Accelerate Training Digitization with game engines

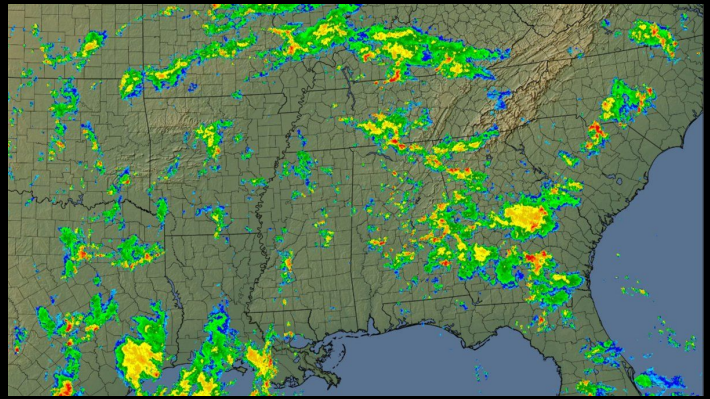
Seb Loze - Simulations Industry Manager

Part I

a new era of digitalization
Two universes inspiring each other

Canon
EOS 550D
CANON ZOOM LENS EF-S 18-55mm 1:3.5-5.6 IS
CANON INC.

Campbell's
Green Giant
Beach-Cliff Sardines
Bumble Bee
Tomato Soup
Pink Salmon
Cream of Mushroom Soup
Cheddar Cheese
BUSH'S Original Baked Beans
Del Monte Cut Green Beans
BUSH'S Black Beans
Hunt's Sauce



It’s all about the nature
of the relationship you choose

Predator / Prey

Image source : Facebook | Beauty At Its Best

Predator / Prey

Image source : Facebook | Beauty At Its Best

Scavengers

Image source : Quora, Serge Elia

Osmosis

Image source : encyclopedie-environnement.org

Osmosis

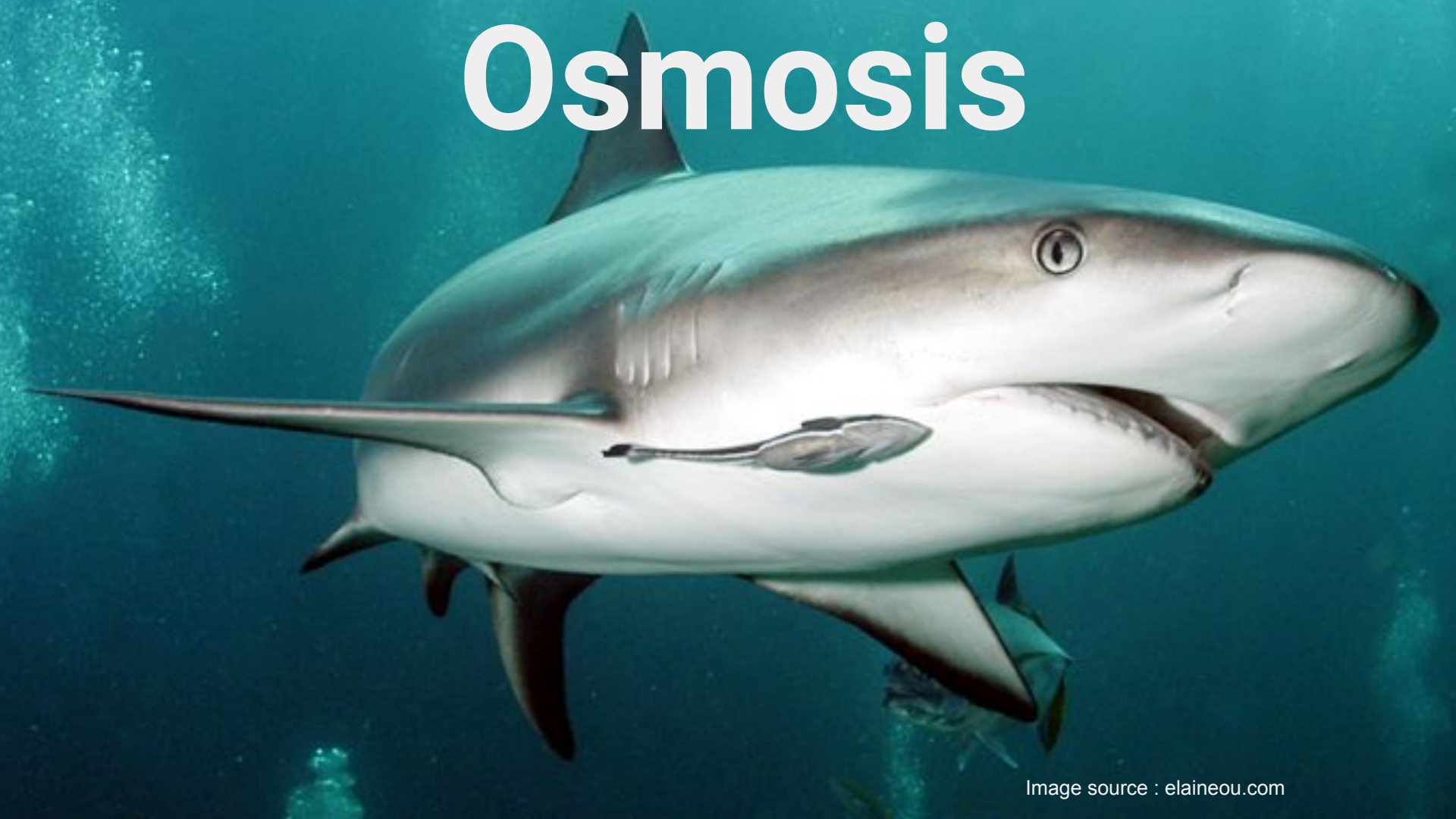
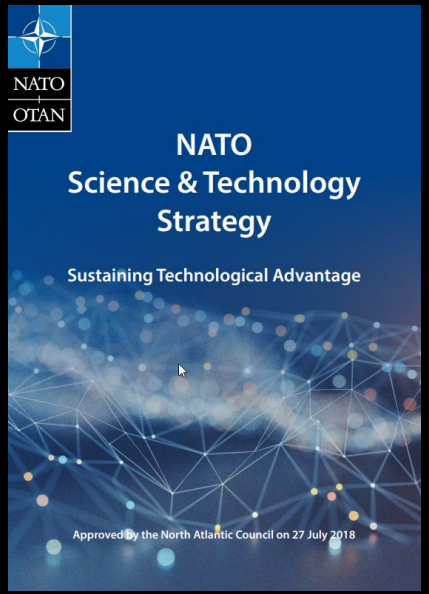


Image source : elaineou.com

Sometimes … Osmosis are possible

When between two species goals are different but they converge …



“Disruptive innovations create a new market and value network which eventually disrupts the existing market and value network, thus displacing established market leading firms, products, and alliances.

For the military, disruptive technologies transform defence capabilities and methods, shifting the force balance and unhinging opponent capabilities.

These emerging and disruptive technologies are heavily driven by commercial investments and interests, and clearly must be leveraged to meet military capability requirements and minimize vulnerability to potential threats.”

- NATO Science & Technology Strategy

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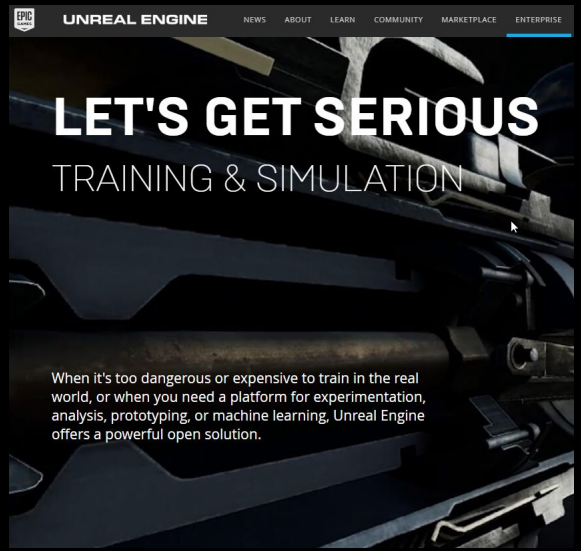


“When it's too dangerous or expensive to train in the real world, or when you need a platform for experimentation, analysis, prototyping, or machine learning, Unreal Engine offers a powerful open source and free solution”

- Unreal Engine
  (Training and Simulation)

https://www.unrealengine.com/en-US/industries/training-simulation

Videos Games | Simulation applications

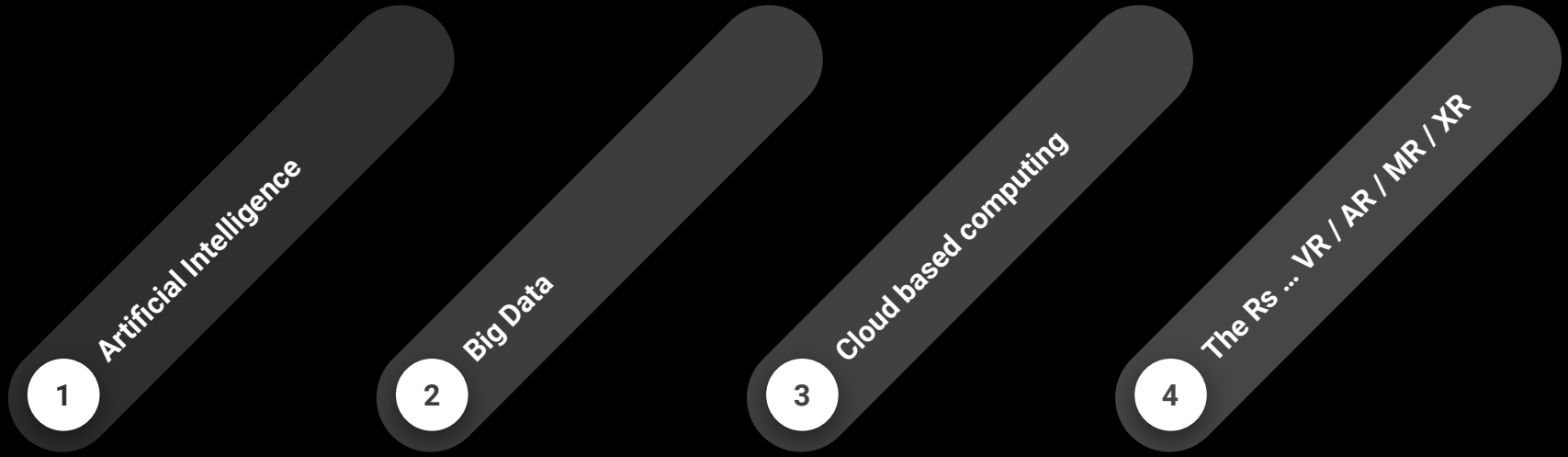
	Video Game	Simulation application
Goal : Entertainment	YES	NO
Goal : Learning	NO	YES
Engaging	YES	YES
Interoperable / Multiplayer	YES	YES
Connected	YES	YES
Visual and physics Realism	YES	YES
Deployability	YES	YES
XR agility / portability	YES	YES
Open	YES	YES
Large open world	YES	YES

Remember Osmosis ?

“When between two species goals are different but they converge …”

HERE'S YOUR "BUZZWORD BINGO" CARD FOR THE MEETING.
2-22
S. Adams
E-Mail: SCOTTADAMS@AOL.COM
IF THE BOSS USES A BUZZWORD ON YOUR CARD, YOU CHECK IT OFF. THE OBJECTIVE IS TO FILL A ROW.
© 1994 United Feature Syndicate, Inc.

Let's ~~kill~~ neutralize the buzzwords



Let's ~~kill~~ neutralize the buzzwords

Artificial Intelligence

The Myth

Skynet / Terminator

The AI will control the humans

Pragmatic use case and redefinition

Agent driven simulation

Pathfinding, Navigation, recognize events and situations, adapt reactions, suggest course of action

Let's ~~kill~~ neutralize the buzzwords

Big Data

The Myth

Privacy concerns

Identity theft, privacy risks

Magic solution to everything

Pragmatic use case and redefinition

“Bring data that’s collected from training exercises and bring it back in to replay, improve performance and give feedback to the trainees” Rear Adm. Robb

Basically capture, replay, analyse for AAR

Let's ~~kill~~ neutralize the buzzwords

Cloud based computing

The Myth

Unreliable and Laggy
Security concerns
Inefficient
Expensive

Pragmatic use case and redefinition

A proven and secure mechanism to deploy

Just a fantastic way to deploy and train anywhere anytime

An essential way to access to Simulation As A Service

Let's ~~kill~~ neutralize the buzzwords

VR/AR/MR/...XR

The Myth

Hard to do well

Only for Gamers

Best way to deploy a training ...

Pragmatic use case and redefinition

Remember multimedia ? (The first time you played a video, a video game …)

This is just a new screen, smaller and closer to your eyes. Just another viewport … It should be easy to deploy

Game engine = development platform

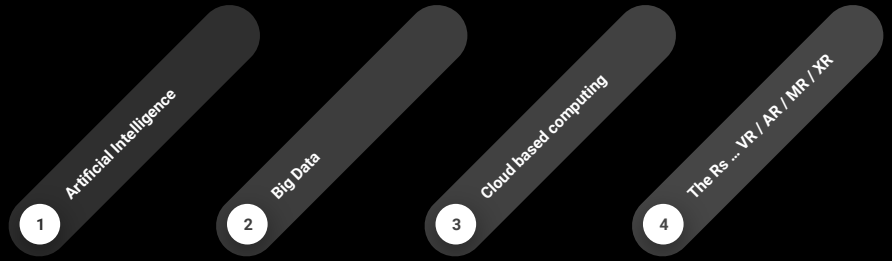
"A game engine is a software-development environment designed for people to build video games.

The core functionality typically provided by a game engine includes a rendering engine ("renderer") for 2D or 3D graphics, a physics engine or collision detection (and collision response), sound, scripting, animation, artificial intelligence, networking, streaming, memory management, threading, localization support, scene graph, and may include video support for cinematics.

Implementers often economize on the process of game development by reusing/adapting, in large part, the same game engine to produce different games or to aid in porting games to multiple platforms."

- Wikipedia

Handling the trends ...



Networking	Streaming	Threading	Memory mgt	Cinematics
renderer	AI	Sound	Scripting	Animations

Game Engine source code

"WE MUST KEEP UP WITH THE PACE OF
EVOLVING DISRUPTIVE TECHNOLOGY"
- ADMIRAL CHRISTOPHER W. GRADY

"GAMES AND GAMING TECHNIQUES REPRESENT AN
UNBELIEVABLE POTENTIAL TO TRANSFORM THE WAY WE TRAIN."
- ADM JAMES ROBB, PRESIDENT NTSA
NTSA
NATIONAL TRAINING & SIMULATION ASSOCIATION

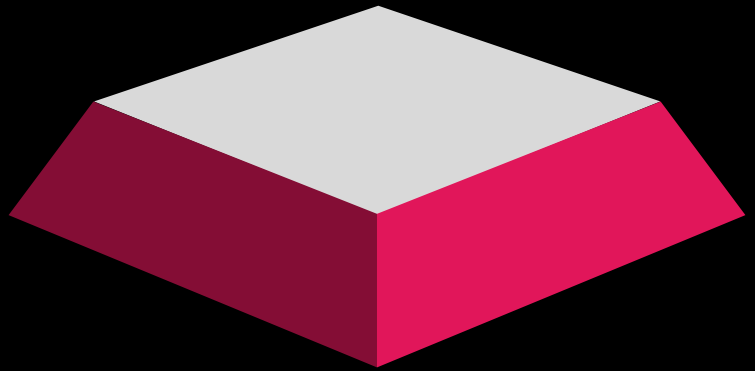
"COMPARED TO OUR PREVIOUS TRAINING SOLUTIONS
, STE WILL BE LESS HARDWARE, MORE SOFTWARE INTENSIVE"
"WE WILL LEVERAGE THE COMMERCIAL/GAMING SECTOR INNOVATIVE TECHNOLOGIES"
MAJOR GENERAL MARIA R. GERVAIS
DSET

Innovative Training Techniques
During #WATS2019 Lt Col Bruce "Buck" Rodger, @usairforce restating the value innovative #VR and #AI technologies will bring to tomorrow's training simulators.

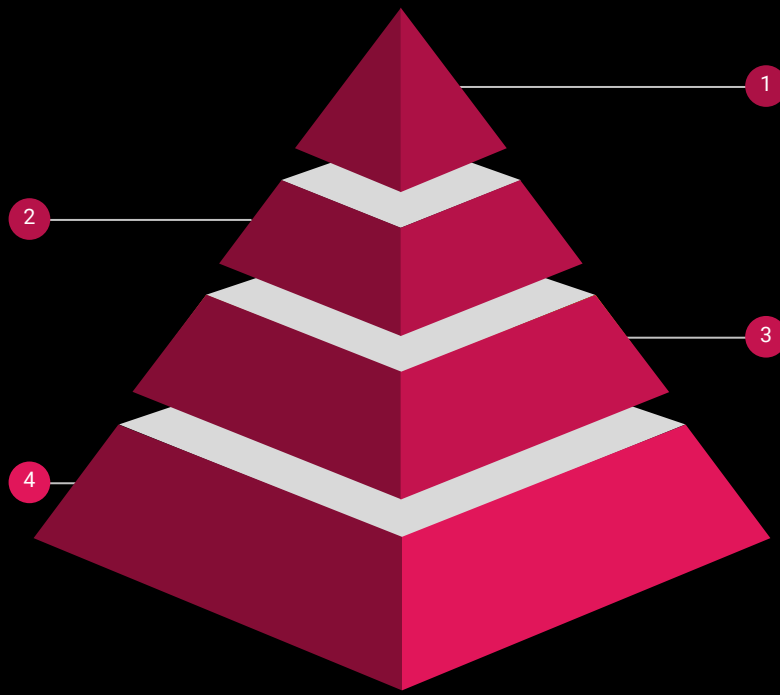
Game engine = development platform

Networking	Streaming	Threading	Memory mgt	Cinematics
renderer	AI	Sound	Scripting	Animations

Unreal Engine source code



A pragmatic training capability development process ...



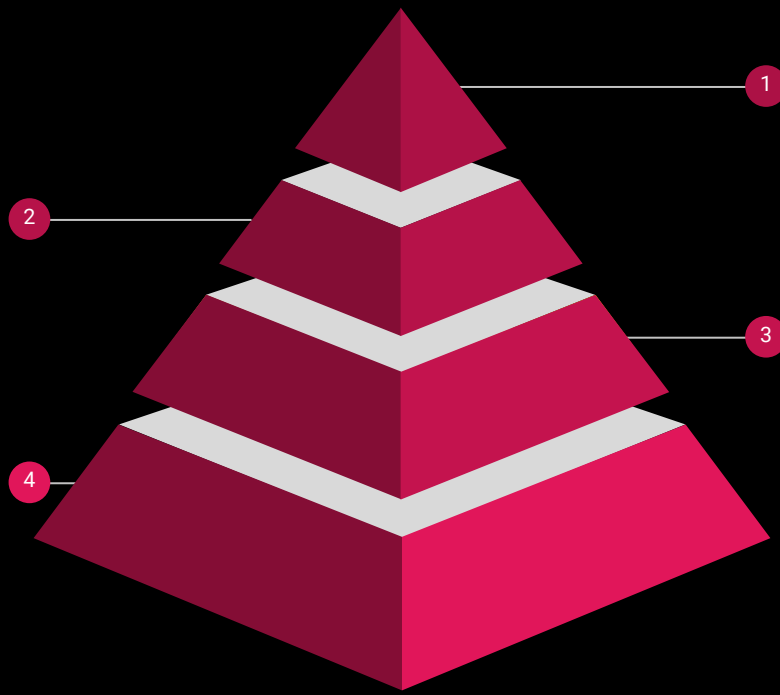
1 **Curriculum definition**

2 **Specialty features implementation**

3 **Integration effort**

4 **Framework level**
Development environment
Standards DB / Interoperability
Game Engine

A pragmatic training capability development process ...



1. **Curriculum definition**
2. **Specialty features implementation**
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   Development environment
   Standards DB / Interoperability
   Game Engine

Remember Osmosis ?

“When between two species goals are different but they converge …”

3 images to remember

Accelerate Training Digitization with game engines

Seb Loze - Simulations Industry Manager

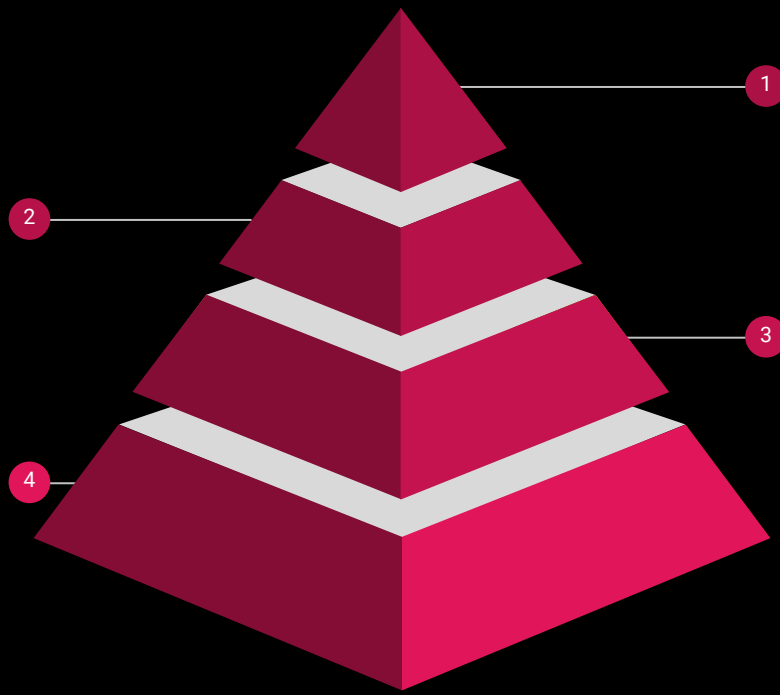
Part II

RetEx Unreal Engine
Simulations use-cases and vision

Previously ...

Campbell's
Green Giant
Tomato SOUP
Pink Salmon
Mushroom SOUP
BUSH'S
Original
BAKED BEANS
Hunt's
SAUCE

A pragmatic training capability development process ...



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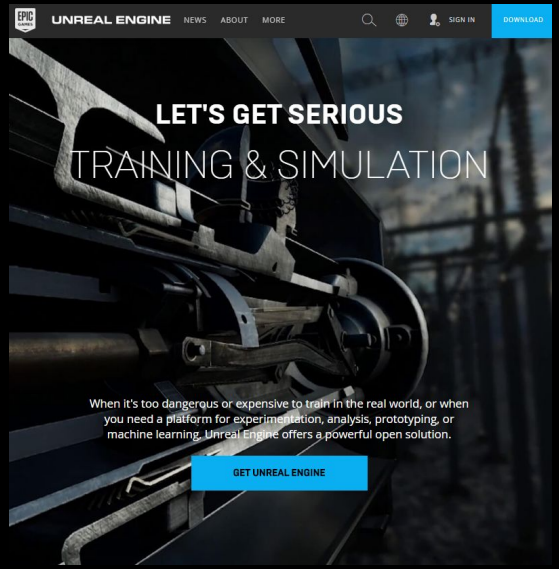
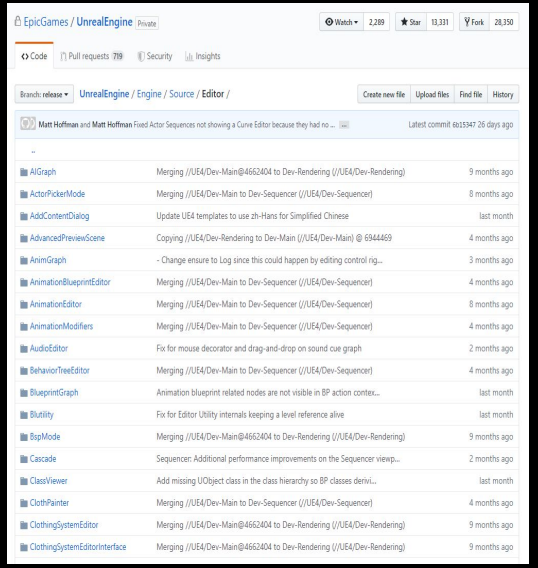
First step : Get access





https://www.unrealengine.com/en-US/industries/training-simulation

Free - Open Source - Supported - Simulation focused

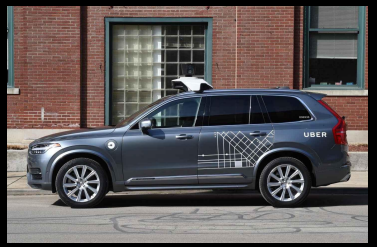
Implementation examples

A small autonomous vehicles detour ...

MSaaS

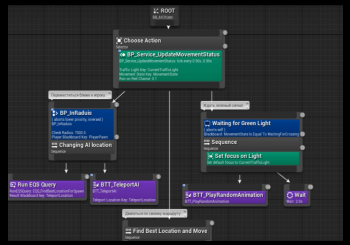
Unreal Engine | Driving Simulation use cases examples

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.iirte.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

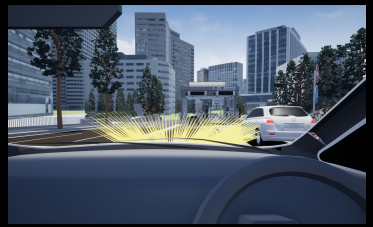
Microsoft Road-Runner photo-realistic simulation and deep learning to train autonomous driving algorithms

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/

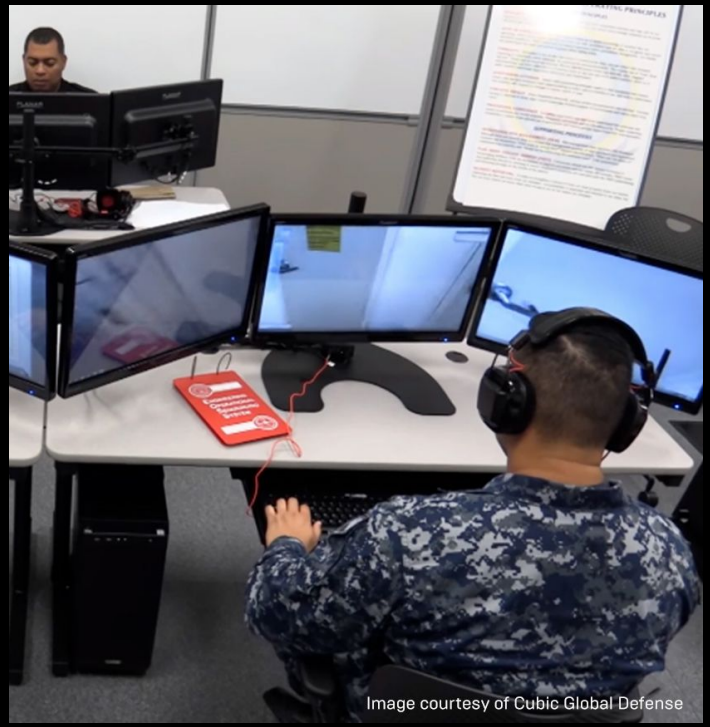
GM - Cruise AV

“Cruise runs lots of simulations across its suite of internal tools — about 200,000 hours of compute jobs each day in Google Cloud Platform (25 times the number of hours 12 months ago) — one of which is an end-to-end, three-dimensional Unreal Engine environment that Cruise employees call “The Matrix.” Macneil says it enables engineers to build any kind of situation they’re able to dream up, and to synthesize sensor inputs like camera footage and radar feeds to autonomous virtual cars.

According to Macneil, Cruise spins up 30,000 instances daily across over 300,000 processor cores and 5,000 graphics cards, each of which loops through a single drive’s worth of scenarios and generates 300 terabytes of results. It’s basically like having 30,000 virtual cars driving around in parallel, he explained, and it’s a bit like Waymo’s Carcraft and the browser-based framework used by Uber’s Advanced Technology Group.”

… Back to how the nations can leverage a game engine …

A maintenance trainer : LCS by Cubic



"Unreal's application of Blueprint, having a visual scripting tool that you don't have to be an engineer to use, you can be a designer or subject-matter expert to use, and create content, has been huge," he says. "And it's been huge in two ways. One, it's really given technical creators a seat at the table with engineers in the DoD industry. The other thing is it's let veterans who are recently out of the military pick up high-fidelity technology and essentially become game developers, and write code without knowing it, using Blueprint. Unreal 4 has reshaped our industry."

- Andre Balta, CTO Cubic Defense

https://www.youtube.com/watch?v=k-aT90ehH8Y

Pilot Training Next - HTX Labs work

"HTX has provided us an immersive emergency procedure trainer that filled an essential gap in our pilot training program. They are a responsive and attentive company, that have been great to work with!"

Paul "Slew" Vicars, Lead for the Pilot Training Next (PTN) Program, U.S. Air Force

"We are very excited to collaborate with them on the next generation of EMPACT and look forward to further developing our state-of-the-art VR training platform that will unlock an entirely new way to influence and analyze the human learning process. This is one of the many advantages of utilizing virtual reality for training and will be the catalyst to an infinite number of possibilities for measuring the effectiveness of corporate learning and development programs,"

Chris Verret, CTO of HTX Labs.

https://www.youtube.com/watch?v=_AyrBoI7aZM

The Infantry trainer - the Squad example

“Right now, our focus is on proving the framework—prototype quickly, prove the capabilities, then look at the future where we can develop platforms together using Unreal Engine. We want to teach them to fish rather than for them."

“The goal here is to be able to grow it, and grow it, and grow it, and eventually provide all the tools that anybody might need to do military research on top of Unreal Engine.”

Chris Greig

Image courtesy of Offworld Industries

Last year ...

- Communications HLA / DIS
- Terrain DBs integrations (from OpenFlight to building pipelines)
- Simulation as a service (pixel streaming, Stadia, AWS, Google Cloud services, Epic Games online services)
- Multi viewport displays (display for blending and warping)
- Chaos Physic Engine / destructions and particles
- Motion cueing universal interface

Launched the MegaGrants

Many more features, unreal engine based applications, integrations of plugins will be revealed during I/ITSEC (Databases, Vehicles, Motion cueing implementation...)

Coming next ...