



DSC 2019 EUROPE VR

Driving Simulation & Virtual Reality Conference & Exhibition

Driving simulated Machine Learning and Humans Training

Seb Loze - Simulations Industry Manager, Epic Games
DSC Europe 2019, Strasbourg, September 5th, 2019



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Squeeze : verb /skwi:z/
squeeze verb (Press together)

To press something firmly, especially from all sides in order to change its shape, reduce its size, or remove liquid from it.

(Source : Cambridge Dictionary)

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To press something firmly, especially from all sides in order to change its shape, reduce its size, or remove liquid from it.

example : 20 mins before lunch time to present Unreal Engine role in the Driving Simulation world

Epic Games

1991 : Epic Games creation 1998: Unreal Engine 2012 : UE4 2015 : Unreal Engine Free 2017 : Fortnite 2019 : First presence at DSC

2016 : CARSIM Plugin 2017 : NVIDIA AGX
 2016 : Intel CARLA
 2015 : Microsoft AIRSIM 2017 : Matlab Simulink vehicles plugin

Unreal Engine supports :





A new **toolkit** for **creation**

UNREAL

1998



UNREAL
ENGINE

FORTNITE

2019



ONLINE
SERVICES



FREE

ANY ENGINE, ANY STORE

Free, any engine, any store





Fair economics for everyone

88/12

Epic Games - Enterprise focus

AEC

*Colcalux Hotel
courtesy of Carlos Motin*

**Manufacturing &
Design**

Film & TV

Courtesy of The Future group

Simulations

Courtesy of Boeing

Unreal Engine



Unreal Engine is an **open**, user-centric, game engine.

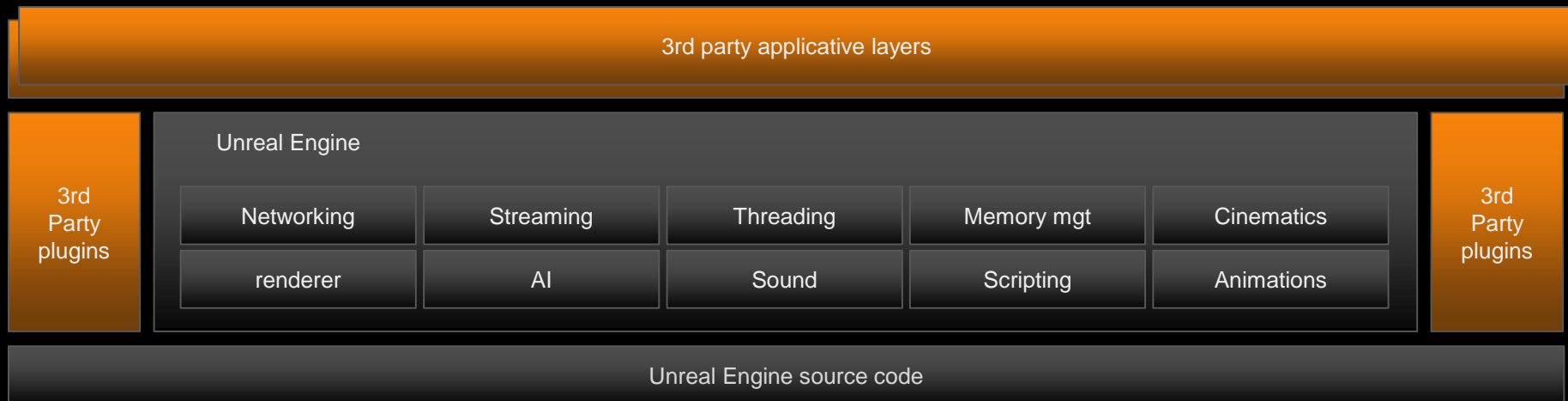
With a DNA built on creating **immersive, interactive, and stimulating virtual worlds**, Unreal Engine is a great way to kick-start Simulator developments and **save time**.

Unreal Engine not only provides the most efficient window to synthetic environments, but also allows simulation providers to define true-to-life dynamics, interoperable communications, and state-of-the-art artificial intelligence behaviors.

UE4 is **free** and its **source code** is available for everyone on github

(No royalties in the Enterprise context)

Unreal Engine, a development platform



Distributed Simulation

Following existing standards (HLA example)

USE THE **AVAILABLE DIS / HLA**
UE4 MODULE
OR
CREATE **YOUR OWN**



coreDS™
Unreal
By DS.Tools

Control over your HLA and DIS networks:

- Through the Unreal Engine Editor
 - Using BluePrint
 - Using the Unreal API
-
- Provides configuration GUIs
 - Switch configuration at runtime (from HLA to DIS, or to a new set of mapping, or FOM, or anything you can think of)
 - Data mapping at runtime—change your FOM file or PDU mapping on the fly, no compilation required
 - Automatic data encoding/decoding
 - HLA 1.3, 1516 and 1516e (FOM agile)—all RTI are supported, including Open Source
 - Supports DIS 4-5-6-7 (with custom PDU support)
 - No code generation required

<https://www.ds.tools/contact-us/trial-request/>

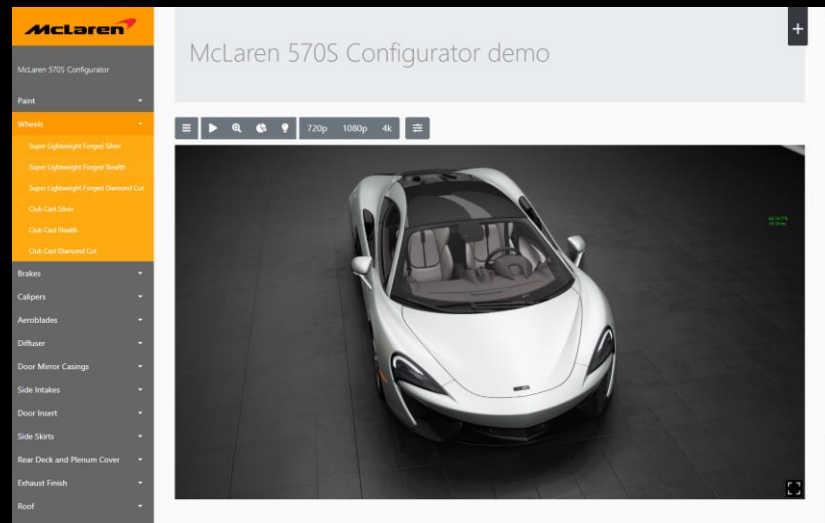
Distributed : Epic Online Services

- Game analytics - Store telemetry about your players and their gameplay to understand and boost retention and engagement. Our dashboards help you make data-driven decisions in real time.
- Ticketing system - Connect directly with players through integrated customer support tools that tie tickets to a player's profile. Provide high-quality personalized support by accessing player data from a single dashboard.

Coming soon

- Player reports
- Player data storage
- Achievements, leaderboards & stats
- Communications
- Parties
- Overlay
- Matchmaking
- Player identity
- Player inventory

Distributed : Pixel Streaming



<https://docs.unrealengine.com/en-US/Platforms/PixelStreaming/PixelStreamingOverview>

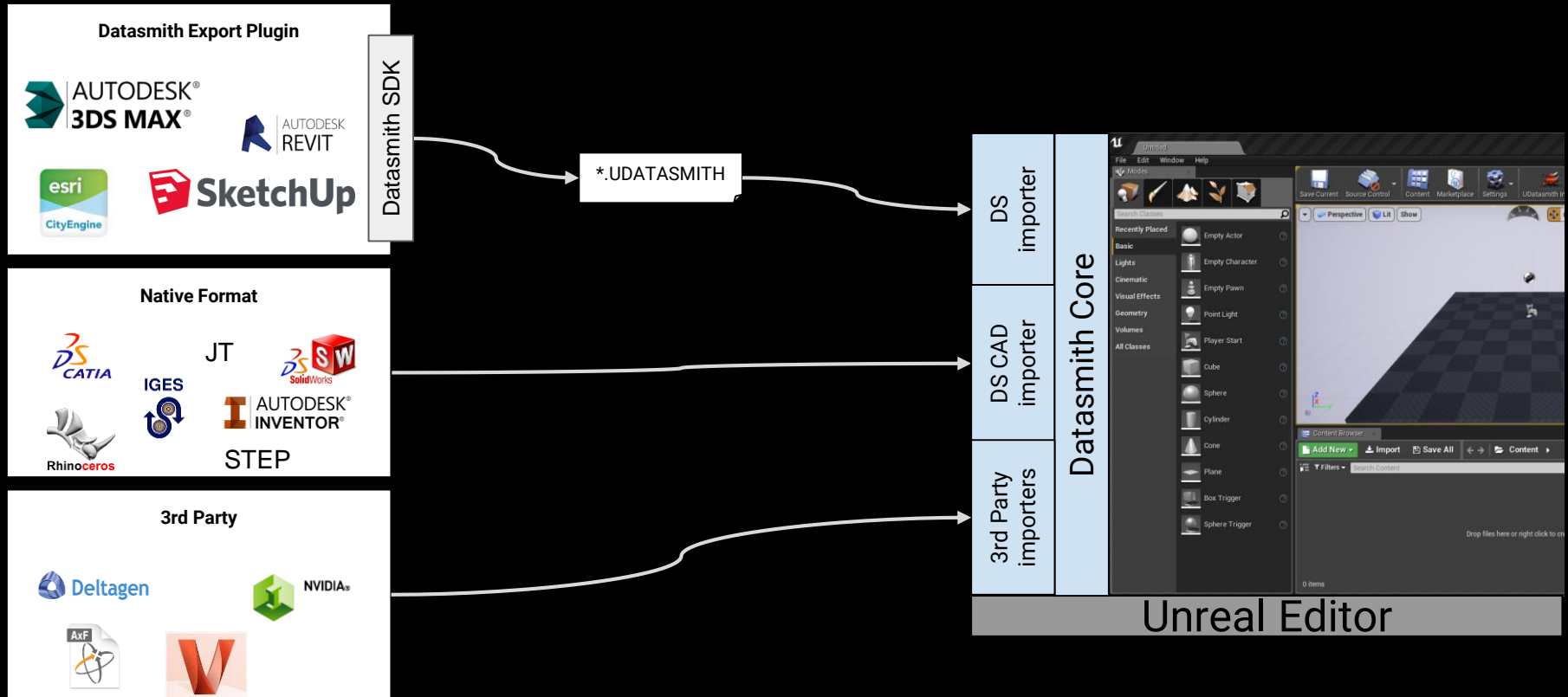
Distributed : Google STADIA



The right tools for the right simulators

PIPELINES AGILITY

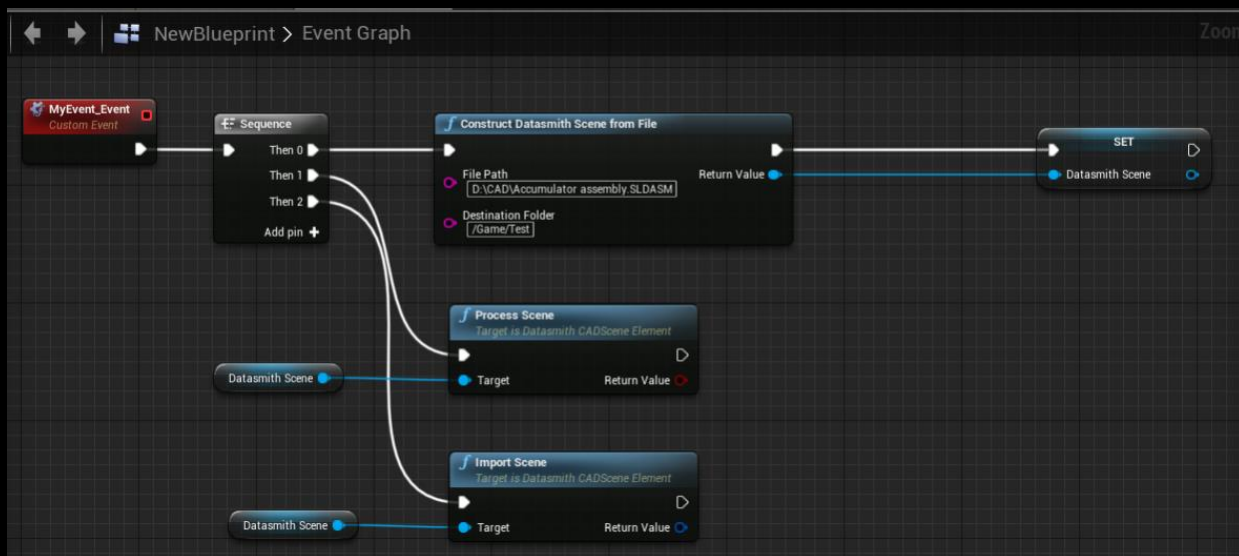
Pipelines Agility : DataSmith



Pipelines Agility : Content Optimization

		Triangle count	Draw call
CAD importer	Tessellation		
Unreal Editor Function	LOD		
	Merge		
	Jacketing		
	Proxy LOD		
	Hierarchical LOD		
	ISM		

Pipelines Agility : Optimization Automation



- 3 solutions / 1 API :
 - C++ coding (commandlets)
 - Blueprint (editor events)
 - Python scripting

Replace tedious low-added-value manual work

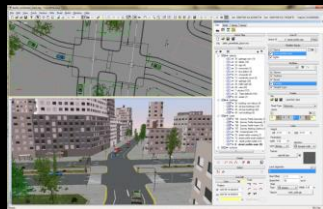
Code once and apply the same process on many projects

Rapid prototyping

Access to libraries

Pipelines Agility

Large terrain DBs / No exclusivity



TrianGraphics
Trian3DBuilder



Esri
CityEngine



VectorZero
RoadRunner



Presagis
FLT, MFLT, CDB



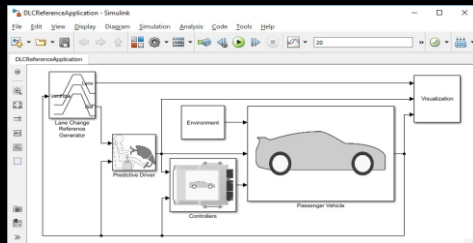
OpenStreetMap
(free plugin)



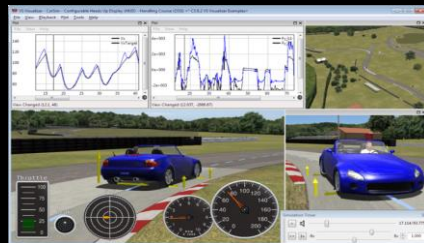
ASCEND - ARL

... and many more to be announced soon

Dynamics / Physics Engine / Hardware



MathWorks - Simulink



Mechanical Simulation - CarSim



NVIDIA - AGX



Microsoft - AirSim

... and others

Unreal Engine - Recap

Many new features and improvements

- 3 releases / year
- Benefit all industries
- Source code access on github

Recent and future developments will help the **AV community**

- **Datasmith - Editor - Physics - Rendering** - and more...

Driving Simulations | Smart and beautiful (and vice versa)

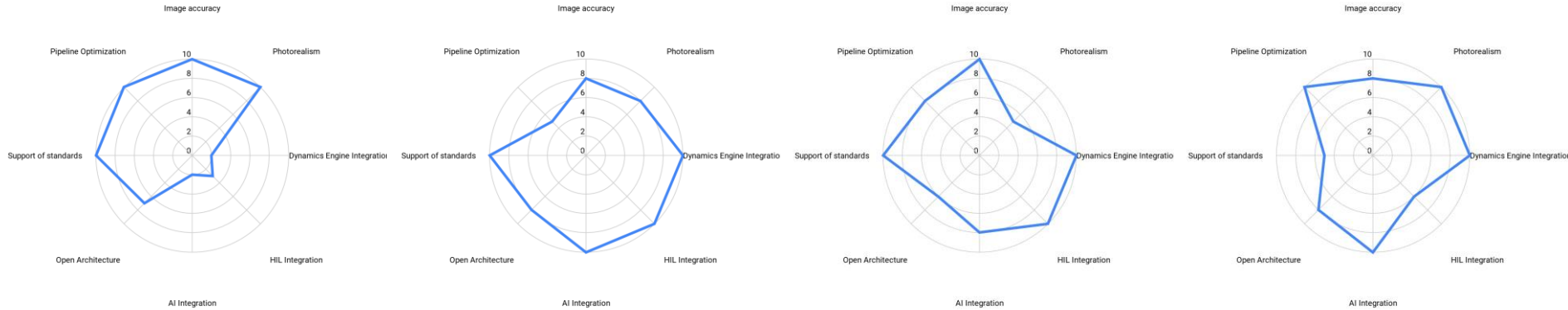
Depending on their goals, priorities in the development process of driving simulators is focusing on 8 criterias impacting the way images are displayed (or not) :

- Image accuracy
- Photorealism
- Dynamics Engine Integration
- HIL Integration
- AI Integration
- Open Architecture
- Support of standards
- Pipeline Optimization

“One thing that we're not necessarily doing is we're not doing a fancy 3D world like this because we are simulating perception.” - Uber, Matt Ranney

“UE4 allowed us to achieve an impressive graphics quality, allowing top quality lighting effects, and rain/wet terrain simulation” - Kunos Assetto Corsa, Marco Massarutto

Driving Simulations | Smart and beautiful (and vice versa)



Automotive digital marketing

Man in the loop Simulator

AV Simulator / machine learning

Racing video game

(Attributed values are projections based on typical use cases observations)

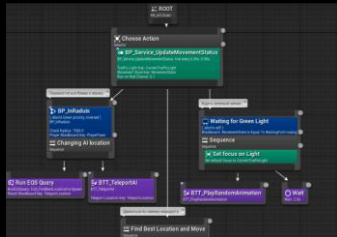
Unreal Engine | Driving Simulation use cases examples

Inside a self-driving Uber



<https://www.infoq.com/presentations/uber-self-driving-software/>

Development of Pedestrian Artificial Intelligence
Utilizing Unreal Engine 4



<https://www.iijte.org/wp-content/uploads/papers/v8i1/A7288058119.pdf>

Nvidia AI Can Render Complete Urban
Environments in Unreal Engine 4



<https://www.extremetech.com/extreme/281649-nvidia-ai-can-render-complete-urban-environments-in-unreal-engine-4>

Microsoft Road-Runner photo-realistic simulation and
deep learning to train autonomous driving algorithms



<https://www.microsoft.com/en-us/garage/blog/2018/04/project-road-runner-train-autonomous-driving-algorithms-for-road-safety/>

Reikko and Vertechs create Auto City



<https://www.vertechs.jp/autocity>

OTSL strengthens 3D Real-Time Sensor Simulator
Framework COSMOSim (R) Ecosystem



<https://www.prnewswire.com/news-releases/otsl-strengthens-its-3d-real-time-sensor-simulator-framework-cosmosim-r-ecosystem-for-autonomous-driving-300883916.html>

Zoox merging Simulation & Reality



<https://zoox.com/journal/>

GM's Cruise is preparing for a self-driving
future in the cloud



<https://venturebeat.com/2019/04/20/gms-cruise-is-preparing-for-a-self-driving-future-in-the-cloud/>

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Epic Games - Mega Grants



\$100,000,000

✓ **Do I have to pay the money back at a later date?**

Absolutely not. We will never ask you to pay back any money that Epic has paid you under Epic MegaGrants. This is not an investment on Epic's part, nor is it a loan. This is our way to give back to the incredible community and reward excellence.

✓ **Why would we give away free money?**

Simply put, we succeed when you succeed. We're incredibly proud of the UE4 community and want to do what we can to grow that community. Epic wants to help you focus more on creation and worry less about keeping the lights on.

<https://www.unrealengine.com/en-US/faq?active=devgrants>

Thank you