



Improving the automotive experience through open source 3D Engines

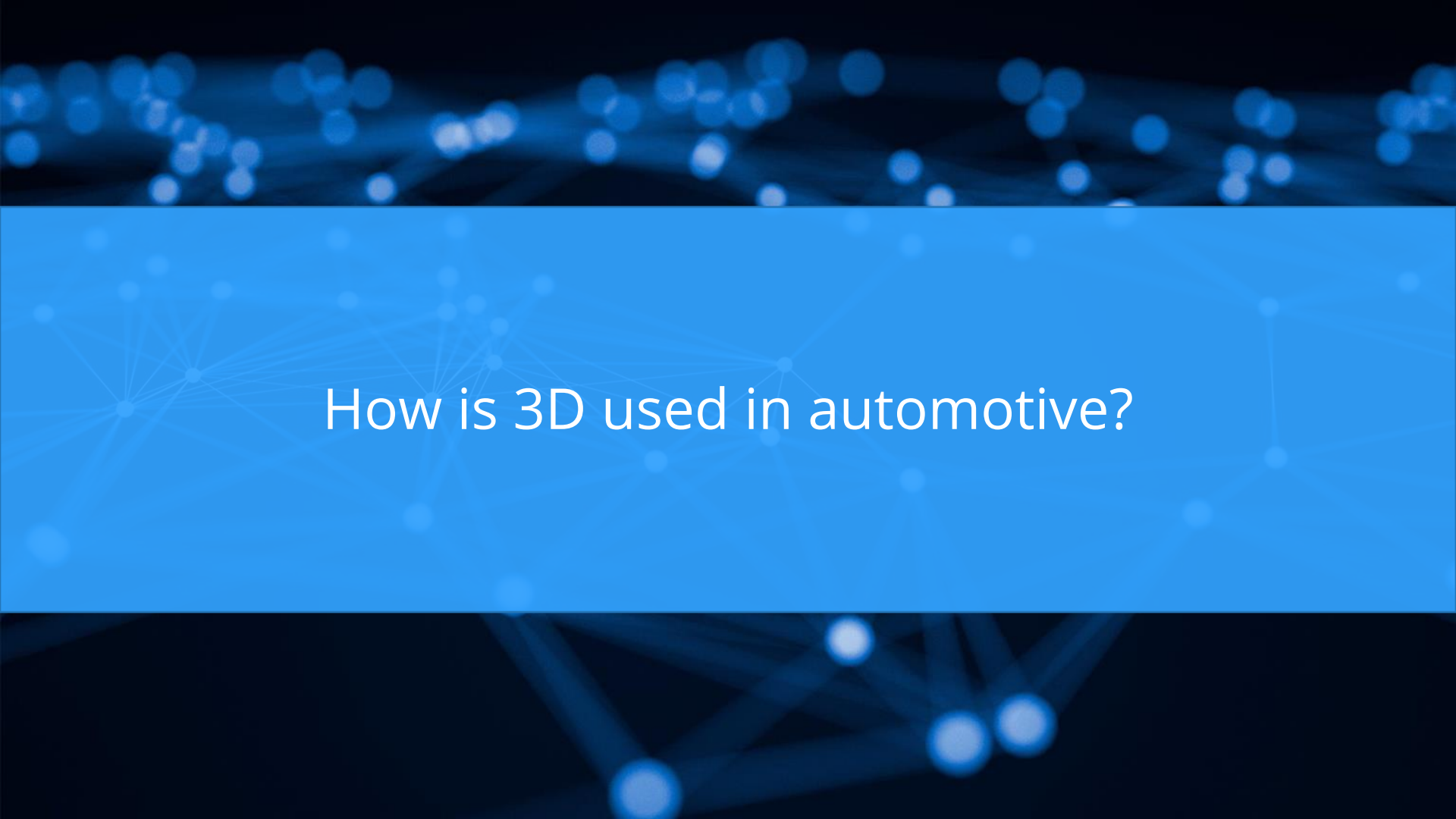
<https://o3de.org>

Royal O'Brien

GM, Digital Media and Games

Linux Foundation

#o3de #ossummit #autolinux @o3de



How is 3D used in automotive?

How is 3D used in automotive?

- › *Design / support of the car and its parts*
 - › *VR headset easier to sculpt, change and AR/VR to view from any angle*
- › *Training of the navigation and self driving systems*
 - › *Cloud / compute farms can create millions of hours on demand*
- › *Inside the car*
 - › *Richer experience, new forms of display and feedback*
- › *Outside of the car*
 - › *Car builder, virtual showrooms, test scenarios*



Design and Insight

Fast visualization and conveyance of ideas drive innovation

- › *Creation and design of cars / parts at any time*
 - › *Shared VR to sculpt, change and view from any angle*



Design and fast iteration

› *Conceptual, interface and part design*



› <https://medium.com/kontrolka/developing-car-hmi-of-tomorrow-with-game-engines-6202a6a6593d>

Fast visualization and conveyance of ideas drive innovation

- › *Limit and view from almost any angle*
- › *Train, repair, and architect to lower costs*



The background features a dark blue field with out-of-focus light blue circles (bokeh) and a network of thin white lines connecting small dots, suggesting a digital or neural network theme.

Training and AI

Where and What to train

- › *Virtual tracks:*
 - › *Create from Digital Twin data*
 - › *Google Earth*
 - › *GIS / DEM Maps*
- › *Interactive data*
 - › *Buildings*
 - › *Pedestrians*
 - › *Traffic signals / patterns*



Training scenarios and scaling

- › *Physical / weather scenarios*
 - › *Train in any weather*
 - › *Simulate force and motion*
 - › *Create hard to replicate*
 - › *Dynamic Lights / Raytracing*
 - › *Visual Impairments*
- › *On-demand cloud based GPU render farms running Linux.*





Inside the Car

Cars of today

- › *Fully embedded systems with smartphone class hardware*
- › *Large LED displays / interactive entertainment screens*
- › *Fully digital LED cluster displays*



Cars of today

- › *Fully Integrated navigation and control systems*
- › *Increasing number of digital sensors and data inputs*



Inside of the car

- › *AR Navigation and interactivity*



<https://vrscout.com/news/mercedes-s-class-ar-navigation-3d-eye-tracking/>

Inside of the car

- › *Stereoscopic displays and 3D Eye Tracking*



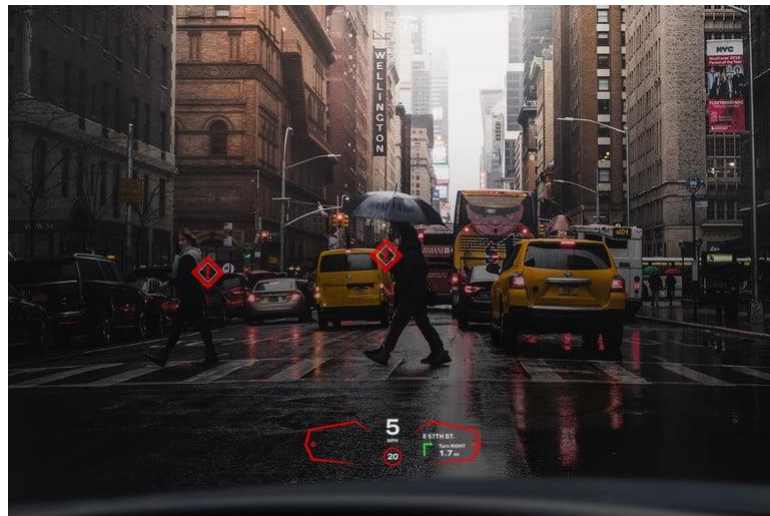
<https://newatlas.com/automotive/genesis-gv80-continental-3d-dash/>



Advanced displays and 3D rendering

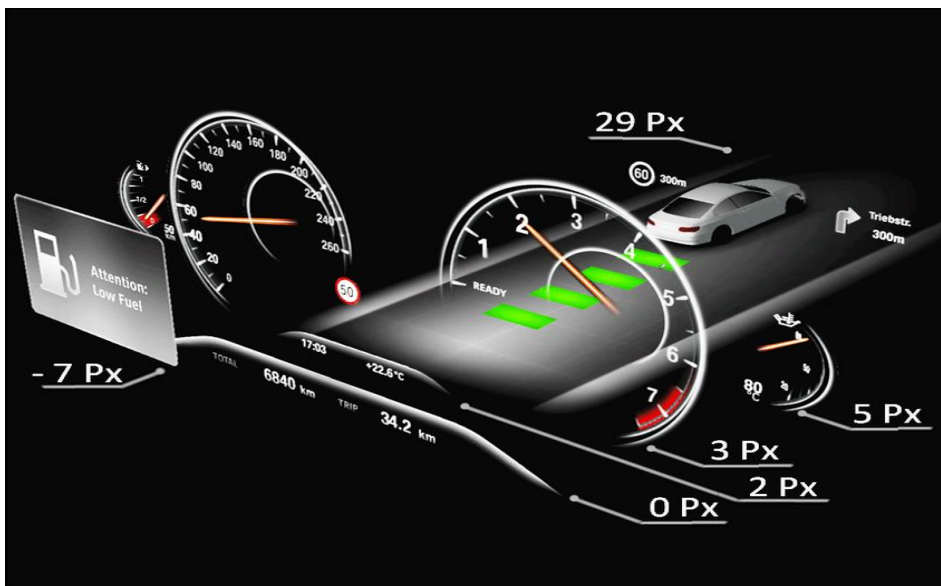
Sensory integration

- › *Augmented reality helps keep eyes on the road*
- › *Haptic, Audible, 2D and 3D notifications*
- › *Hazard info and Assistance can be helpful, not distracting*



3D Depth

- › *Interfaces with depth more immersive*
- › *Once mapped to 3D, engine does the work*

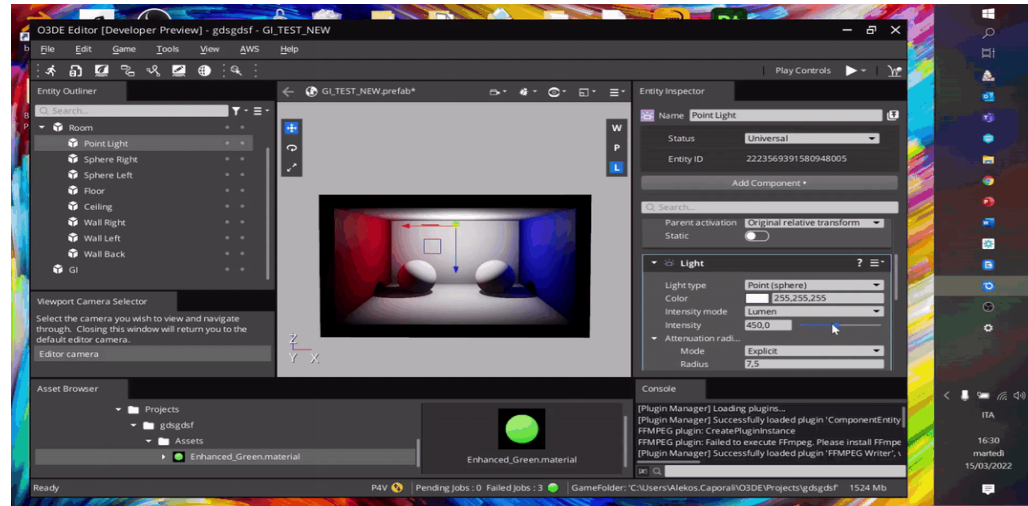




Mobile hardware, Linux and Portability

Mobile hardware

- › *Native support for ARM and x86 based CPUs, less power*
 - › *One API for ARM Neon or x86 SIMD fast math, more possibilities*
- › *Ray tracing support for lower and mid end Mobile GPU hardware*
 - › *Partners like Imagination Technologies demonstrating capabilities today**

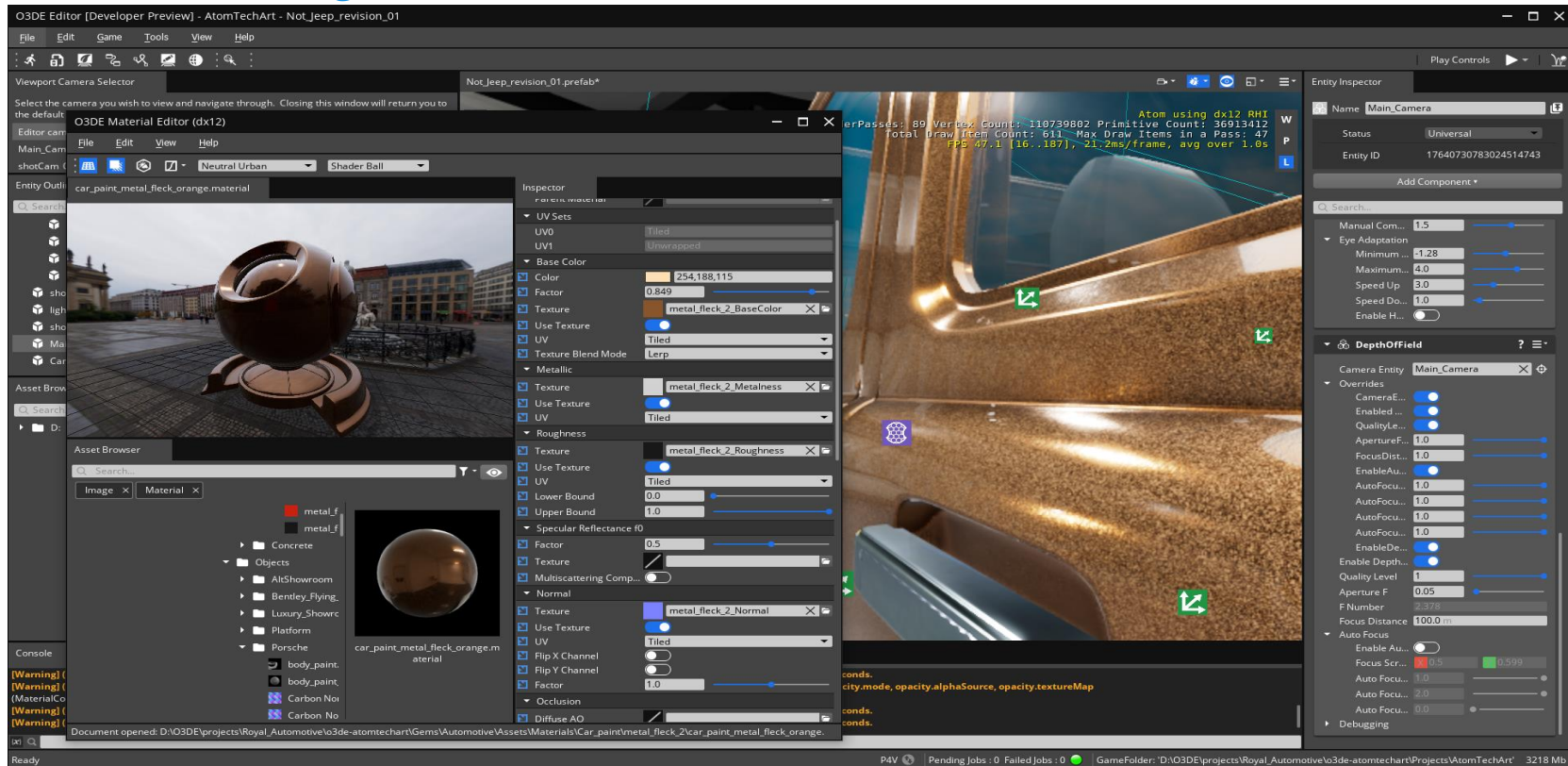


Mobile hardware

- › *Lightweight footprint Modularity*
 - › *Minimal cross dependencies in modular system*
 - › *Use only what you need, no need to unwind libraries you arent using*
- › *Mobile working group focused on optimized mobile Open 3D Engine*



Full control of design



Integrity from design to implementation

- › *Full Linux support for Vulkan as a first class citizen*
- › *Physically based rendering for fidelity*



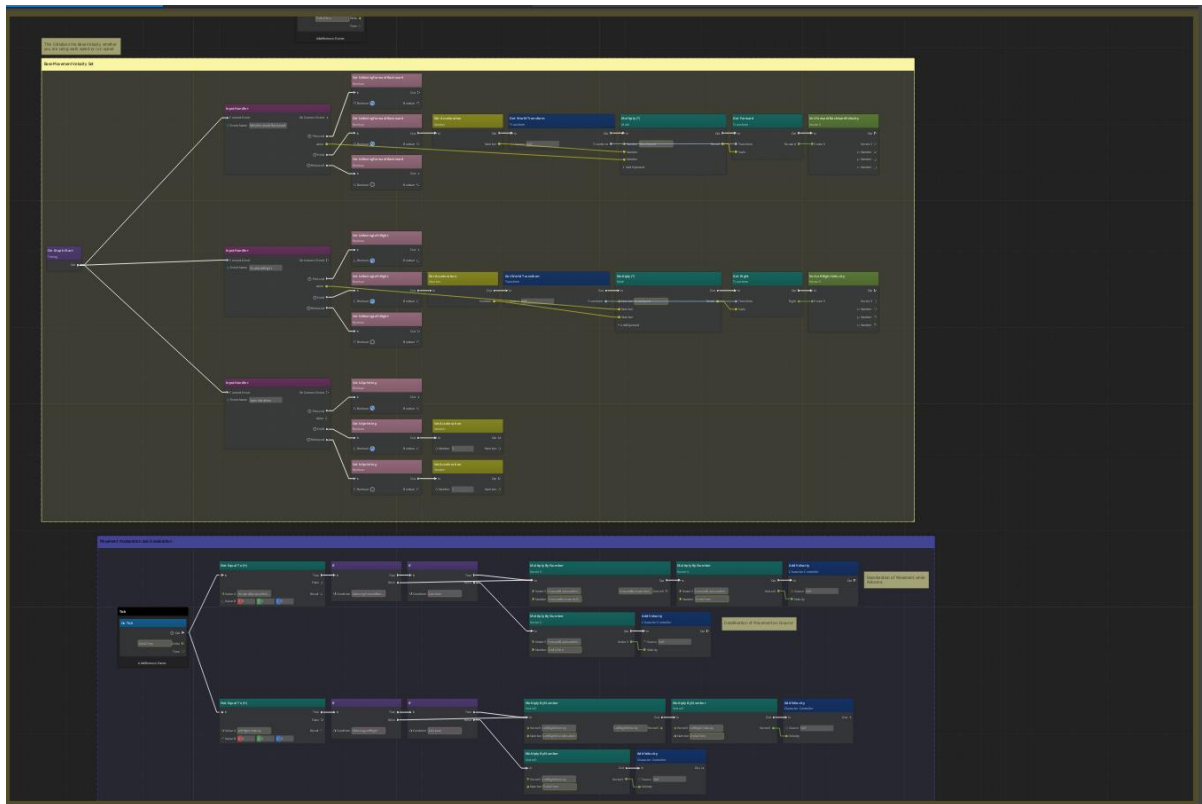
Portability and sharing of assets – You are not locked in

- › *3D Models: FBX, USD, GLTF, OBJ*
- › *Materials: PBR, Metal-Roughness, Transparency, 32 bit per channel*
- › *Shaders: HLSL and extended shader languages*
- › *Made to support both Commercial and Open-Source*
- › *Shared vision with members like Epic Games*



Technical prototyping and automation

- › *Visual scripting*
- › *C/C++/Python*
- › *Modular plugins*





Customer experience and Marketing

Online Media and marketing

- › *Car configurator from Home*
- › *Environmental views*



Online Media and marketing

- › *Ease of update*
- › *Cloud scaling*
- › *Virtual Showfloors*

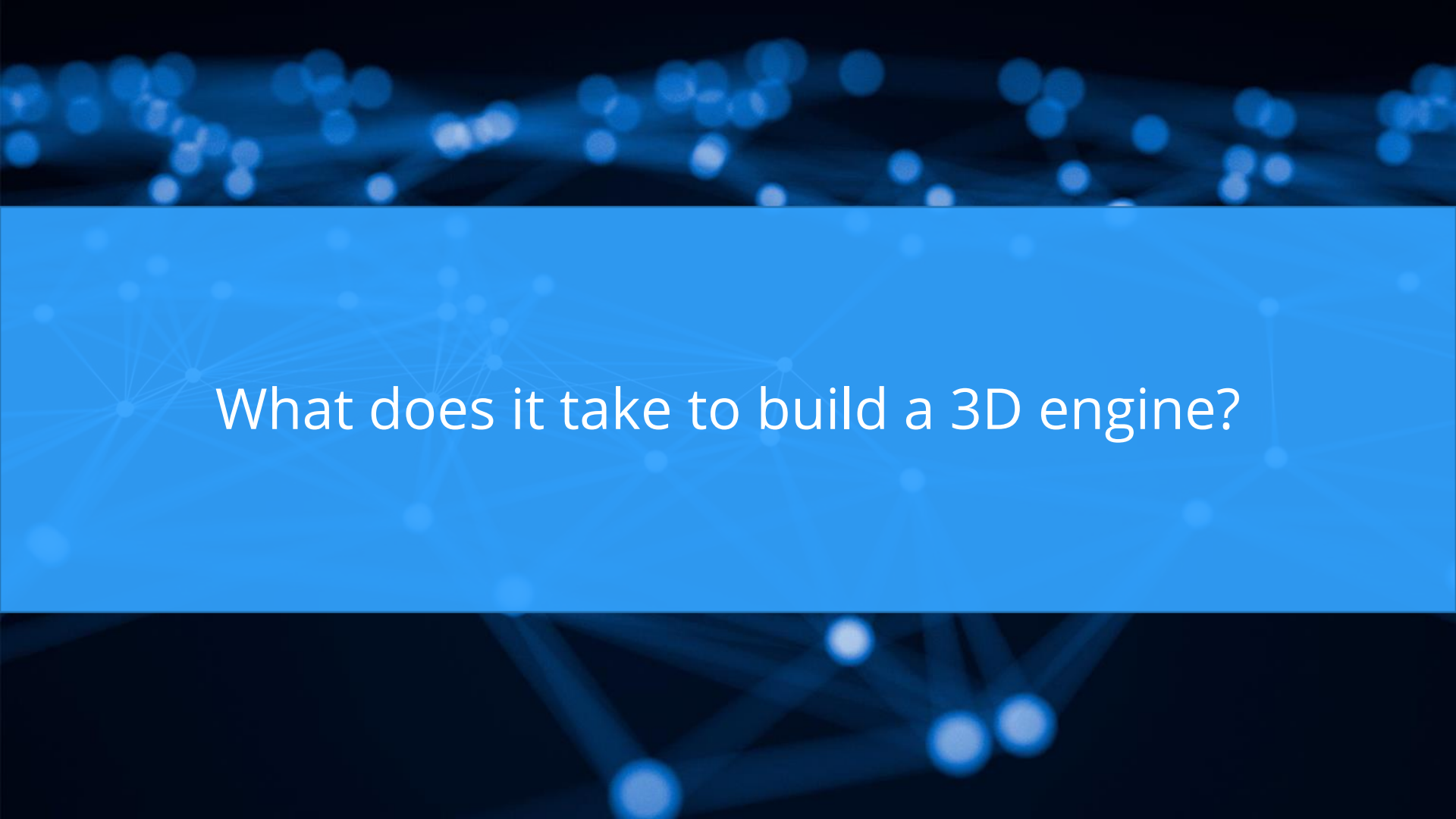


Online Media and marketing

- › *Raytracing for production quality*



<https://www.ospray.org/>

The background is a dark blue gradient with a complex network of glowing blue nodes and lines, resembling a digital or neural network. A solid blue horizontal band is positioned across the middle of the image, serving as a backdrop for the text.

What does it take to build a 3D engine?

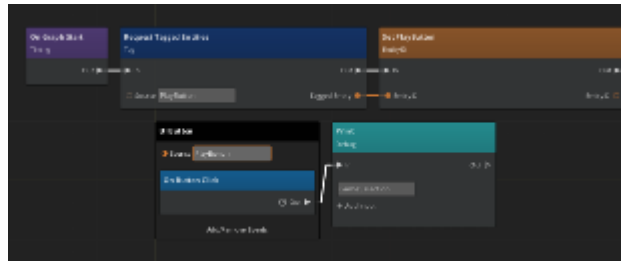
Top-quality 3D engines are as complex as operating systems

What does it take?

- › *8+ years to feature parity... and then an ongoing commitment to keep pace with advancements.*
- › *Huge investment of money to fund teams and technology.*
- › *Specialized knowledge from experts in science, math, engineering. Includes developers for graphics hardware, physics, lighting, networking, cloud services, and more.*
- › *Integration expertise to ensure 20+ systems can operate together--in real-time, on very diverse hardware and operating systems.*

Open 3D Engine Major Components

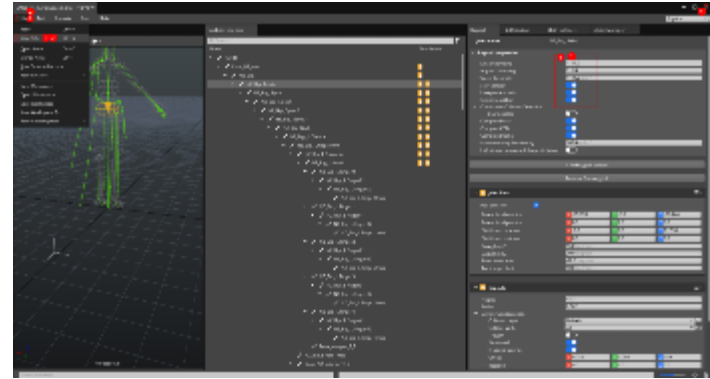
- › **Programming** - The systems used to create logic and tasks to drive the operation of games and simulations.
 - › Physics and collision Subsystems
 - › Script Canvas (visual scripting), LUA compiling
 - › AI Navmesh and Behavior tree
 - › C++ code gems, Python scripting, Qt and UI extensions
- › **Packaging & assets** - The systems to import assets and export final product for deployment.
 - › Asset processor for on the fly conversion of media assets with python extensibility
 - › Package and deployment subsystem using CMake
 - › Sample and Starter game assets



Open 3D Engine Major Components

- › **Animation** - The animation system provides the tools to create fluid motion for 3D characters and objects.

- › EmotionFX Animation system
- › Cinematics Subsystem
- › Import tools for root node support
- › Node and relationship tagging



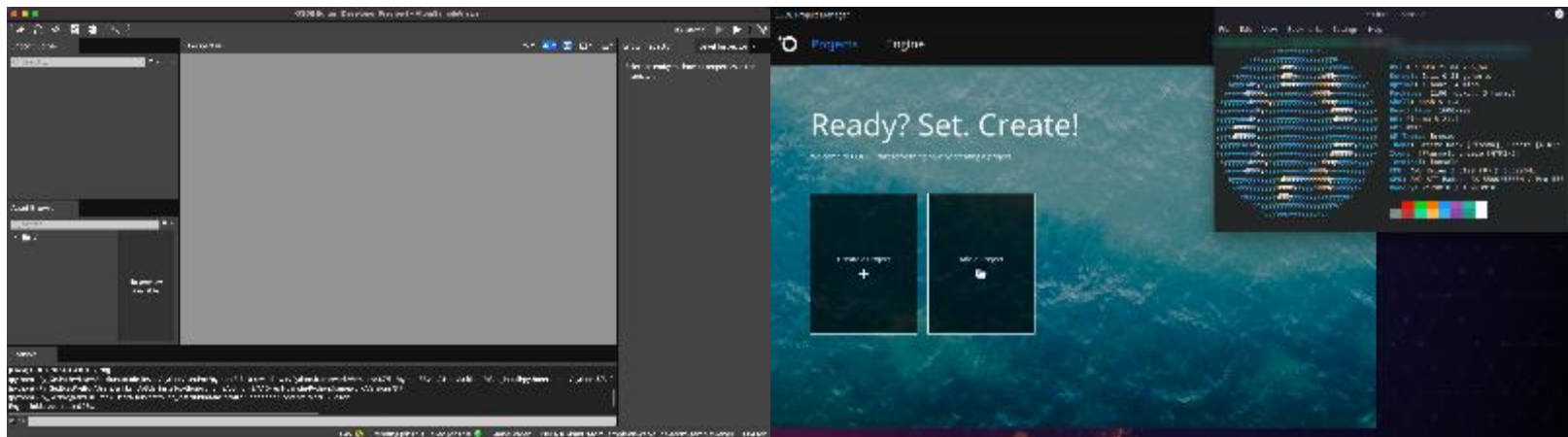
- › **Networking and Cloud** - The connectivity software scale globally

- › Networking 2.0 (multiplayer)
- › Rewind and interpolation for latency
- › Cloud Services support



Open 3D Engine Major Components

- › **Platform support** - Tools and software support to create once and build for multiple platforms
 - › Native Linux, Windows, Mac, editor authoring and runtime support
 - › Mobile hardware platform support (Android/iOS/Vulkan Posix)
 - › Open XR: VR Support / AR Support fully developed in the open
 - › <https://github.com/o3de/sig-graphics-audio/issues/39>



Thank you



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