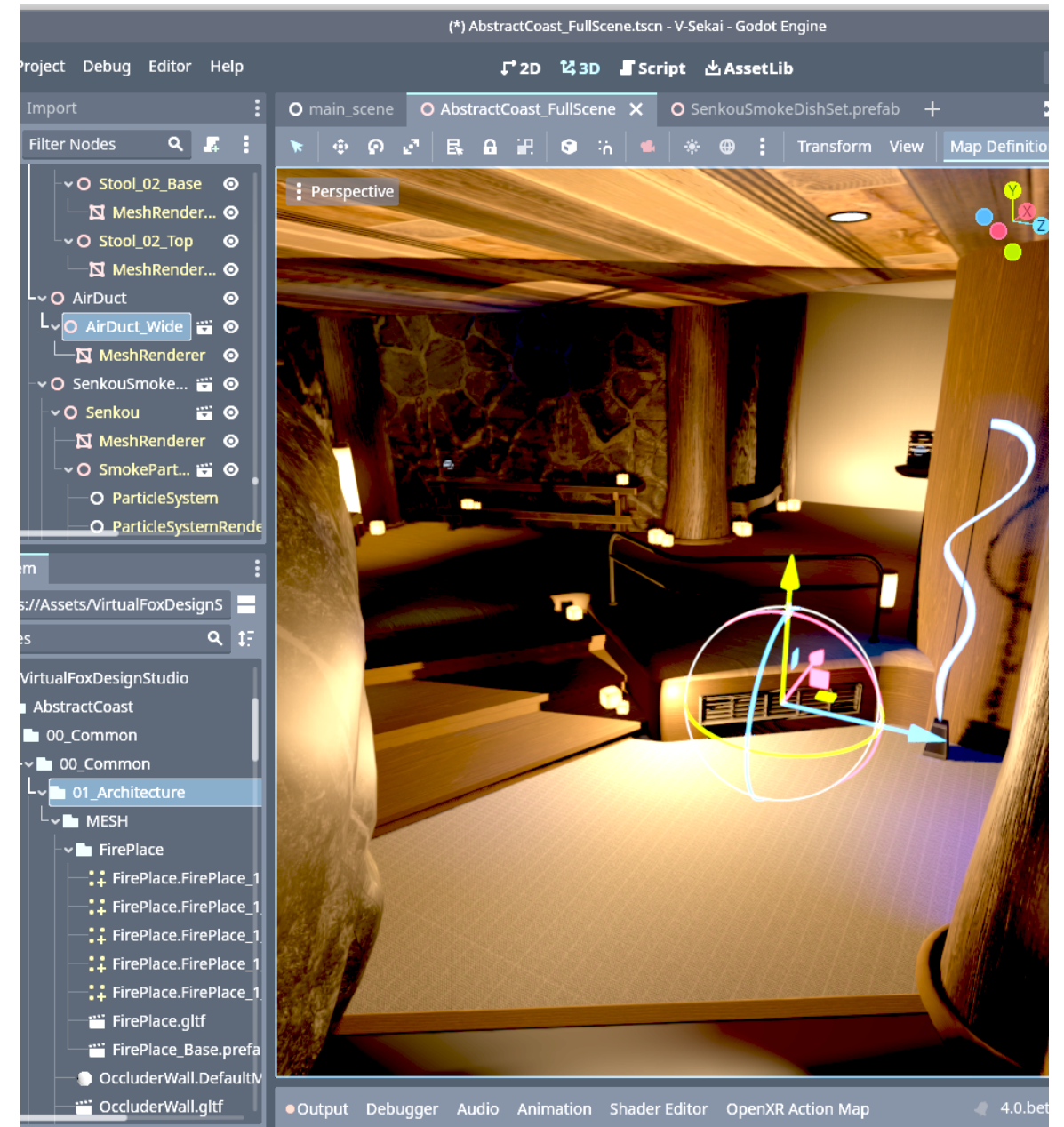


**FOSS XR 2022**  
2022-10-06



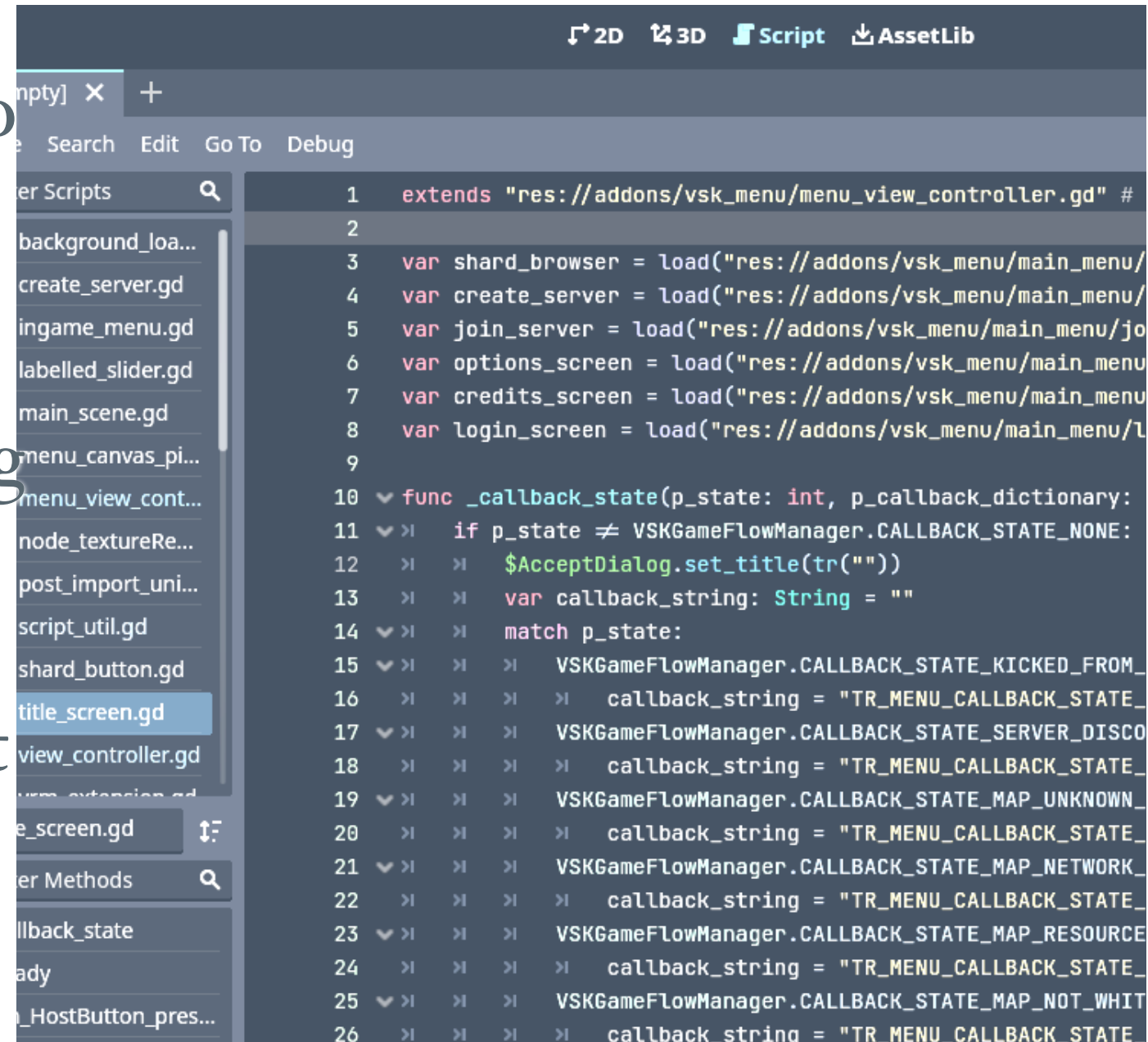
# Godot - common tools

- ❖ Import system (more on this later)
- ❖ Resources (data): Scenes, scripts, meshes and textures
- ❖ Nodes (state): appearance, behavior, and signals
- ❖ Export games to all platforms



# Godot - scripting

- ❖ GDScript – in-house scripting language similar to python, (without the GIL)
- ❖ Built-in script editor
- ❖ GDExtension – C++ binding ABI with cross-version compat, shared objects
- ❖ Native .NET 6, C# support
- ❖ Open source!
- ❖ Can compile modules in



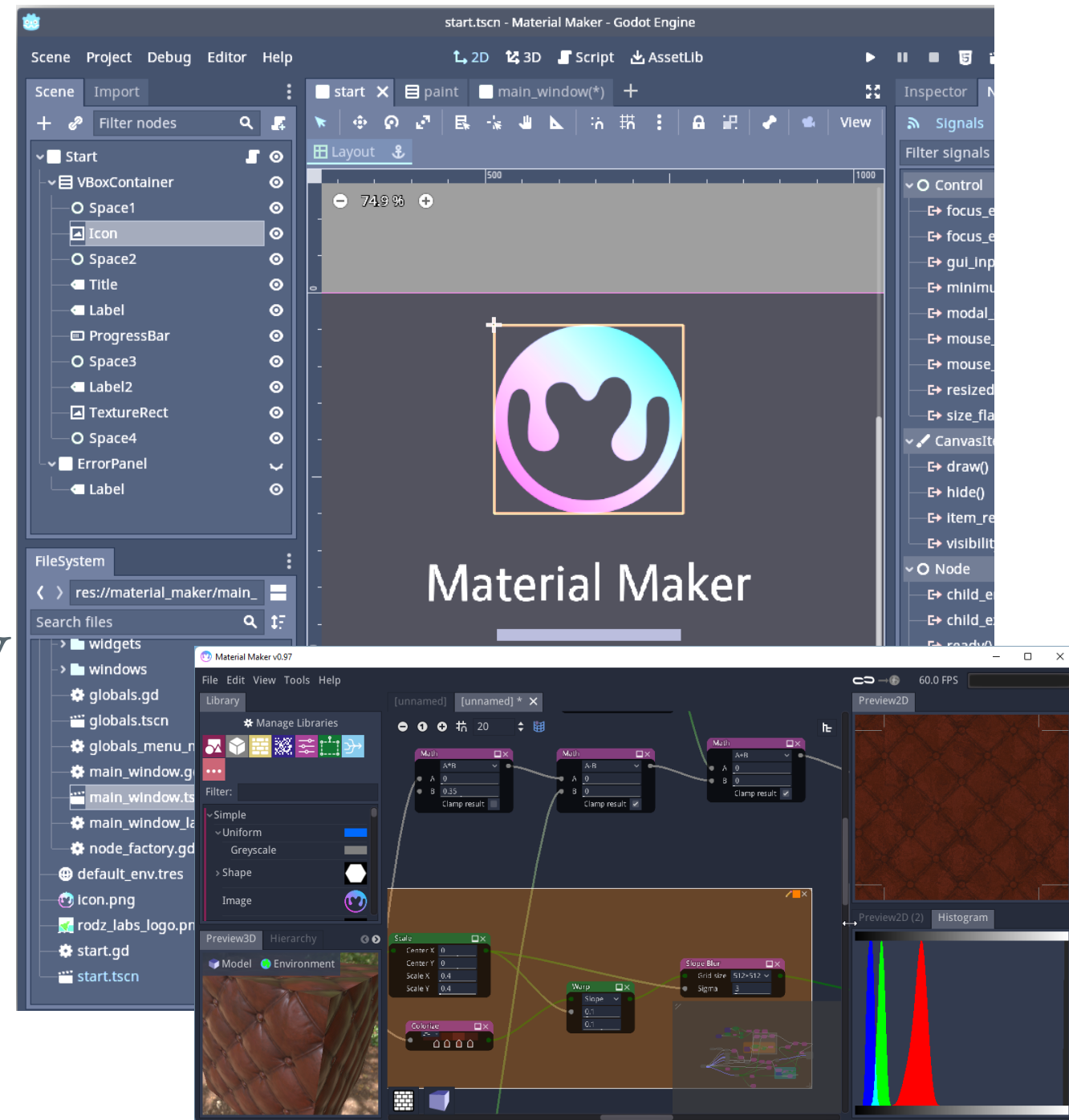
The screenshot shows the Godot script editor interface. At the top, there are navigation buttons for 2D, 3D, Script, and AssetLib. Below that is a menu bar with Search, Edit, Go To, and Debug. A file explorer on the left shows a list of script files, with 'title\_screen.gd' selected. The main editor area displays GDScript code for a class that extends 'res://addons/vsk\_menu/menu\_view\_controller.gd'. The code includes several variable declarations for loading resources and a function '\_callback\_state' that handles different states of a VSKGameFlowManager, setting titles and callback strings based on the state.

```
1 extends "res://addons/vsk_menu/menu_view_controller.gd" #
2
3 var shard_browser = load("res://addons/vsk_menu/main_menu/
4 var create_server = load("res://addons/vsk_menu/main_menu/
5 var join_server = load("res://addons/vsk_menu/main_menu/jo
6 var options_screen = load("res://addons/vsk_menu/main_menu
7 var credits_screen = load("res://addons/vsk_menu/main_menu
8 var login_screen = load("res://addons/vsk_menu/main_menu/L
9
10 func _callback_state(p_state: int, p_callback_dictionary:
11     if p_state != VSKGameFlowManager.CALLBACK_STATE_NONE:
12         $AcceptDialog.set_title(tr(""))
13         var callback_string: String = ""
14         match p_state:
15             VSKGameFlowManager.CALLBACK_STATE_KICKED_FROM_
16                 callback_string = "TR_MENU_CALLBACK_STATE_
17             VSKGameFlowManager.CALLBACK_STATE_SERVER_DISCO
18                 callback_string = "TR_MENU_CALLBACK_STATE_
19             VSKGameFlowManager.CALLBACK_STATE_MAP_UNKNOWN_
20                 callback_string = "TR_MENU_CALLBACK_STATE_
21             VSKGameFlowManager.CALLBACK_STATE_MAP_NETWORK_
22                 callback_string = "TR_MENU_CALLBACK_STATE_
23             VSKGameFlowManager.CALLBACK_STATE_MAP_RESOURCE
24                 callback_string = "TR_MENU_CALLBACK_STATE_
25             VSKGameFlowManager.CALLBACK_STATE_MAP_NOT_WHIT
26                 callback_string = "TR_MENU_CALLBACK_STATE_
```



# Godot - 2D

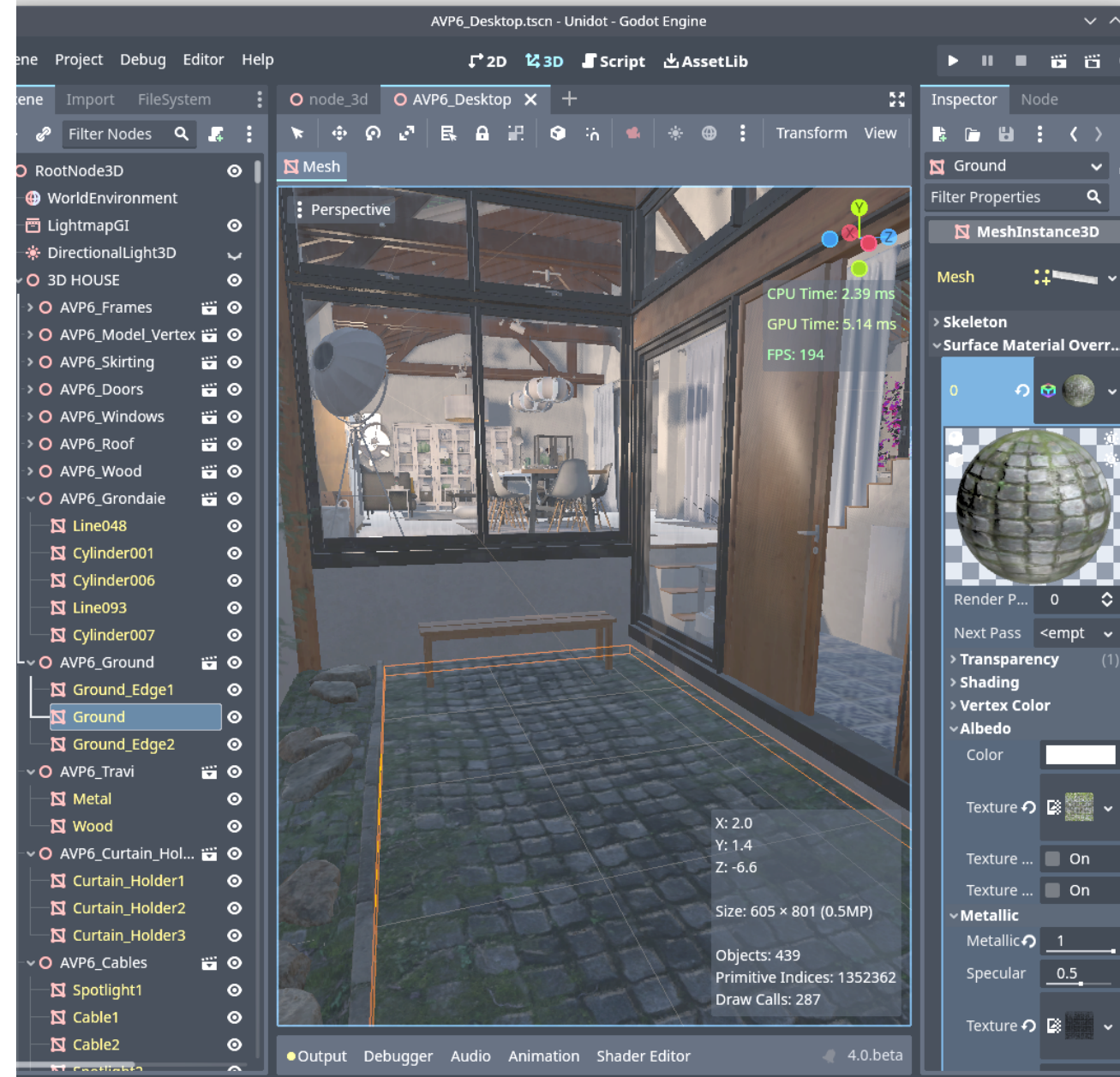
- ❖ Has a full 2D engine with physics, viewports
- ❖ Control nodes provide a fully featured native UI system
- ❖ Godot can be used to make ordinary GUI apps.



*Material Maker by RodZilla4*

# Godot - 3D

- ❖ full 3D engine
- ❖ In-house physics engine
  - ❖ Pluggable w/ GDExtension
- ❖ RenderingDevice API
  - ❖ Vulkan, DX12, consoles, mobile (Vulkan, MoltenVK)
  - ❖ Clustered-forward (PC)
- ❖ 3D scene graph, skeletons
- ❖ OpenXR

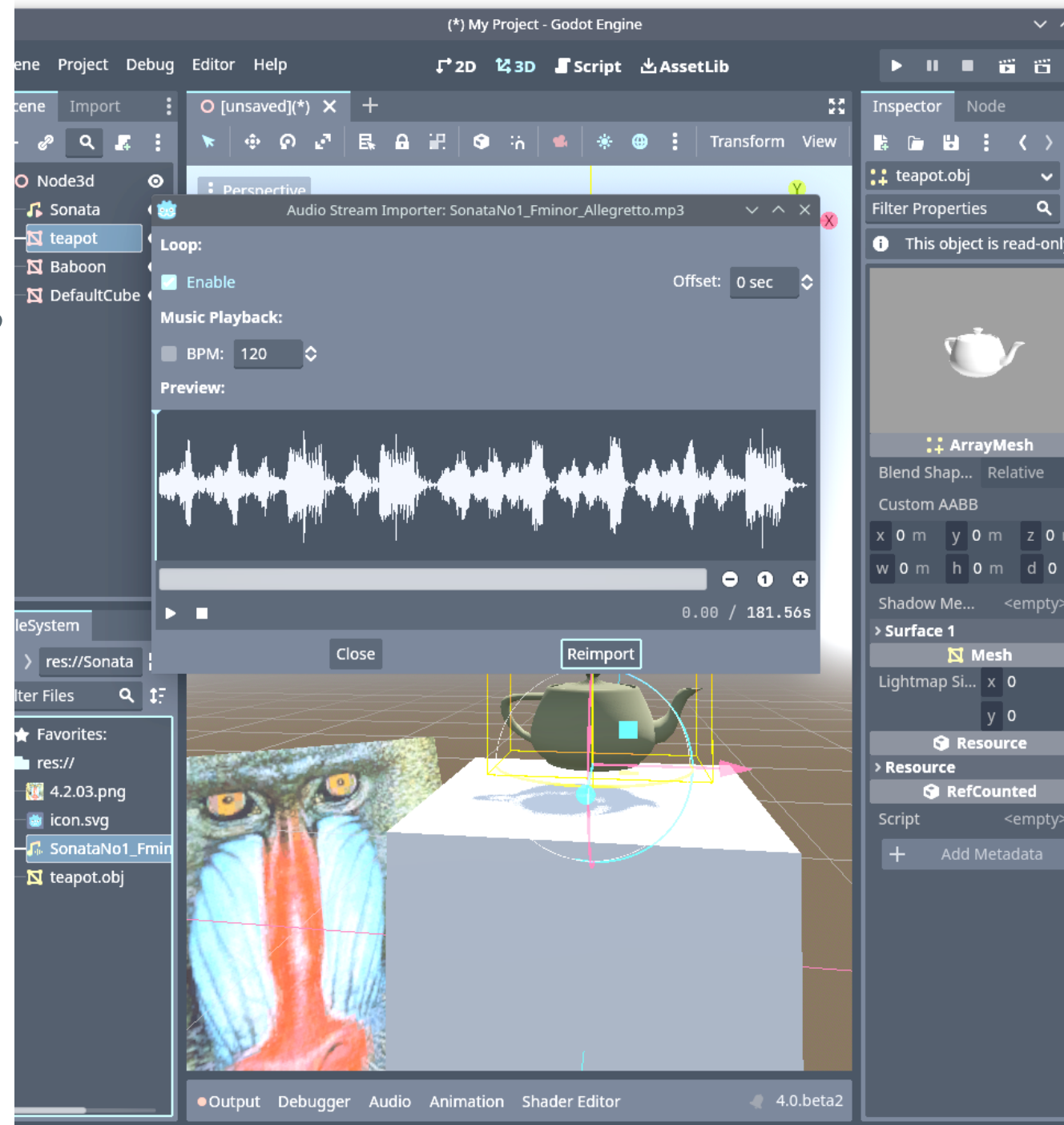


*ArchVizPRO Interior Vol.6*

# Content is key

# Resource Importer

- ❖ Extensible with script
- ❖ Supports several types of files out of the box:
  - ❖ Audio (.ogg, .mp3, .wav)
  - ❖ Image (.png, .jpg, .tga, .exr)
  - ❖ Video, Text, etc.
  - ❖ Raw 3D Mesh (.obj)





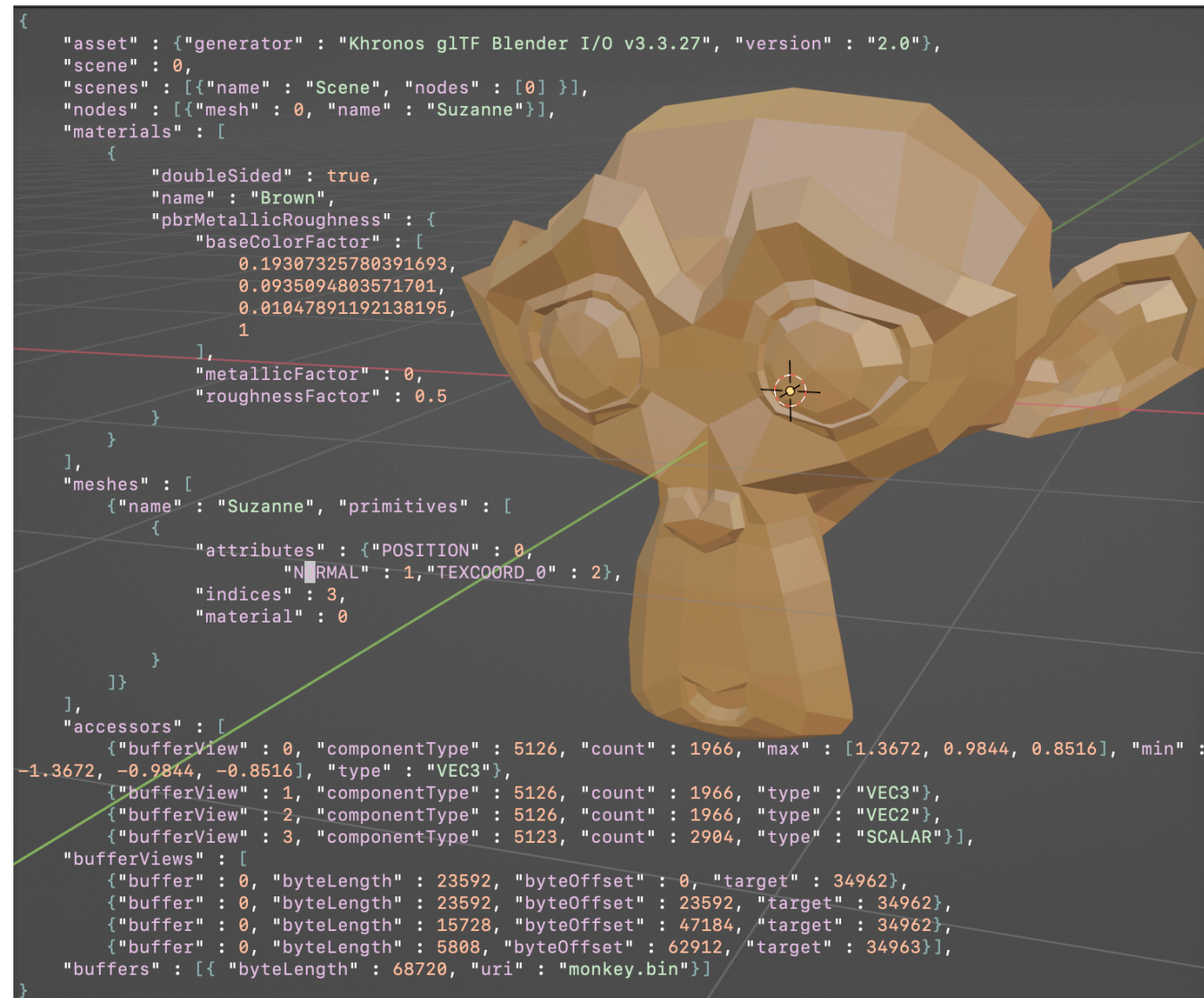


*“glTF™ is a royalty-free specification ... defining an extensible, publishing format that streamlines authoring workflows and interactive services by enabling the interoperable use of 3D content across the industry..”*

*–<https://www.khronos.org/gltf/>*

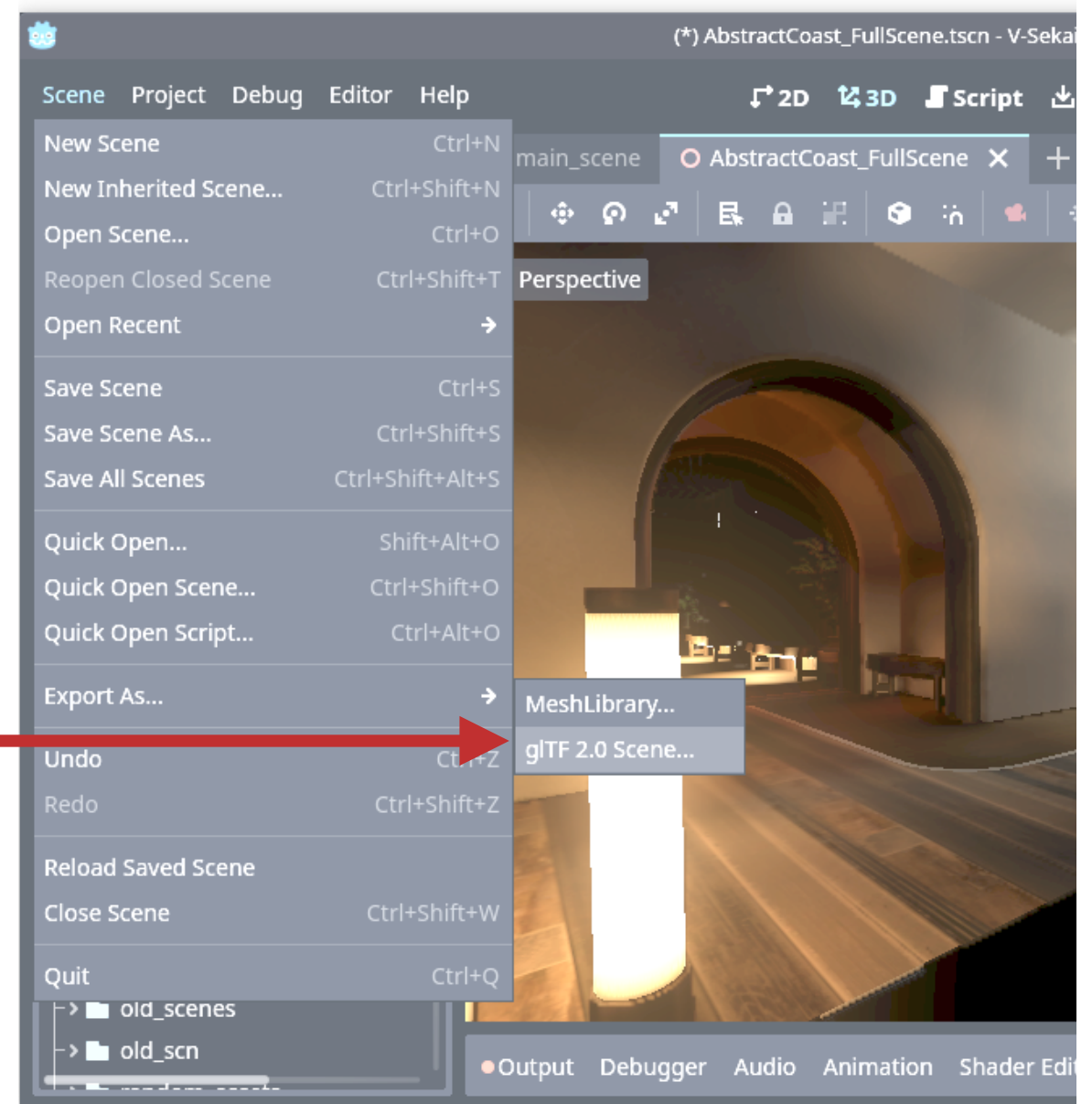
# glTF - Features

- ❖ Easy to read JSON format
- ❖ Replaces proprietary FBX  
Replaces older COLLADA
- ❖ Wide application support
  - ❖ Blender, Godot
  - ❖ ISO/IEC 12113
  - ❖ More industry adoption in Unity, other software
- ❖ Extensible, thriving ecosystem
- ❖ Full PBR out of the box.



# glTF in Godot: Scene Import/Export

- ❖ Import models in glTF, FBX and more.
- ❖ Skeletons / Armatures (rigged characters)
- ❖ Full PBR
- ❖ Export scenes in glTF
- ❖ Write custom glTF plugins with DOM access, such as audio sources or colliders.

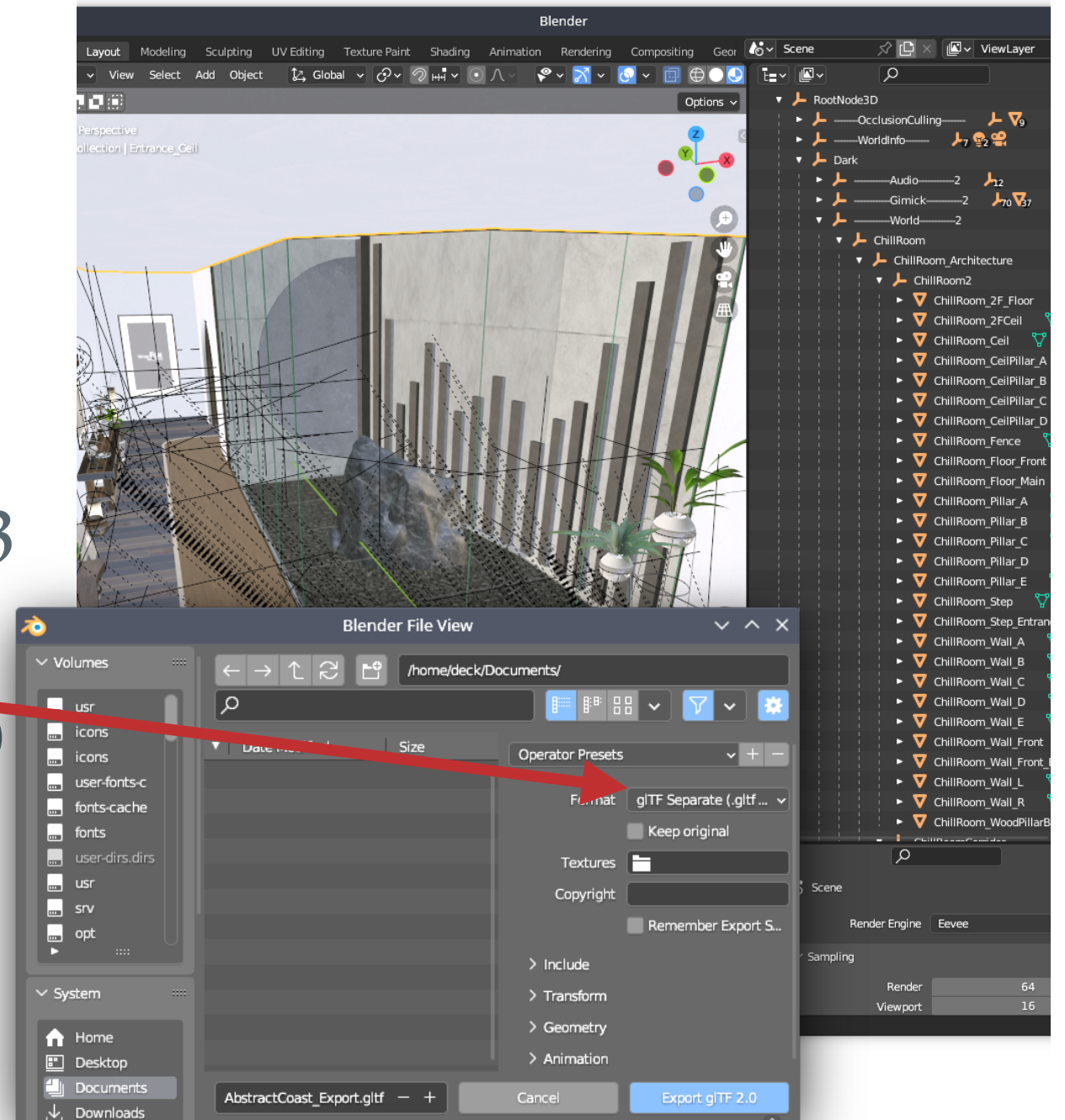


*AbstractCoast by Lura*



# glTF in Blender

- ❖ Blender is an open source 3D editor
- ❖ Extremely robust glTF support
  - ❖ Big fixes in Blender 3.2 + 3.3
- ❖ Godot recommends glTF Separate (.bin + texture)
- ❖ Use glTF Binary (.glb) for single file distribution

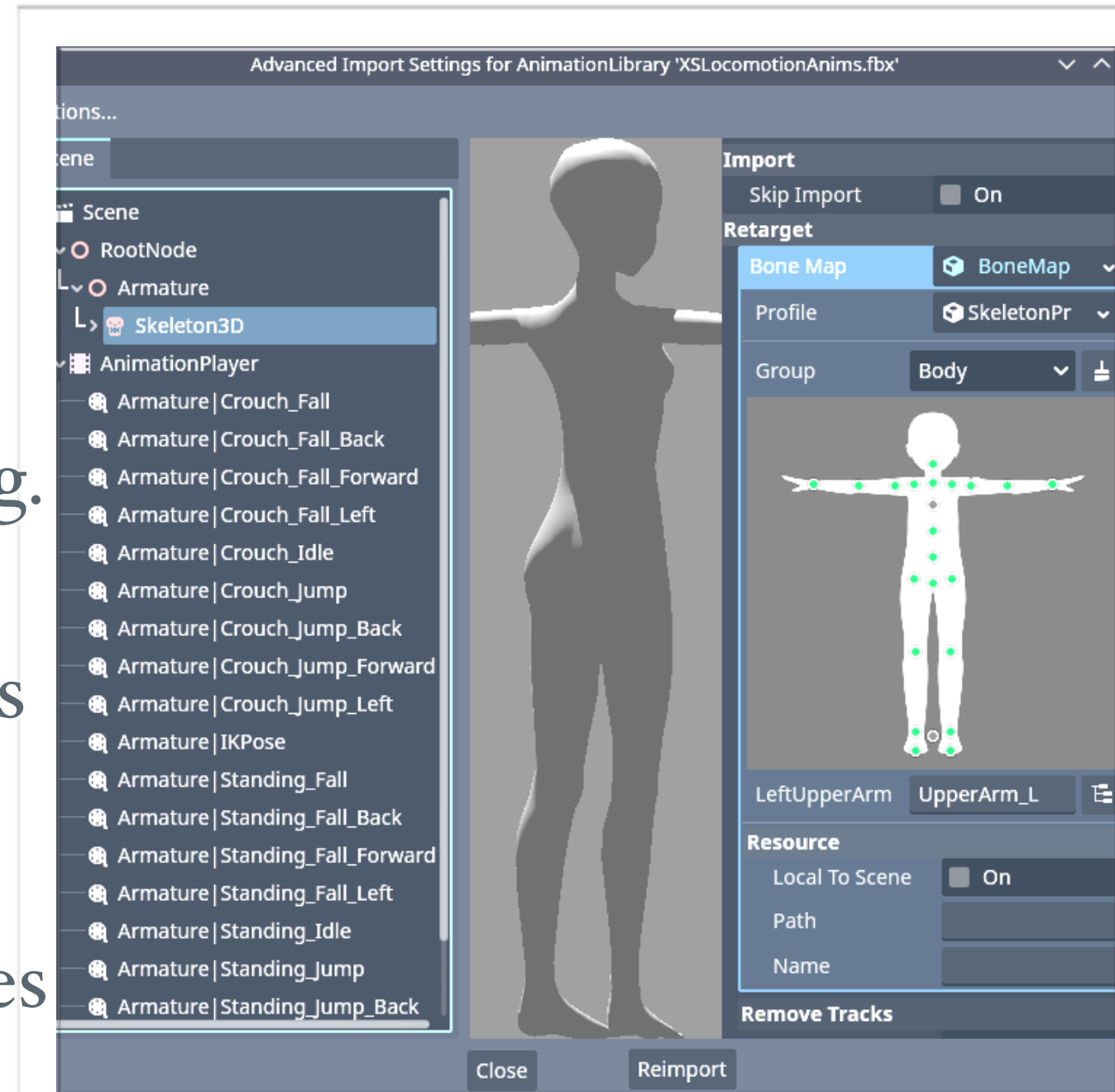




# Animation Retargeting

(New in Godot 4.0)

- ❖ Import as model, or import as animation library
- ❖ Built-in humanoid profile.
- ❖ Custom profiles possible, e.g. monsters or animals.
- ❖ Compatible with animations from Mixamo, Blender.
- ❖ Blend walk and run animations with blend spaces (AnimationTree)



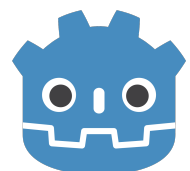
*XSLocomotionAnimator by Xiexe*

# Animation Retargeting

*Animations and special credit to Tokage*

*Rio by Waii! (<https://waii.booth.pm>)*

*Low Poly Godette by SirRichard92*



GODOT

2022-10-06



V-Sekai

# glTF is Extensible

- ❖ glTF JSON is easy to read, extensible by design.
- ❖ Most tooling is open source and PRs accepted:
  - ❖ Khronos extension registry on GitHub. Submit a PR!
  - ❖ Godot: New GLTFDocumentExtension API
  - ❖ Blender: glTF-Blender-IO by Khronos
  - ❖ glTF Transform by Don McCurdy (JS lib / batch CLI)

# glTF Extensions - OMI



## OMIgroup

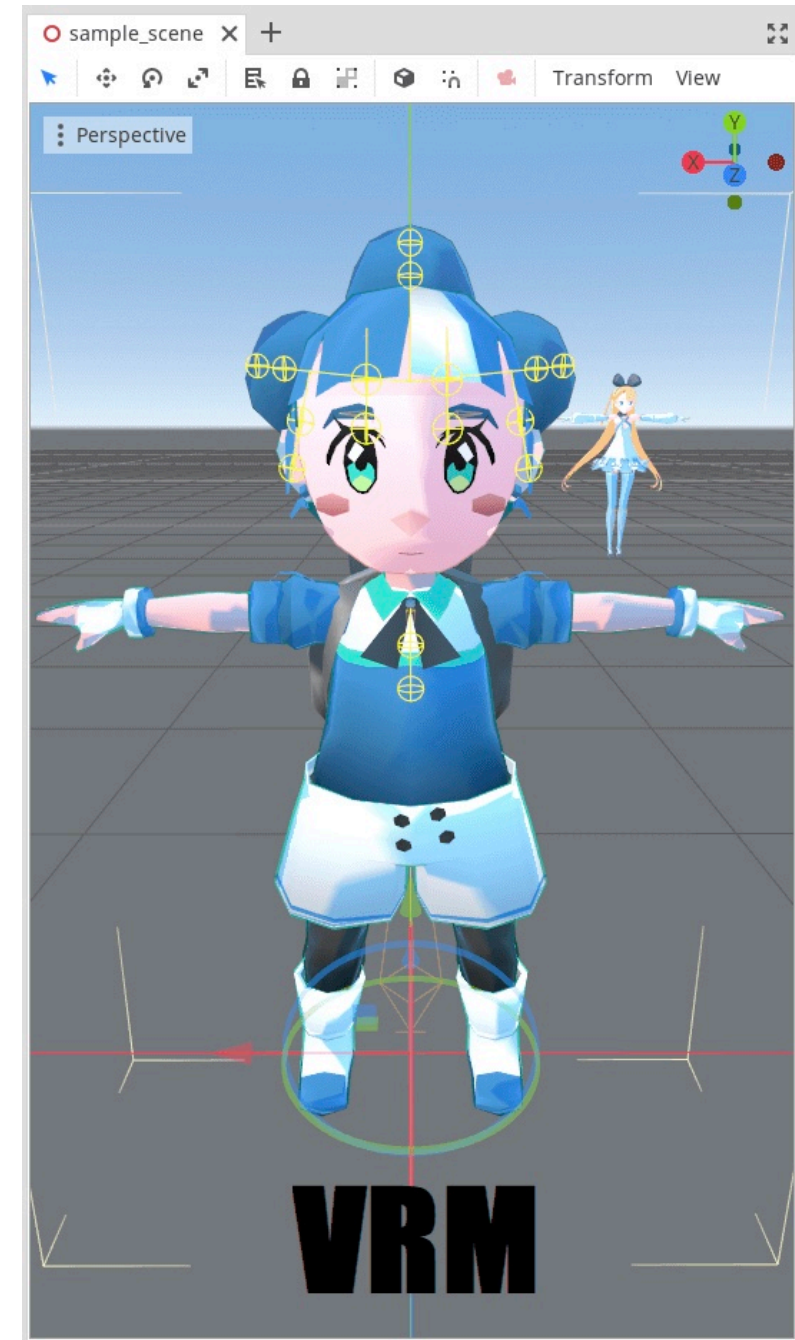
*“We bolster the metaverse as an open and interoperable resource for anyone, inspired by the collaborative efforts of the community.”*

- ❖ Open Metaverse Interoperability: [omigroup.org](https://omigroup.org)
- ❖ <https://www.w3.org/community/metaverse-interop/>
  - ❖ KHR\_audio (Audio sources in 3D scenes)
  - ❖ WIP: OMI\_physics\_body, OMI\_collider
  - ❖ OMI\_ref, others still being proposed



# glTF Extension - VRM

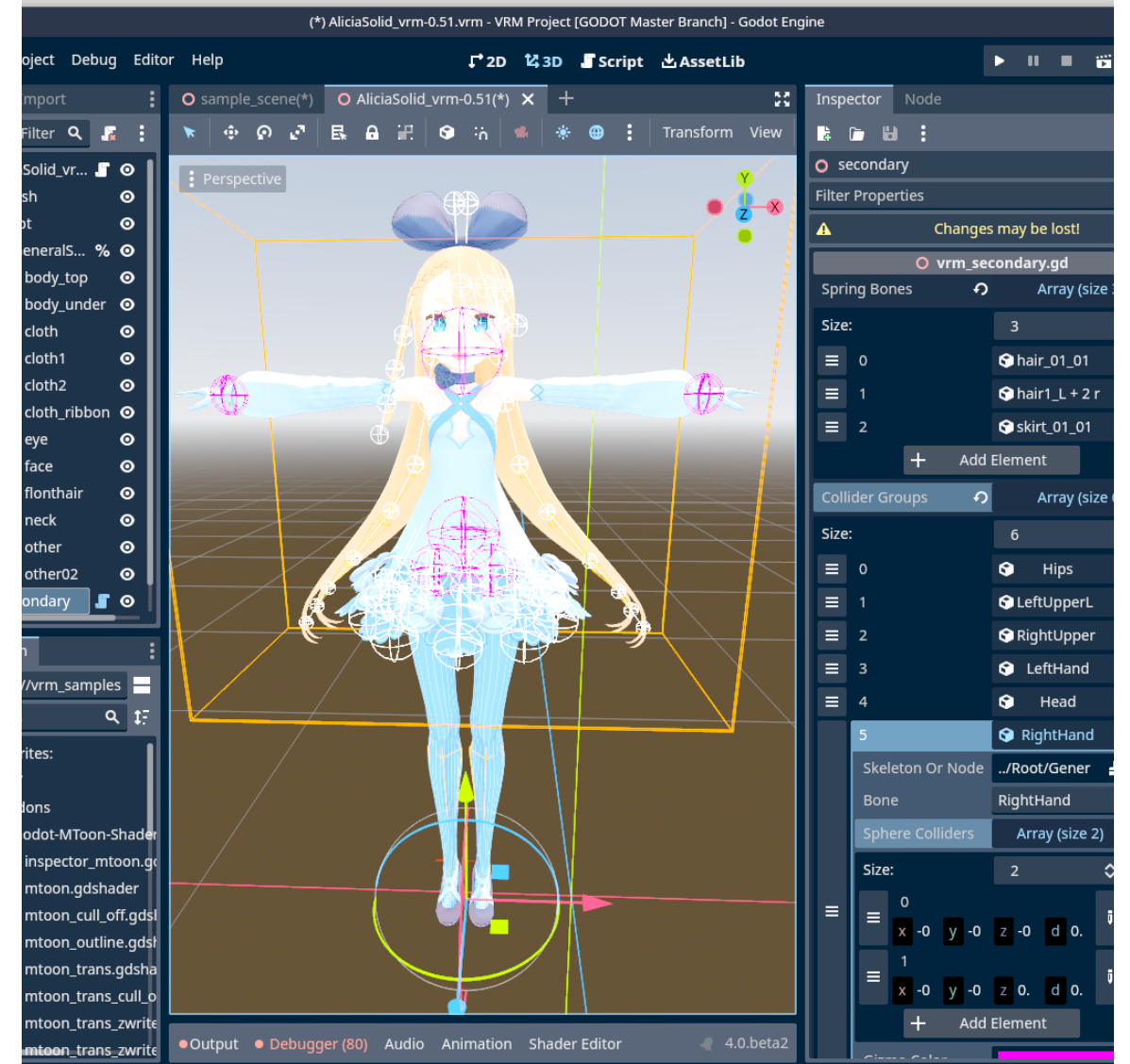
- ❖ Avatars for XR, on top of glTF
  - ❖ **Automatic** humanoid rigging
  - ❖ Interactive hair and clothing
  - ❖ Twist bones, constraints
  - ❖ Toon shading + glTF PBR
  - ❖ Face shapes for speech
- ❖ Cross-engine support:
  - ❖ Godot, Unity, Three.js, Blender, UE



*Low Poly Godette by SirRichard94*

# VRM for Godot

- ❖ Contains simplified physics simulation for spring bones
- ❖ Meta-information with author and license
- ❖ Custom facial expressions using morphs



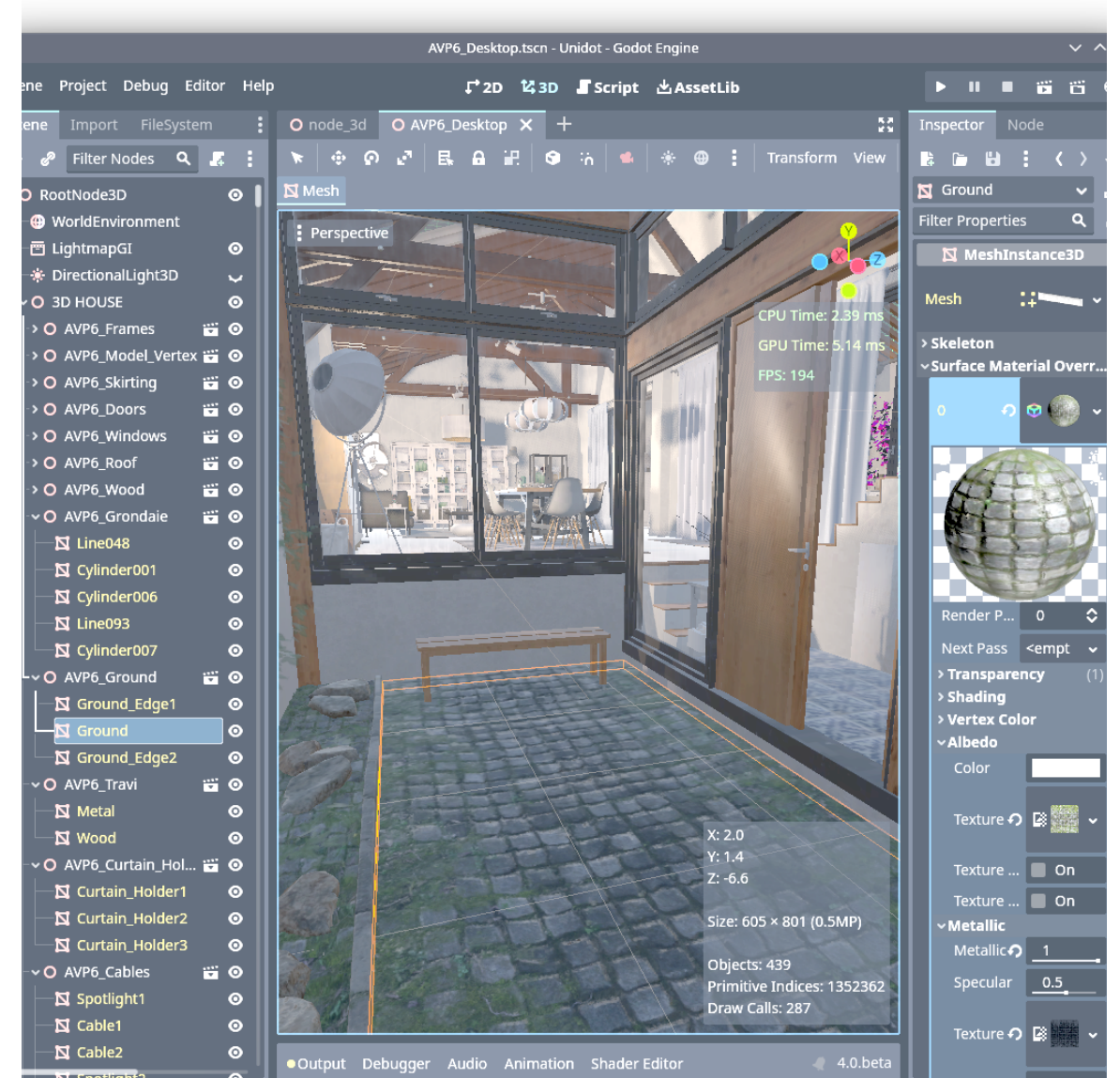
*Alicia Solid* ©DWANGO

# VRM for Godot



# Unidot Importer

- ❖ MIT license
- ❖ Import unitypackage content
- ❖ Large market, used in popular social VR ecosystems.
- ❖ Supports armatures, standard materials (no shaders yet), meshes, preserve recursive scene / prefab instancing.
- ❖ Still in beta



*ArchVizPRO Interior Vol.6*  
*Purchased on Unity Asset Store*



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https://youtu.be/YVaGGZb6JcM. The BOOTH logo is in the top left corner."/>

仮想狐のデザイン工房

3D Environments / World

**【販売ワールド】**  
**Abstract:Coast [PCVR/Quest]**

Abstract:Coast [Light Pack] 4,000 JPY

Abstract:Coast [Dark Pack] 4,000 JPY

Abstract:Coast [Full Pack] 6,000 JPY

Virtual Comfort Room  
**Abstract:Coast**

VRChat向け販売ワールド VirtualComfortシリーズ第6段  
Abstract:Coast

抽象的な海岸を見立てた自宅向けワールドです。  
ゆったりとした時間をお楽しみ下さい。

VRCSDK3向け、Quest、クロスプラットフォームにも対応しています。  
RandomBookShader同梱!

参考動画 - Reference video  
<https://youtu.be/YVaGGZb6JcM>

家具  
インテリア  
部屋  
家  
クロスプラットフォーム  
ワールド

<https://lura.booth.pm>

AbstractCoast\_Ver1.0 — Dolphin

Select Assets to import

Assets

- VirtualFoxDesignStudio
  - AbstractCoast
    - 00\_Common
      - 01\_Architecture
        - MESH
          - FirePlace
            - FirePlace.fbx
            - FirePlace\_Base.prefab
            - OccluderWall.fbx
            - WorldBlackBox.fbx
          - 02\_Prop
            - AirDuct
              - AirDuct\_Circle.prefab
              - AirDuct\_Square.prefab
              - AirDuct\_Wide.prefab
            - MESH
              - AirDuct\_Circle.fbx
              - AirDuct\_Square.fbx

Force reimport all models

Import and show result Hide OK

AbstractCoast\_Full Set\_Ver1.0.unitypackage

important.png

License.txt

Quest\_Cross Platform.png

Readme\_EN.txt

Readme\_JP.txt

AbstractCoast\_FullScene.tscn - V-Sekai - Godot Engine

Perspective

WorldEnvironment

WorldEnvironment

Background

Mode

Energy M...

Sky

Sky Ma...

Process ...

Radiance ...

Resource ...

Custom F...

Rotation ...

Ambient L...

Reflected ...

Tonemap ...

SSR

SSAO

SSIL

SDPFI

Enabled

Use Occ...

Read Sky ...

Bounce F...

Cascades ...

Min Cell...

Cascad...

Max Dis...

Scale...

4.0.beta

*AbstractCoast by Lura (<https://lura.booth.pm>)*

# FBX2glTF

- ❖ Lots and lots of FBX content
- ❖ Thanks to hard work by Facebook, does a nearly perfect conversion of FBX content to glTF.
- ❖ Godot solved most FBX import issues by going via FBX2glTF.
- ❖ Code is open source, but it does use Autodesk SDK



*“Running” FBX downloaded on Mixamo*

# OpenXR

*“OpenXR is a royalty-free, open standard that provides high-performance access to Augmented Reality (AR) and Virtual Reality (VR)—collectively known as XR—platforms and devices..” –Khronos*



# OpenXR in Godot 4.0

- ❖ OpenXR integrated into Godot 4.0 core
  - ❖ No plugins needed for most platforms (easy!)
  - ❖ (Caveat: OpenXR Loader for quest needs .aar blobs until Meta adopts Khronos loader)
  - ❖ Vulkan/OpenXR spec issue: OpenXR must be enabled before Vulkan: cannot toggle at runtime.
- ❖ Pretty easy to enable XR in Godot 4.0:
  1. XROrigin3D, XRCamera3D, XRController3D Nodes
  2. Project Settings (XR Shaders, OpenXR enabled)
  3. `get_viewport().use_xr = true`



# XR Godot addons

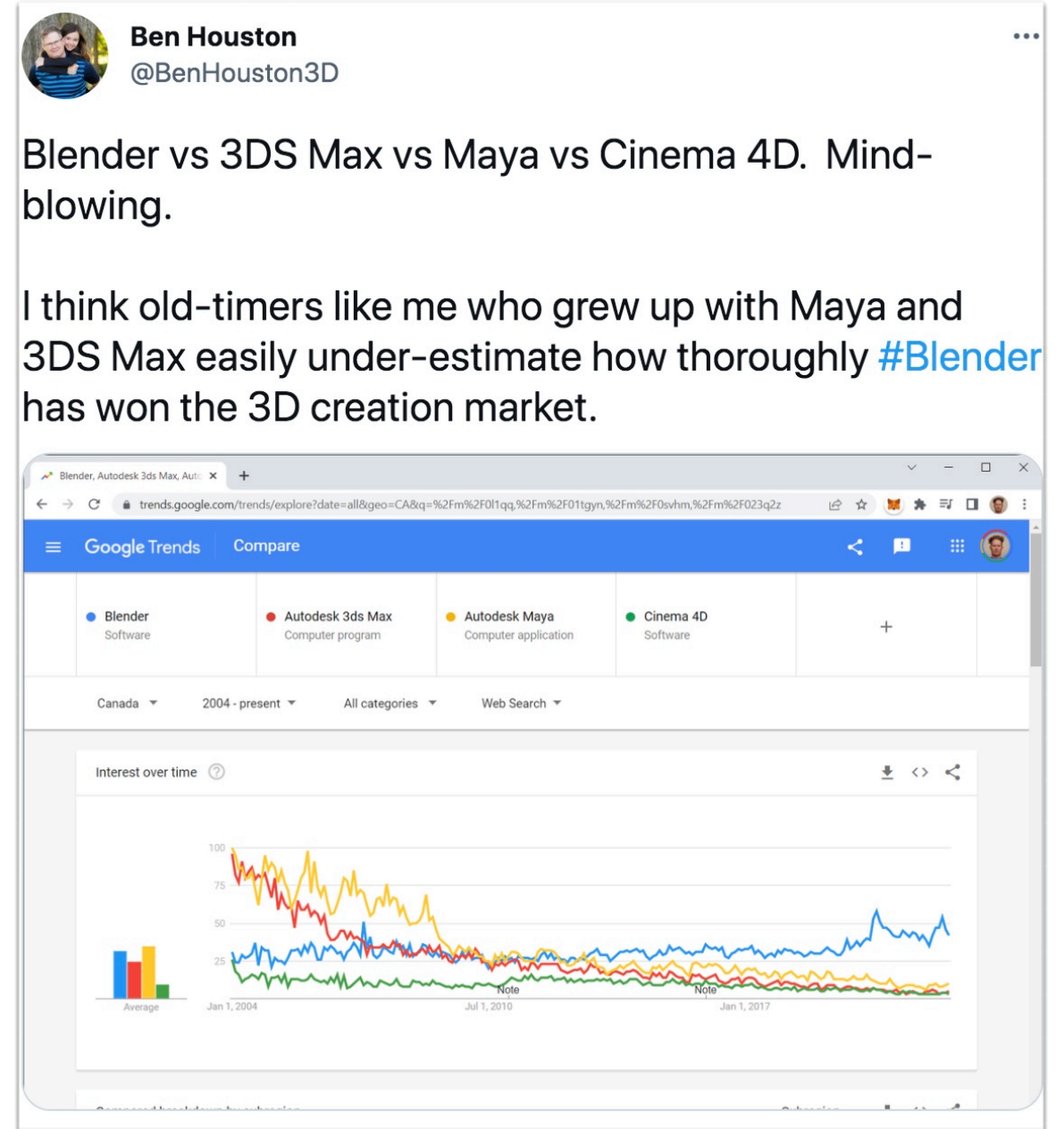
- ❖ <https://github.com/GodotVR/godot-xr-tools> (4.0-dev)
- ❖ IK modules:
  - ❖ <https://github.com/V-Sekai/RenIK> (supports 4.0)
  - ❖ In development: EWBIK (“Everything will be IK”)
- ❖ VoIP: [https://github.com/V-Sekai/godot\\_speech](https://github.com/V-Sekai/godot_speech)
- ❖ HRTF (spatialized 3d audio): Engine patch:  
[https://github.com/V-Sekai/godot\\_3d-audio](https://github.com/V-Sekai/godot_3d-audio) branch
- ❖ <https://github.com/V-Sekai/lasso> : 3d interaction:  
object picking & snapping
- ❖ More: [canvas\\_plane](#), [godot\\_xr\\_vignette](#), ...

# V-Sekai

- ❖ Fully MIT licensed social VR stack on Godot
- ❖ Tools for avatar creation, wearing avatars in VR
- ❖ Safe scripting, voip, networking and scalability
- ❖ Huge untapped market. Deserves to be open.
- ❖ Huge scope, piggyback on hundreds of Godot contributors
- ❖ Already over 100+ V-Sekai PRs merged into Godot
- ❖ <https://github.com/V-Sekai>

# The Future!

- ❖ Blender has grown to industry leader in 3D DCC
- ❖ Blender has 10-15 years head start on Godot
- ❖ Godot is beginning show similar trajectory (Todo: graph)
- ❖ W4 Games
  - ❖ Build industry connection to maintain relevance + consoles
- ❖ Godot is + will always be FOSS



# The Future: WebXR

- ❖ Godot 4.x aims to have robust WebGPU + SharedArrayBuffer. Not in time for 4.0
  - ❖ Godot Compiled to Web vs Web-native
- ❖ Many up and coming platforms are targeting web + WebXR + WebGL2 -> WebGPU
- ❖ Web ecosystem heavily favors open source:
  - ❖ Three.js, Third Room are well engineered, versatile, and may become strong players.



# Questions?

- ❖ Thanks for listening!
- ❖ Easy to find us.
  - ❖ <https://github.com/godotengine/godot>
  - ❖ <https://github.com/V-Sekai>
  - ❖ <https://github.com/GodotVR>
  - ❖ Email me! [pathorn@cal.berkeley.edu](mailto:pathorn@cal.berkeley.edu)
  - ❖ Join V-Sekai Discord: <https://discord.gg/7BQDHesck8>