Vortex Studio 2018c
Release Notes

WHAT'S NEW

Welcome to the third Vortex Studio release of 2018! We keep working on the interface of the software to make it more powerful and ever easier to use. New features and improvements have also been added, as well as general performance increases.

Vortex Dynamics was renamed Vortex Studio in 2017, with version numbering replaced by year of release to simplify maintenance. It features a slick, easy-to-use interface, streamlined content design workflow, and built-in functionalities that reduce system integration time.

Vortex Studio Platform

Many new additions have been made to the core platform, including:

General Enhancements

There have been several changes to improve the general performance and usability of the software:

- Upgraded **performance for the dynamics calculations**, allowing more physical objects to be modelled within a scene. See the *Dynamics Module* section for more details.
- Upgrades to the simulation quality, performances and visual appearance of the **Earthwork Systems**: new soil cohesion model, faster soil particle solver, advanced soil rendering, and more. Coupled together, these changes allow more natural soil behaviors as well as new emergent properties. See the *Earthwork Systems* section for more details.
- The deployment, setup and update workflow of Vortex Studio has been revised and simplified into a single **Setup application**.
  - o The Vortex Setup application includes a step-by-step wizard that allows users to select which software packages and libraries they wish to install.
  - o It also allows simultaneous installation or upgrade of Vortex Studio on multiple networked computers.
- Bohemia Interactive Simulations (BISim)'s VBS3 software is extensively used in the defense market. It provides a virtual training environment for tactical training, experimentation and mission rehearsal for land, sea and air. Using a special VBS3 component, it is now possible to **use Vortex Studio to simulate portions of a VBS3 Mission**.
  - o The VBS3 Component supports the following Vortex Studio features: Mechanism, Wheeled Vehicle Systems (including tire models, if present), Tracked Vehicle Systems, and Cable Systems.
  - o *Note that this feature requires additional plugins that must be obtained directly from CM Labs. Please contact your account representative.*
- The **Vegetation Library** has been revised for better visuals and LOD.

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Dynamics Module Enhancements

There have been improvements made to the Dynamics module:

- This release introduces a new **parallel solver** technology which allows splitting large dynamics simulations for greatly reduced computation times.
    - Using the newly introduced Solver Group extension (see below), a simulation can be split into smaller portions called partition. The new parallel solvers can then be leveraged to solve the split simulations concurrently on separate computer cores.
    - The results are then combined using a novel partition coupling method, coined "Schur Complement Coupling," which produces realistic interaction forces at the interfaces between the split simulations, even in very stiff and massive simulations. This feature is enabled by default via the new parameter "Partition Coupling Method" of the Dynamics Module in the application setup file (.vxc).
    - Note that the previous coupling method, called "Point Force Coupling," is still available and is enabled when migrating application setup files from previous Vortex Studio versions, to ensure full backward compatibility.
        - In this case, to enable the parallel solver, select "Schur Complement Coupling" in the Dynamics Module's "Partition Coupling Method" parameter. Make sure to update to the new coupling method to benefit from the performance improvement.
- To fully leverage the newly introduced parallel solver, a **Solver Group extension** is now available at the Scene level. It can be used to split your simulation into sub-simulations (partitions) which can be solved in parallel by the new solver.
    - For each Solver Group, simply add the extension and then reference one or more objects in the Scene.
    - This can be anything which contains rigid bodies, such as entire Mechanisms, but also Cable Systems or Vehicle Systems.
    - All rigid bodies (Parts) in the user-specified objects will be placed into a partition and will form a sub-simulation.
- The "Partition Grouping Memory Optimization" option is disabled by default in the Dynamics Module to allow for best workload balancing in the parallel solver.
    - Without memory optimization, the memory consumption of a dynamics simulation is potentially increased, specifically for very large simulations with many partitions. If the simulation consumes too much memory, re-enable this option.
- The "Relative Sleeping" feature in the Part file is renamed **Auto-Merge**, with the Part interface adjusted accordingly. This change is fully backward compatible: Relative Sleeping parameters selected in a file created in a previous Vortex Studio version will be automatically migrated to the corresponding Auto-Merge parameters when loading the file in Vortex Studio 2018c.

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Graphics Module Enhancements

There have been several changes and improvements made to the Graphics module:

- A technical preview of a new **Physics-Based Rendering** (PBR) lighting model is available in the Graphics Materials for greatly improved visuals. It considers the "metalness" and roughness of surface materials in the lighting calculations.
  - It employs the well-known Physics-Based Rendering (PBR) approach for highly realistic visualizations. When the option is selected in the Graphics Material's Properties panel, the *metalness* workflow is employed instead of the current specular-based workflow.
  - When using a SkyBox or SkyDome, the PBR lighting information is automatically computed from the provided environment map and incorporated into the lighting model. This produces realistic lighting and reflections of the environment on surfaces, depending on the user-specified roughness and metalness layers in the Graphics Material.
  - It is possible to have both specular- and PBR-based Graphics Materials in the same scene. Legacy Scenes and Graphics Galleries thus do not have to be adjusted.
  - *Note that this is only a technical preview and not the final version of the feature. User feedback is welcome!*
- A new **Decal** extension has been introduced for projecting textures on the surfaces of 3D models. It can be found in the Graphics category of the toolbox.
  - Decals can be used to add surface detail to any model or terrain: logos on vehicles, markings on the ground, dirt layers, mud splashes, individual signs on streets or buildings, etc.
  - Decals can be used at the Scene or Mechanism levels.
- Performance and visual appearance have been improved when displaying a **cable with meshes** via the Graphics Spline extension.
  - Links no longer "jump" back and forth when spooling.
  - The "Mesh" option has been optimized and can be three to four times faster in some scenarios.
- Activating a camera no longer affect the number of views on the simulation applications (e.g. slave nodes) that don't display it, thus improving performance.

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Vortex Studio Editor

There have been several changes and improvements made to the Vortex Studio Editor.

- The **Home page** has been revised to make it more useful to new and existing users.
    - The Options panel has been streamlined and made easier to use.
    - It is no longer required (but still possible) to double-click on buttons to create new files. The "Create" button has been removed.
    - A new "Resources" section has been added with links to documentation, tutorials, glossary and community forum (online access required for the latter).
- The **Grid** has additional functionalities to make it more useful as a reference when placing objects in a Scene or Mechanism.
    - It is now possible to move or rotate the grid to a specific location.
    - A Grid position toolbar can be added to the Viewport via the Options panel.
    - It is now possible to set whether the Grid appears (or not) in new documents via the Options panel.
- A new **debug display for visualization of partitions** (sub-simulations) of jointed rigid bodies (parts) has been added to the Dynamics Visualizer.
    - It is available in the Debug Display menu in the Editor (right-click Viewport).
    - This display is particularly useful in combination with the Solver Groups extension for splitting a complex simulation up into sub-simulations (partitions), and then simulating it via the new parallel solver ("Schur Complement Coupling" selected as "Partition Coupling Method" in parametrization of Dynamics Module).
- A new **Solver Analytics panel** has been added to the Editor for pinpointing costly constraints in a simulation.
    - It is available via the Panel Selection button in the Editor.
    - The panel lists all constraints in order of the solver's effort required for processing them. Constraints which create a bottleneck in a dynamics model can be quickly identified and the model optimized to avoid the bottleneck.
    - Possible optimizations include increasing constraint relaxation (increasing the constraint's compliance) or replacing (or even removing) some redundant constraints.
- The **VHL (Vortex High level) extension** has been extended to expose the followings:
    - Array of fields
    - Container of fields
- Constraint creation was revised with extensive feedback from mechanical engineers. The wizard was removed; when creating a constraint, the selected parts will automatically set in the constraint attachments.
    - For specifying constraint axis and positions, a new, more versatile constraint attachment tool is provided.
    - See "Customizing Offsets" in the "Editing Constraint Properties" chapter of the Vortex Studio online documentation.

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Vortex Studio Player

There have been changes and improvements made to the Vortex Studio Player.
- Picking is now disabled by default for improved performance.
  - If picking is enabled in the Graphics module of an existing simulator, consider disabling it as it might impact performance.

Vehicle Systems

Vehicle Systems have been expanded to bring these improvements:
- The **Pacejka 2002 tire model** was added to the Tire Model component.
  - It is used for simulation of hard ground wheel interactions.
  - To use this new model, add it to the Tire Type in the Tire Model Component of a wheeled vehicle.
- It is now possible to set the **inertia of a wheel** independently of its radius and width.

Cable Systems

Cable Systems have been expanded to bring these improvements:
- The new **Snapback feature** models the whiplash effect created when cables or hooks break under tension. This is important when training for handling cables and slings under tension, e.g., during towing of vehicles or lifting massive loads.
  - The effect can be added to both Generic Cables and Hook Groups.
  - Parameters are available to control both direction and energy.
- "Tension Start Side" and "Tension End Side" outputs have been added to the **Grabbing Tool** to display a grabbed cable segment's tension on either side of the grab.

Earthwork Systems

The Earthwork Systems have been expanded to bring these improvements:
- An **improved cohesion model for soil particles** has been added which allows for more realistic piling behavior of cohesive soils such as loam or clay.
  - Instead of modeling cohesion as a viscous, lateral force between particles, cohesion now acts in the normal direction and uses a water-bridge representation for modeling the suction effects between interacting particles.
  - This is a more realistic approach as it will not only produce cohesive forces in the normal direction but will also increase the lateral shear resistance due to increased normal stress induced by the cohesion modeling itself. This in turn produces higher friction forces as is expected.
  - Using this new model, excavator buckets digging in cohesive soils fill up naturally and more realistically and produce the soil shapes and fill levels in the bucket that would be expected for these soil types.
  - New soil presets for the cohesive soils "Loam" and "Clay" make use of this new technology. Note that for backward compatibility, the previous soil presets, containing version number 2018b in their name, are still available.

- The **soil particle solver** now uses the single-precision floating-point format for particle properties and in the time integration.
    - This improves the soil particle solver performance due to improved cache locality.
    - It enables the use of single precision vector extension intrinsics, which lead to further speed-ups.
- The **soil volume rendering**, or Screen-Space Mesh (SSM), in the Soil Particles Graphics extension has been greatly improved for more visual realism and to be easier to tune for overall performances.
    - The soil's appearance has been made more realistic by improving the shading and adding the ability to insert a noise overlay for reproducing rougher soil textures.
    - Many parameters have been added for tuning the blur effect applied on the particles when producing the surface of the soil volume. This makes it possible to stretch and smooth out the surface if desired, thus enabling visualization of many more soil types.
    - By using the "Blur Sample Count" parameter in the "SSM Blurring Properties" container, the GPU time consumption of the technique can be tuned as needed.
    - The soil particle volume rendering can now be shifted backwards via the "SSM Depth Offset" parameter to make any soil rock models more visible. This makes rocky soil textures more visually appealing.
- The **visuals of the diggable zone** have been upgraded so that the zone will correctly overlap the surrounding terrain for a cleaner transition.
- Calculation of mass and detection of particles on surface in an Earthwork Zone is now disabled by default for best performance.
    - These are the "Output Mass" and "Output Particles" parameters, respectively.
    - Mass calculation is costly for Earthwork Zones with many vertices. Detection of the particles travelling on the Earthwork Zone and which can be used to inflate the height field (see "Inflation Factor" in Height Field Graphics extension) is equally costly.
    - To re-enable mass calculation or particle processing, simply set the corresponding flags to "true."

Vortex Marine

Vortex Marine has been expanded to bring these improvements:
- More parameters are now exposed to control the **Kelvin wave** of ships in the water.
    - Wave minimum amplitude
    - Wave maximum amplitude
    - Foam scale
    - Wave scale
    - Gravity scale
    - Fade-in scale

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SYSTEM REQUIREMENTS

Supported Platforms

Vortex Studio 2018c runs on the following platforms:

- Microsoft Windows 10 (x64 version 1709)
- Linux (Ubuntu 14 LTS, CentOS 7)

Hardware Requirements

Vortex Studio requires the following at a minimum:

- CPU   3.4GHz (Intel i7-4700)
- RAM   8GB for runtime and Vortex Studio Player

  16GB for Vortex Studio Editor
- GPU   NVIDIA GeForce GTX 970

Recommended hardware requirements:

- CPU   3.4GHz (Intel i7-7700 or better)
- RAM   16GB for runtime and Vortex Studio Player

  32GB for Vortex Studio Editor
- GPU   NVIDIA GeForce GTX 1070 or better

Supported Compiler

Vortex Studio 2018c supports the following C++ compiler:

- For Microsoft Windows Platform, Microsoft Visual Studio Version 2015 (VC14)

Note: the legacy Microsoft Visual Studio Version 2010 (VC10) installers will be available on demand through support only, until the end of 2018.

Supported Graphics

Vortex Studio 2018c supports NVIDIA GeForce video cards.

- NVIDIA GTX 970 and above are tested regularly at CM Labs with driver series 388.59.

*Note: on computers that have multiple graphics cards (e.g., laptops with integrated Intel card and dedicated NVIDIA graphics card), the default configuration of these systems is to auto-select the card to run the application, which might prevent Vortex Studio from running. Using the NVIDIA Control Panel, select **Manage 3D Settings** and change the **Preferred** graphics processor to **High-performance NVIDIA processor**.*

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Supported VR Hardware

Vortex Studio 2018c supports the following VR hardware via the OpenVR protocol:

- HTC Vive
- Oculus Rift (DK2)

Python

Python 2.7.13 is supported. The corresponding Anaconda distribution 4.3.0.1 allows for an easy integration of Vortex on various platforms.

Simulink/Matlab

Matlab 2015b is supported.

Licensing

Vortex uses RLM by Reprise Software™ for licensing and can provide node-locked, dongle-based, networked, and multi-user server-based licensing.

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COMPATIBILITY NOTICE

We recommend that you back up your assets before migrating to the latest version. If saved, it will not be possible to open them again in their original version.

From any version of Vortex Studio
Files from these versions should open with no issue in the newest release.

From Vortex 6.8 and earlier
Files from these versions will not open in the newest release. Please convert them with a supported version first.

Between any Vortex version
Record-and-Playback as well as Keyframe files created with previous versions may not work with Vortex Studio 2018c.

From any version of Vortex Studio Essentials
Note that content saved in Vortex Studio Essentials cannot be opened in other Vortex Studio Editions (Solo, Team or Academic).

END-OF-LIFE NOTICE

Since Vortex Studio 2017
To import assets created before Vortex Studio 2017a, please convert them with a supported version of Vortex first. Note that Vortex Studio 2018a was the last version to directly support files created with Vortex 6.7 and 6.8

Since Vortex 6.5
CM Labs recommends that you port your Vortex-based projects from x86 to x64. Vortex 6.5 was the last release with dedicated x86 binaries and installers.

Since Vortex 6.3
VxVehicle and VxCable are no longer supported. If you have been using these APIs, please convert your assets using Vehicle Systems and Cable Systems instead.

Microsoft Visual Studio 2010
Vortex Studio now supports Microsoft Visual Studio 2015 (VC14) only.

Legacy Microsoft Visual Studio Version 2010 (VC10) installers will be available on demand through support only, until the end of 2018. If you are still using VC10, please upgrade now to continue to benefit from the frequent Vortex Studio updates and new features.

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FIXED ISSUES

Summary	Description
Lights On-Off Freeze	The simulation no longer freezes for a few seconds when lights are turned on-off for the first time.
Fog on Custom Clouds	Fog is now displayed properly on top of custom cloud layers in the Skydome.
Alignment of meshes in cables' Graphics Spline	Long meshes in a Graphics Spline no longer appear in a zig-zag pattern.
Halo Manager Removal	Undoing the addition of a Halo Manager no longer leave behind three objects.
Earthwork Zone picking	Picking the Earthwork Zone in the Viewport now works correctly.
Earthwork Zone accessory	When a diggable Earthwork Zone is deleted or made non-diggable, the accessory no longer stays on the terrain.
Earthwork dust emitter white flash	The Earthwork dust emitter no longer emits a white flash.
SSAO Fog	The Screen Space Ambient Occlusion (SSAO) feature now takes fog into account if the latter is present in a scene.
Switching Viewport Configuration	Switching Viewport Configuration in the Editor no longer show a black area.
Scaling Earthwork Zone	Incorrect resizing of Earthwork Zones and Soil Bins no longer occurs when using the Resize tool or scale input fields.
Fog in Mirror	Fog now displays correctly in Mirror extension.
VSync enabled	VSync no longer always enabled at start of simulation even if disabled in Setup.
Reflections on ocean surface	Reflections were incorrectly displayed if the sea level was set to a non-zero value. They are now displayed correctly regardless of the chosen sea level.
Re-importing Graphics	Re-importing Graphics does not dirty the document. It is now possible to save the changes.
Python error messages	Some syntax error messages disappeared in the dynamics Python extension.
Simulation Pause event	The Simulation Pause event is now synchronous on all nodes.
Synchronisation time	The synchronisation time in a distributed system has been improved. In case of overrun, the synchronization time should be reset in a way to get proper synchronization of all displays at the same frame.

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P-in-P Display	The Picture-in-picture display now switches to the correct camera.
Head position for HMD displays	The head placement was corrected for Head Mounted Displays. This fixed issues with the perspective projections as well as the shadow alignment when using a Virtual Reality setup with stereoscopic view and head tracking.
VHL network performances	When a value is exposed as a VHL output, but the value is also connected to some other extensions, there was a performance penalty on a distributed system, with the only workaround was to rework the connections from the culprit output. This is now fixed.

KNOWN ISSUES

Summary	Description
Sub-sea particles	Particles can sometimes take on the color of the subsea volume after camera is moved underwater and back again.
Vortex Setup service	The VortexSetup service is not restarted upon cancelling an installation.

DEPRECATIONS

The followings were deprecated in release 2018c:

- N/A