

Vortex Studio Unified Simulation and Visualisation Platform for Land and Sea

Simulation integrators who are building applications to train drivers, equipment operators and vehicle crews face many challenges.

Meeting client expectations requires expertise in many domains, from vehicle and environment modeling to the integration of third-party systems. Developing solutions on your own can be complex, and increases the risks of project delays and unexpected costs.

Vortex Studio solves these problems.

Vortex Studio provides a unified simulation and visualisation platform that allows you to meet customer requirements on a wide range of operational and tactical training projects, and offer a differentiated solution that is essential to your success. It is supported by CM Labs' team of vehicle dynamics experts, engineers, and 3D graphics software specialists, ensuring you have access to the right set of skills for every project.



Take control of your simulation projects

Client success



Elbit Systems uses Vortex Studio to power its defense vehicle program. Vortex Studio has enabled Elbit to simulate a wide range of wheeled and tracked vehicles for driver training. Developing ground vehicle and maritime equipment training simulators can be complex. Between high customer expectations, tight schedules and the unique requirements of each project, selecting the right simulation technology and partners can be the difference between a profitable program and a never-ending series of revisions. Backed by CM Labs' extensive experience in ground vehicle, maritime and heavy equipment simulation, Vortex Studio lets you surpass customer expectations and maximise project profitability.

Take control of project risks

Vortex Studio reduces the risk of project overrun by providing a modular simulation development environment that can integrate with any technology. It combines content creation tools, an engineering-grade dynamics engine, an integrated IG and a networking layer, and can easily be extended with 3rd-party CGF and IG systems based on project requirements.

Deliver a superior training experience

Vortex Studio's dynamics engine uses engineering data to model individual equipment components. This makes it easier to tune equipment behaviour to replicate real-world performance, and enables the simulation of realistic equipment failures. This allows you to deliver high-fidelity simulations that provide a best-in-class training solutions to your customers.

Rely on a trusted simulation partner

Building solutions with Vortex Studio means CM Labs' team of dedicated mechanical and simulation experts are there to support you, from project proposal to systems and hardware integration and final client acceptance. That's why Vortex Studio is the solution of choice of the defense industry's leading training solution providers.

Expand your simulation portfolio

Vortex Studio allows you to create simulator-based training solutions for a wide range of applications, from driver training to earthmoving equipment and lifting operations. Below are some of the projects that Vortex Studio allows you to tackle:

Ground Vehicles

Vortex Studio can accurately simulate a wide range of tracked and wheeled ground vehicles, including light and heavy combat vehicles,amphibious equipment, mobile robots and other remote-controlled equipment. Vortex Studio's powertrain modeling and soft-ground simulation models, ensure that trainees experience how the vehicle performs under any operating conditions and are ready for real-world deployment.

Logistics & Military Engineering

Extend training capabilities to earthmoving and lifting operations. Vortex Studio's unique real-time deformable terrain and cable simulation and integrated visualisation capabilities lets you add cranes, excavators, wheel loaders and rough-terrain container handlers to your simulation toolbox, enabling the creation of mobility, counter-mobility, survivability, and sustainment support scenarios.

Maritime Equipment

Vortex Studio allows you to simulate maritime environments, enabling the creation of surface and subsea scenarios involving ship-based and port-based equipment. Deliver training solutions for deck and dockside operations, such as maritime material handling, equipment launch and recovery, towing and anchor handling, and underwater vehicle operations.

A flexible and extensible simulation platform

Vortex Studio helps you build true-to-life immersive simulations for operational and tactical training applications. It provides an integrated simulation creation environment that combines Vortex Studio's validated mechanical dynamics engine, off-the-shelf applications and integrated image generation system. From equipment modelling and scene creation to integration and distribution, Vortex Studio helps you build differentiated training solutions efficiently.



Professional support and services

Vortex Studio is supported by a dedicated team of mechanical dynamics experts and simulation specialists, with a vast experience of ground vehicle, heavy machinery and lifting equipment simulation. Whether you need assistance to define system and software requirements, integrate software or hardware components into your Vortex Studio, writing vehicle testing criteria or supporting customer acceptance testing, the CM Labs team can help you throughout your project's lifecycle.

Engineering-grade mechanical dynamics

Whether your solutions are used to train heavy equipment operators, military vehicle drivers or explosive ordinance disposal robot pilots, the quality of the training experience you deliver depends on the accuracy of your dynamics engine. Vortex Studio includes CM Labs' validated multibody dynamics engine. It provides professional-grade mechanical dynamics modeling, with accurate collision detection, stiff contacts and stable forces, even with large mass ratios. Vortex Studio replicates equipment performance using an engineering approach, allowing emergent behavior based on mechanical and physical properties rather than scripted events.

This allows you to deliver superior operational and tactical training solutions to your customers. Vortex Studio's dynamics engine scales seamlessly with your simulation architectures, and includes the validation tools and expert support required for today's training simulation projects.



Ground Vehicles

Vortex Studio provides advanced simulation models for soft- and hard-ground materials, as well as powertrain components including engine, suspension, brakes, wheels and tracks. It allows you to create highly-detailed vehicle models that mirror real-world behavior, down to engine noise levels and individual wheel traction. It enables the simulation of mechanical faults such as brake failures and flat tires, and supports vehicle attachments, such as trailers, weapon systems and engineering equipment.

Cables, Rigging and Tethers

Vortex Studio makes it easy to create exercises involving vehicle towing, lifting or remote operation of tethered equipment with its integrated cable simulation and visualisation capabilities. Vortex Studio lets you add cables, ropes, winches, pulleys and tethers to your equipment, and provides accurate and stable simulation of short and long cables under slack conditions and tension.

Built–In Verification and Validation Features

Vortex Studio provides a testing framework so that equipment performance can be consistently measured for purposes of regression testing, verification, and validation. Well-defined outputs allow comparison with mathematical models of vehicle behaviour, data from field measurements, and project requirements. Vortex Studio also provides developers with an interactive test environment where mechanisms can be edited and tested before being deployed in a larger simulation environment.

Advanced visualisation

Vortex Studio's built-in visualisation engine lets you render simulations in high-quality visuals, whether it is on simple desktop or synchronized multi-channel systems. Its seamless integration with Vortex Studio's dynamics engine and content creation tools protects your investment and provides you with a cost- effective image generator.

Vortex Studio's renders detailed environments in real time, with dynamic lighting and weather effects, water surface reflections, particle-based dust and smoke, and supports modern material rendering and shaders.



Client success



Doron Precision Systems chose Vortex Studio to power its next-generation mining and driver training simulators, replacing disparate internal tools with a single unified platform that allowed them to focus on training solution development.

Earthmoving Equipment

Vortex Studio enables the simulation of earthmoving tools, such as buckets and blades, and virtual environments containing deformable terrain, enabling the creation of logistics and heavy machinery training solutions to your offering. Vortex Studio provides advanced soil models for loam, clay, sand and gravel, and includes built-in visualisation of soil in motion, with realistic dust and particles based on terrain properties.

Marine Simulation

Vortex Studio can simulate the effects of fluid buoyancy, drag, lift and added mass hydrodynamics on ship-based equipment, amphibious vehicles, cables and underwater equipment. It provides built-in wave models, and enables full sea state customisation, as well as complete surface and underwater visualisation, including surface reflections, particle spray and subsea visibility.

Character Animation

Populate scenes with a wide range of interactive animated human characters, from soldiers following patrol routes to signalers providing directions during a lifting operation. Vortex Studio provides a library of character models and animations. Individual characters respond to the environment and high-level commands, and can be controlled by simulation participants, scripts, or instructors. It can also be externally CGF-driven.

Professional simulation tools

Client success



Airbus Defense uses Vortex Studio to build simulators to train explosive ordinance disposal robot pilots. Vortex Studio was chosen for its highly-accurate dynamics engine, which generates the precise contacts involved in EOD operations and ensures pilots are ready to face the demanding situations requiring their intervention. Vortex Studio provides you with a reusable simulation project workflow that takes you from mechanical dynamics modelling and scene building to customer acceptance testing and delivery. Its off-the-shelf applications simplify simulation creation and distribution, while its extensive software development kit enables the integration of third-party solutions in your simulation toolchain, ensuring Vortex Studio can easily be adapted to your needs.



Vortex Studio Editor

The Vortex Studio Editor is a full desktop-based creation environment for simulation project teams. It provides all the tools needed to model virtual equipment and create engaging scenes, and is designed to enhance collaboration between 3D designs, mechanical engineers and scenario editors.

Highlights:

- Create mechanisms, objects and terrain from CAD and 3D models
- SUI-based mechanical dynamics modelling
- Provides a desktop-based simulation environment to test drive the models
- **Enables simulation customisation** and control using embedded scripting
- > Includes visual optimisation and debugging tools

Vortex Studio Player

From single screen desktop systems to distributed multi-display simulators, the Vortex Studio Player provides a complete toolset to configure, distribute and monitor simulation applications. It provides an intuitive point-and-click interface that accelerates system integration and troubleshooting.

Highlights:

- Distributed simulation architecture with centralised management
- Supports any display configurations, including monitors, blended projection systems and head-mounted displays
- Includes simulation recording and playback tools for after-action review
- > Built-in optimisation and troubleshooting tools

Integration framework

Vortex Studio is a flexible solution that has been designed to enable the integration of third-party technology into your simulation production tool chain. Whether you wish to extend Vortex Studio's out-of-the-box capabilities with custom extensions or to leverage its validated terrain and vehicle dynamics within your own technology stack, Vortex Studio provides you with the ability to create a unique training experience.



Software

Vortex Studio enables the integration of specialised software through its cross platform C++ APIs and modular architecture.

Vortex Studio lets you integrate:

- > Streaming and procedural terrain databases
- Third-party image generators, such as VT MÄK VR Vantage, Presagis Vega Prime, Bohemia Interactive Simulations' VBS, and game engines such as Unity and Unreal
- **Computer Generated Forces** using HLA/DIS
- > Scripting and external software applications

Hardware

With easy integration of hardware control systems via USB, CANBUS, OPC, and other protocols, Vortex Studio simplifies the creation of custom simulators replicating exact cabin layouts.

- Vortex Studio lets you connect:
- > Proprietary steering wheels
- > Operator joysticks
- > Motion platforms
- > Vehicle dashboards and displays
- > Surround audio systems

Client success



Netherlands-based research institute MARIN uses Vortex Studio to power their maritime equipment training simulators. MARIN's DOLPHIN simulator product line will train operators for complex missions, from tandem lifting operations and side-by-side offloading.



About CM Labs Simulations

For over 20 years, CM Labs has provided dynamics-based simulation solutions and services to organisations around the world. With a long history in the real-time visual simulation and gaming industries, CM Labs produces feature-rich simulation capabilities that set the industry standard for real-time interactive 3D dynamics and simulated mechanical equipment behaviour.

The CM Labs team features experts with decades of experience and wide-ranging backgrounds in training, vehicle dynamics, heavy equipment, and robotics.

With proven experience ranging from deep-sea to space projects, our engineers, scientists and computing professionals—many with PhDs and master's degrees—excel at all aspects of visual simulation, from initial concept and R&D, to integration, training, and beyond.

Through Vortex Studio, its flagship simulation software, CM Labs provides capabilities for training simulators, mission rehearsal, serious games, virtual prototyping, and testing.

Vortex Studio customers include BAE Systems, Elbit, Thales, Volvo, John Deere, Lockheed Martin, NASA, and over 100 other leading companies and academic institutions



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