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UNIGINE 2 Sim in real-time

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Real-Time 3D Visualization For Aviation

Real-Time 3D Visualization For Aviation

Most FSTDs (Flight Simulation Training Devices) include a visual system, and it is mandatory for FFS (Full-Flight Simulator). Real-time 3D graphics is used to imitate out-of-the-window and sensor views in the flight simulator or control tower simulator.

VFR skills are critical for helicopter operators, as well as for fixed wing vehicles in emergencies, traffic/weather avoidance, etc.

Why High-Quality Visuals Are Important?

Realistic 3D graphics is required to transfer the simulator skills into real life. **Modern pilots** expect video game quality of the image in order to believe and immerse into the simulation and efficiently obtain the automatic skill.

Computer Vision in **autonomous drones** requires even more photorealistic, physically accurate visual datasets for machine learning of the AI.

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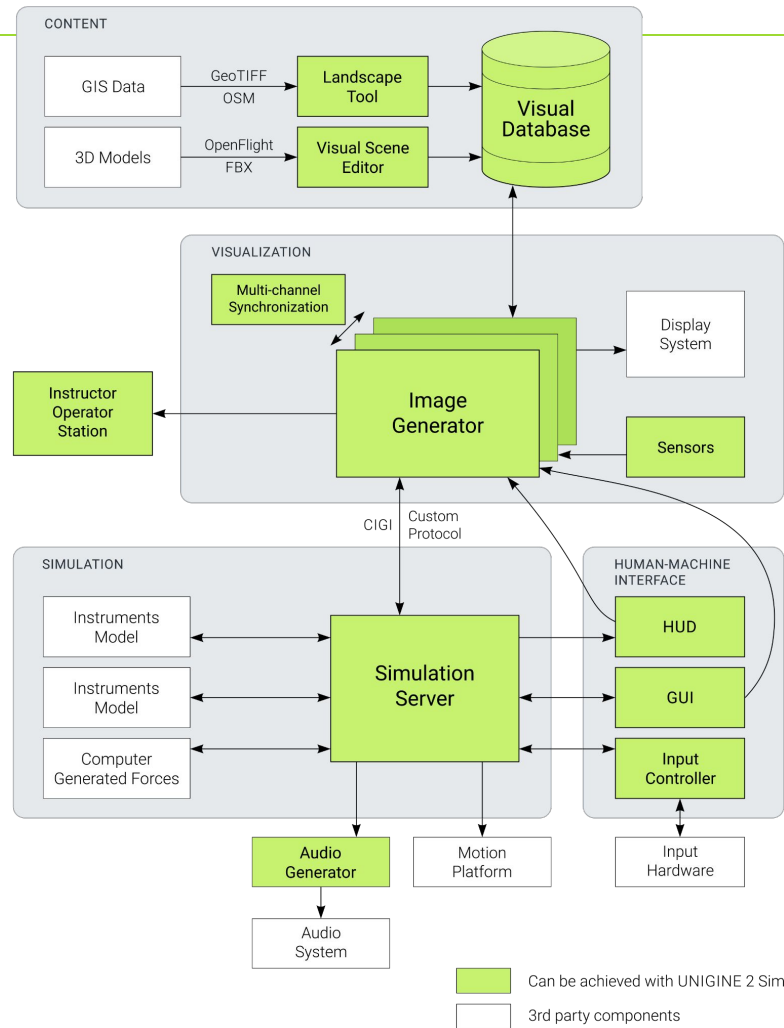UNIGINE 2 Sim in real-time

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UNIGINE 2 Sim:
Real-Time 3D Visualization SDK

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Software Development Kit

UNIGINE 2 Sim is positioned between COTS and a generic 3D engine: we have a rich set of features tailored for simulation & training (as COTS do) - including sensors, etc., but it also has a lot of flexibility (as a generic 3D engine).

The downside is that you still need a **team of experienced C++ or C# developers** in order to use the power of this software development kit.

CONTENT

| GIS Data | GeoTIFF OSM | Landscape Tool |
| 3D Models | OpenFlight FBX | Visual Scene Editor |

Visual Database

VISUALIZATION

Multi-channel Synchronization

Display System

Instructor Operator Station

Image Generator

Sensors

CIGI · Custom Protocol

SIMULATION

Instruments Model

Instruments Model

Computer Generated Forces

Simulation Server

HUMAN-MACHINE INTERFACE

HUD

GUI

Input Controller

Audio Generator

Motion Platform

Input Hardware

Audio System

Can be achieved with UNIGINE 2 Sim

3rd party components

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Use Cases

**Different tasks,
the same technology**

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Flight Simulation

UNIGINE 2 Sim is in the core of flight simulators of different class and type:

- Rotary wing / Fixed wing
- Civil / Military
- Special vehicles

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Air Traffic Management

- ATC tower simulator
- Airport management
- Ground services training

UNIGINE-powered systems of these types can be found worldwide.

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Image generated by UNIGINE 2 Sim in real-time

Maintenance Training

UNIGINE-powered immersive virtual environments are perfect for AMT (aviation maintenance technician) training and attestation.

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Image courtesy of GDI
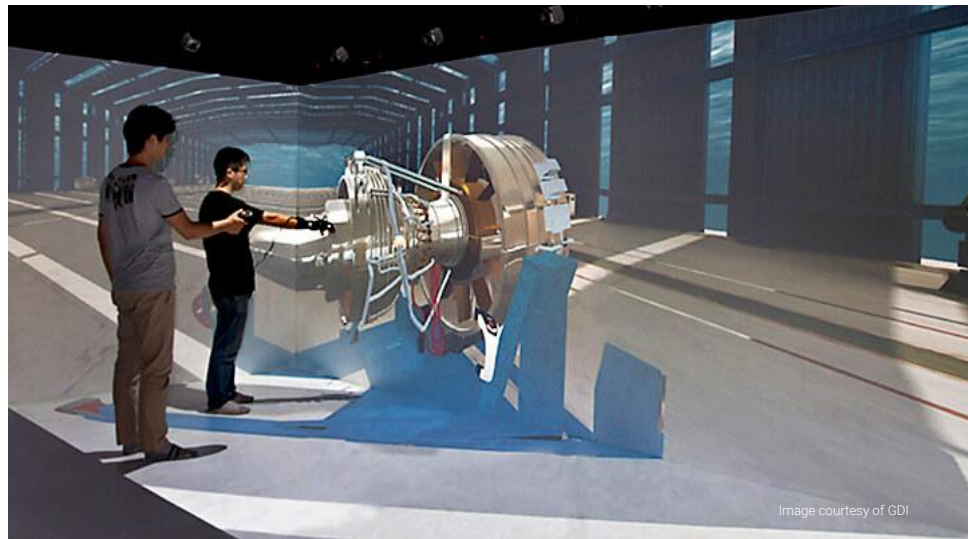
Research & Development

The outstanding flexibility of UNIGINE 2 Sim API allows the use in R&D projects:

- New vehicles development
- Ergonomics research
- SIL (Software-In-The-Loop) simulation

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Image generated by UNIGINE 2 Sim in real-time

Image generated by UNIGINE 2 Sim in real-time

Image generated by UNIGINE 2 Sim in real-time

Unmanned Aerial Vehicles

UNIGINE 2 Sim is used not only for **Drone/UAV operator training** (including first response/defense) but also for **AI learning in fully autonomous aerial vehicles:**

- Generation of synthetic databases for deep learning of computer vision
- AI verification in parametric virtual environments

Built-in camera and sensor effects are very useful here.

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UNIGINE 2 Sim in real-time

pos_x: 214.61
pos_y: -205.82
pos_z: 70.47

Image courtesy of Daedalean AI
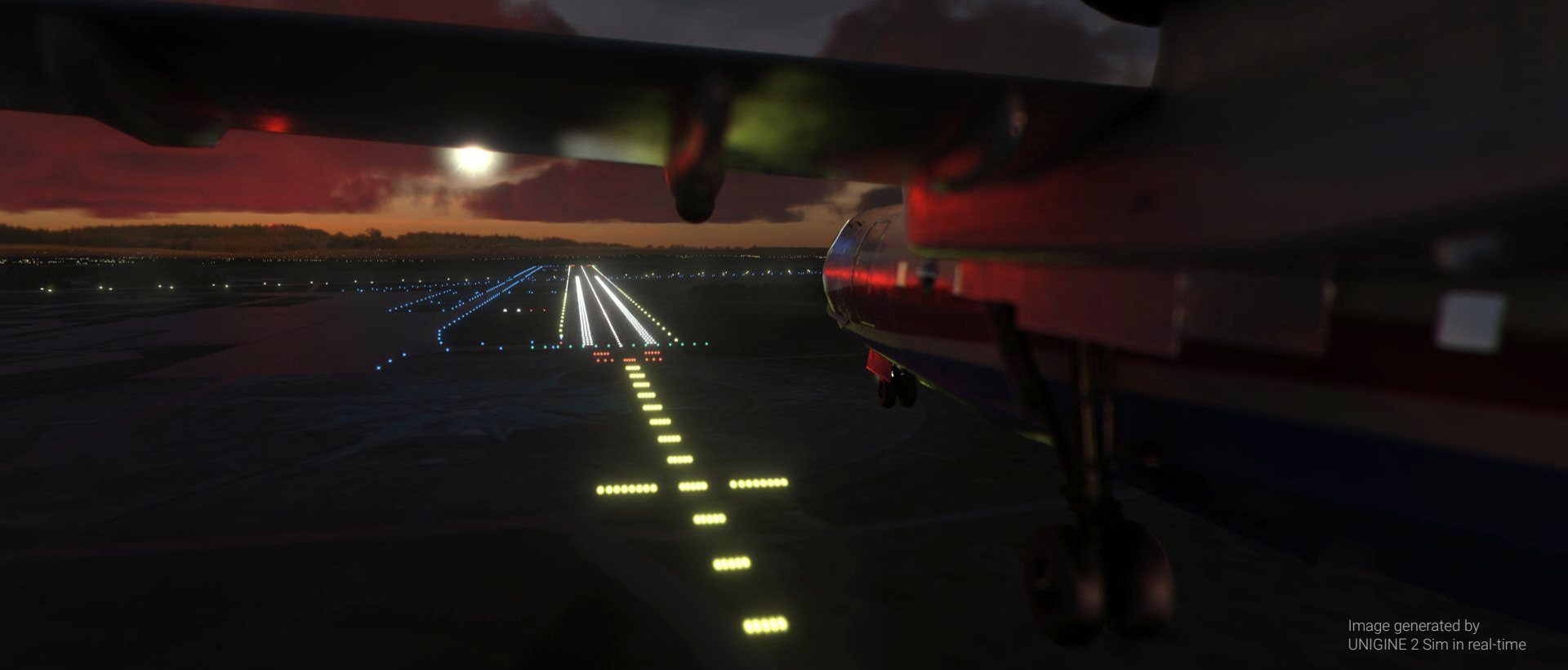
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Key Advantages

Realistic Atmosphere

- Full spectrum of cloud types, including Cumulonimbus
- Regional weather
- Multiple layers of 3D volumetric clouds
- Weather effects, including wind affecting objects, rain, fog, lightning, and snow
- Sun and Moon, star map

Image generated by UNIGINE 2 Sim in real-time

Image generated by UNIGINE 2 Sim in real-time

POWERED BY :: UNIGINE 2
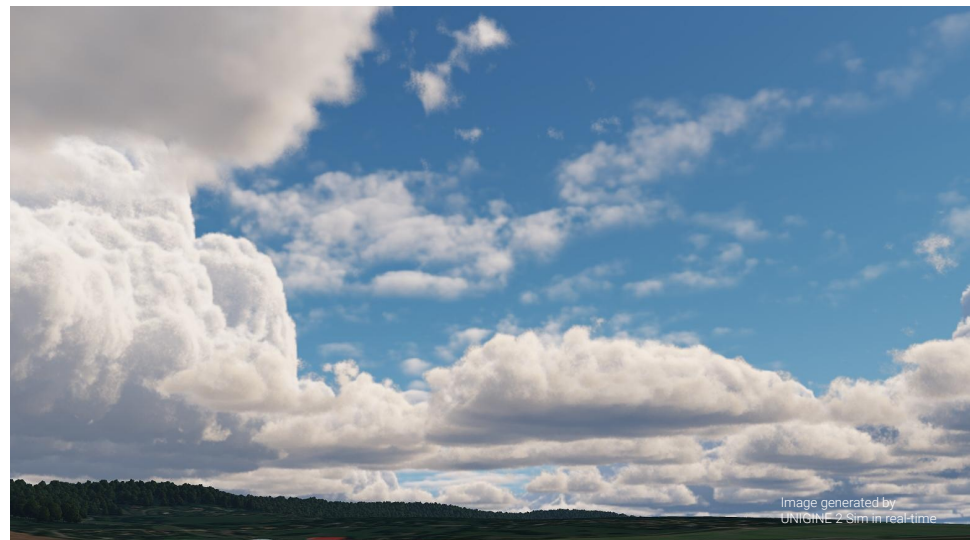
Earth Scale

- 64-bit precision per coordinate (scenes as large as the Solar system)

- Support of 3D ellipsoid model (WGS84, custom models)

- Support of both geo-coordinates and Cartesian system

- Ephemeris system for celestial bodies positions

- Support of ENU / NED and ECF coordinates

Image generated by UNIGINE 2 Sim in real-time
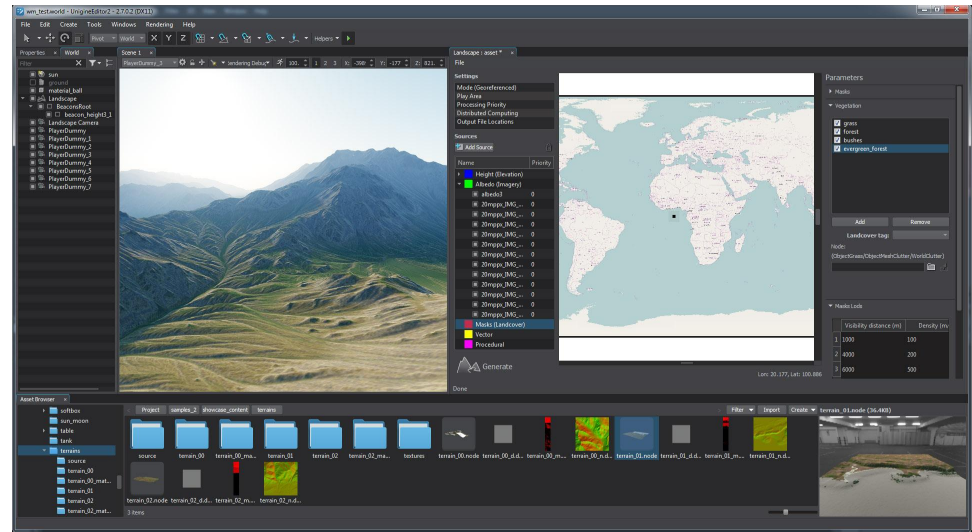
Realistic Visual Databases

- Unique terrain technology:
    - Extreme details up to 1 mm per pixel
    - Multiple high-resolution insets
    - Dynamic modification at the runtime - craters, funnels, trenches
    - Up to 1024 detail materials
    - Cooperative editing by a team of 3D artists
    - UAV-grade zoom support
- Performance-optimized object cluster system
- Asynchronous multi-core data streaming
- Visual 3D scene editor with support for GIS data formats (elevation, imagery, vector)

Images generated by
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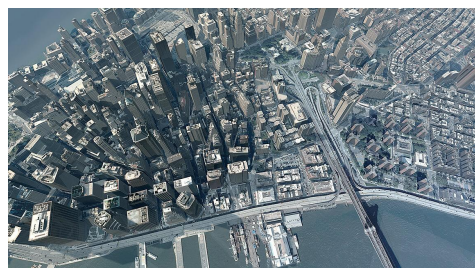
Visual Fidelity & Performance

UNIGINE 2 Sim is capable of visualizing very complex and detailed virtual scenes with great performance: lag-free 60 Hz on consumer-grade hardware.

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Features For Simulation & Training

- API for Flight Model Dynamics (FDM) integration
- Airfield lighting system (PAPI, TDZ, REIL, etc.)
- API for motion platform control
- Sensors visualization (thermal, FLIR, enhanced NVG)
- CPU/GPU sync for scene data to integrate with dynamics models
- Professional motion capture
- HMI / HUD display widgets
- Scalable from simple trainers to Level D FFS

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Image generated by
UNIGINE 2 Sim in real-time
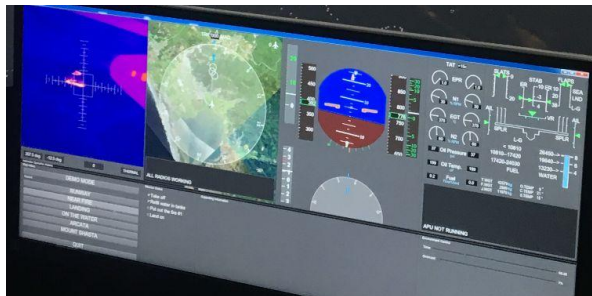
Easy To Integrate

- Industry-standard network protocols:
  - CIGI
  - HLA
  - DIS
  - Custom protocols API
- Support for Windows and Linux
- Minimal 3rd-party library dependencies
- C++ and C# APIs
- Embeddable into multi-window apps (Qt, WPF, WinForms, SDL, custom GUI frameworks)
- Local, cluster, and cloud deployment

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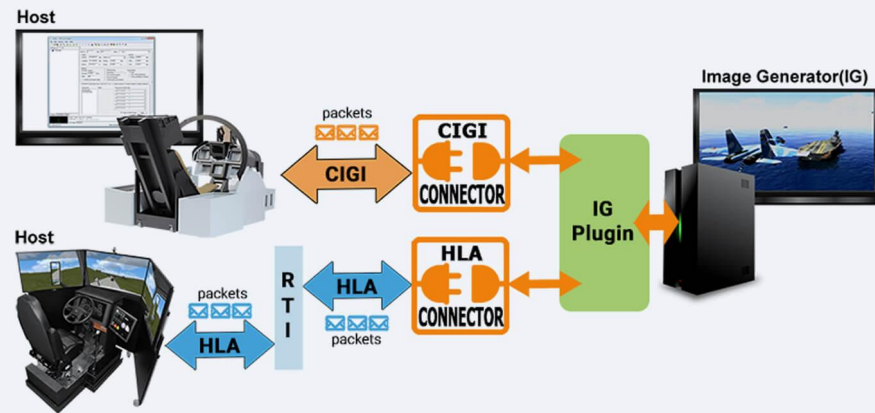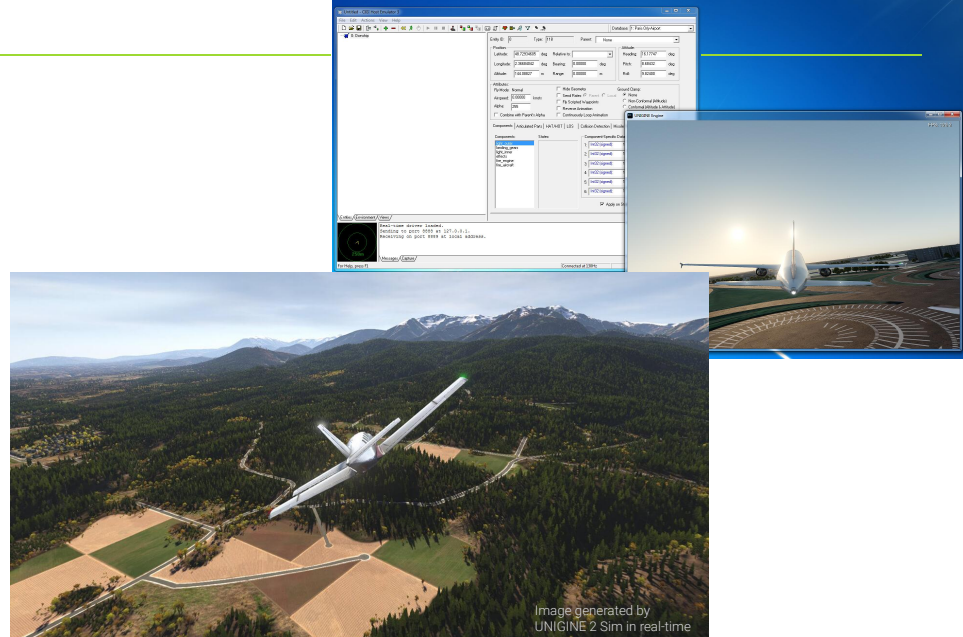
Display Everywhere

- Multi-channel rendering over network

- Curved (cylinder / dome / custom) screens (image warping and edge blending)

- 180 / 360 degrees panorama (linear, curved & fisheye)

- Stereo rendering modes

- CAVE

- Video walls

- VR headsets (Oculus Rift, HTC Vive / Pro, Varjo, OpenVR, WMR)
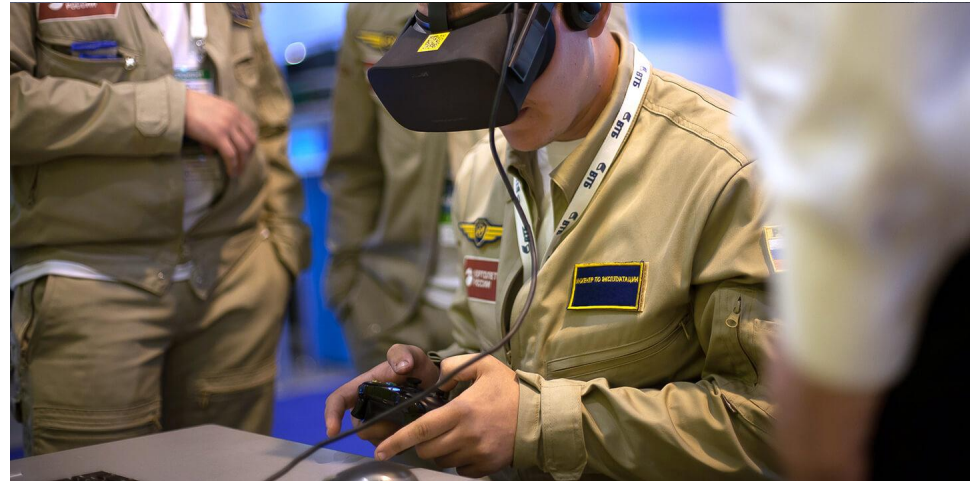
Team Of Experts

UNIGINE Engine has been developing since 2005. Almost from the very beginning, the development team is deeply involved in the simulation & training projects (mostly aerospace industry). The team has made many turnkey projects as well.

This practical experience and shared knowledge of multiple subject matter experts are converted into the UNIGINE 2 Sim software platform. So, our clients can use ready-made components that have been developed especially for solving similar tasks.

Our technical experts are always here to help your team with any questions. Customized training sessions are available as well.
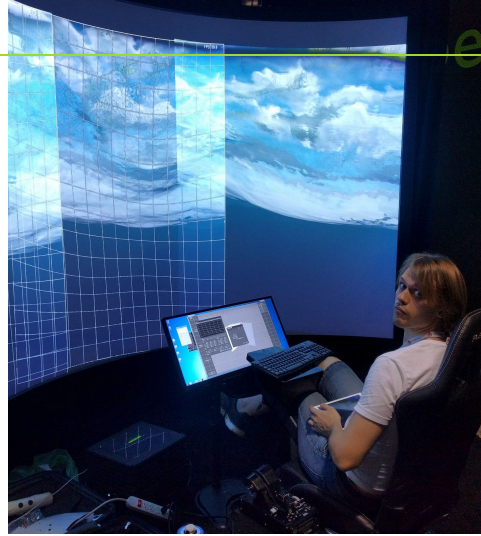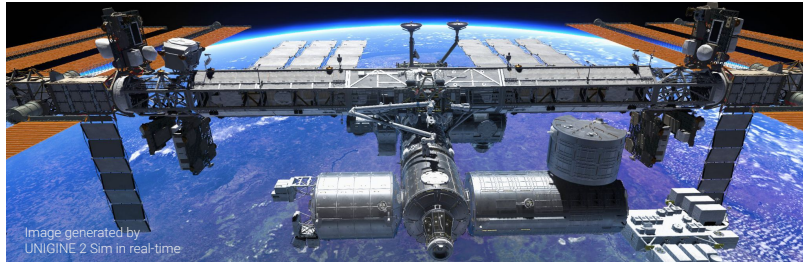
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Your Technology Partner

Customers In Aerospace Industry

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Space:

- German Space Center (DLR)
- Russian Space Agency

Flight Simulation:

- (NDA) Aircraft manufacturers (**multiple**)
- (NDA) Helicopter manufacturer
- Central Aerohydrodynamic Institute (TsAGI)
- (NDA) System integrators (**multiple**)

Air Traffic Management:

- UFA / ATCSim
- Azimut-Alliance
- (NDA) ATC system developer
- (NDA) System integrators (**multiple**)

Autonomous Aerial Vehicles:

- Daedalean
- (NDA) UAV manufacturer
- (NDA) System integrators (**multiple**)

Value Proposition Summary

- 16 years of focused R&D at your disposal
  - saves budget on the 3D engine expert team
  - allows focusing on the project, not the tools
  - reduces project risks
- Tailored for simulation & training
  - easier to integrate
  - less additional development required
  - reduces time to market
- Superior graphics
  - better immersion/training for end-users
  - easy to understand marketing advantage for top management/customers
- Dedicated support by experts
  - fast and professional assistance on any issue
  - high-intensity training for your technical team
- We use our own product in aviation-related projects
  - engine developers walking your shoes
  - additional quality control
  - a core team with practical experience in the subject matter
  - product development is driven by the industry-specific requirements
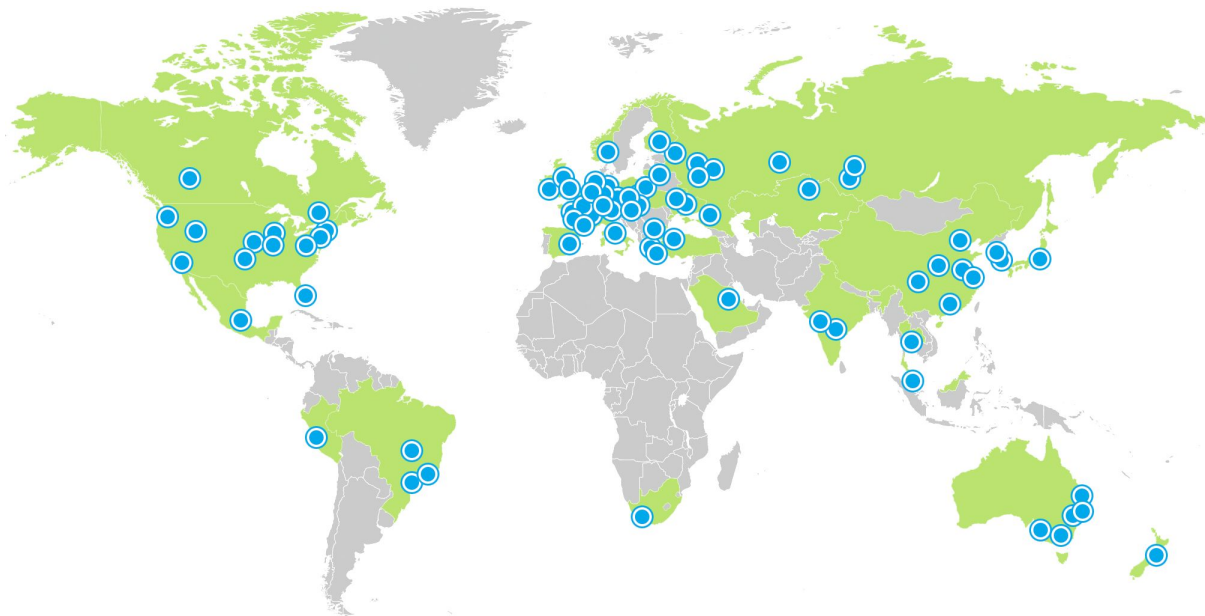- Proven by industry leaders

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Try Today

Developers from 250+ companies across all the continents use UNIGINE technologies to realize their projects since 2005.

sim.unigine.com

UNIGINE Holding S.à r.l.

Registration № B211502
9bis rue Basse, 4963 Clemency,
Luxembourg
Tel.: +352-2880-0757
info@unigine.com

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