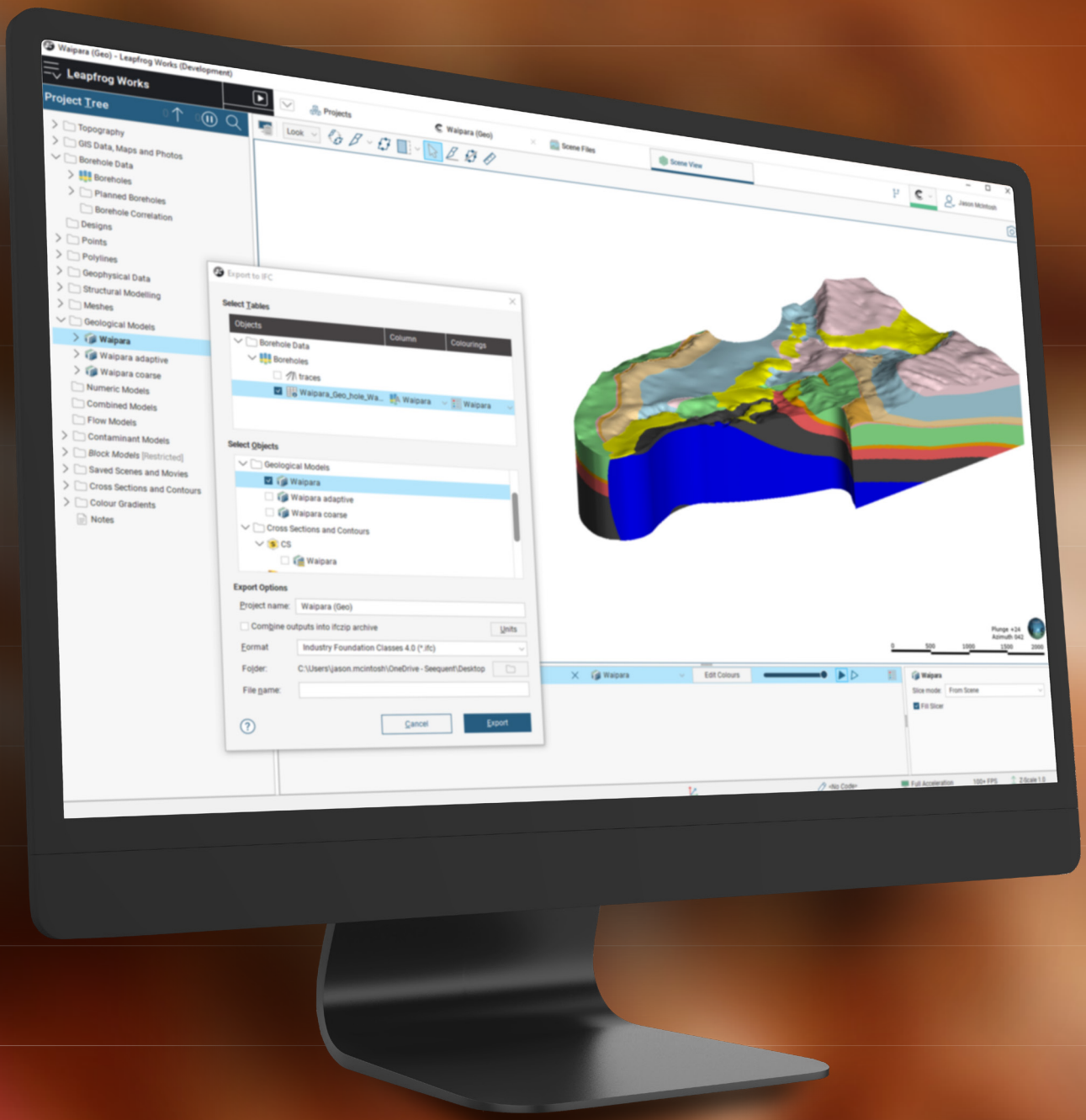
Leapfrog Works **2021.2**

new release



leapfrog

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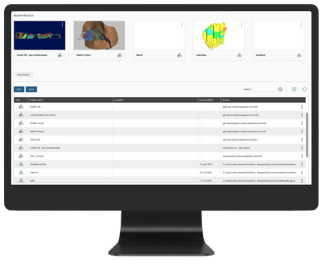
Leapfrog Works Release Notes

1.1. Single Projects Tab – Phase 2



The second phase of this initiative makes connecting to Central smooth and effortless, particularly if you are working with multiple Central servers. The Central server list and associated features, "go to portal" and "publish", are now located in a single location which, with a refreshed user interface, makes the Central integration from Leapfrog more intuitive, easier, and quicker to use. Other items that have been changed in this release are:

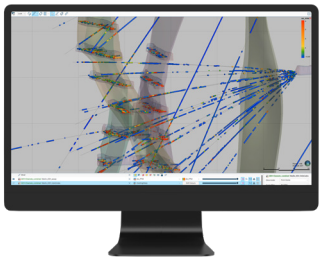
- Selecting a central project will connect to the server it comes from (auto-connect)
- Central Server selection menu relocated alongside user profile at top right corner
- Projects' view – now includes the option of grid view
- Updated styling of the server list

1.2. Restricted Objects

You may notice some changes in the availability of objects created in a different Leapfrog product to the one you are working in now. These changes are part of longer-term work related to the delivery of Leapfrog functionality.

If you have any questions, please contact your regional representative.

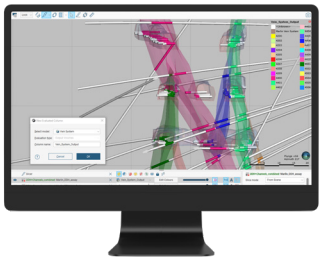
1.3. Drilling improvements



1.3.1. MERGED BORE HOLE SETS

In the previous release (2021.1) a major new change was introduced to Leapfrog with the addition of multiple bore hole sets. This opened significant new workflow opportunities for using data of different types in geological models. However, there were still a few modelling situations where data from the additional bore hole data sets could not be included, for example, the vein segments required to build a vein must all come from a single table as must the inputs to domained estimation.

In this release, we are pleased to bring you powerful new functionality to overcome these limitations, by allowing you to combine bore hole sets. This simple process is accessed via the New Combined Bore Hole option. Any bore hole sets can be combined, with the user specifying which tables to combine, which value or category fields to map together and the priority order to use when combining.



1.3.2. EVALUATED COLUMNS ON INTERVAL TABLES

Evaluate GM categories directly onto interval tables as a new column then use this as a category in set level statistical analysis. A valuable alternative to the use of back-flagging, as it avoids the issue of small intervals that can be created in back-flagging.

This feature provides a valuable alternative to the use of back-flagged tables for analysis of statistics by category at the bore hole set level.

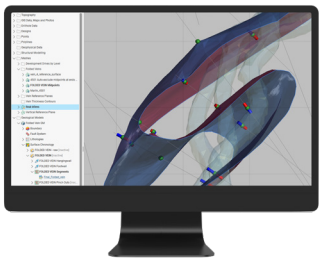
Currently, to break down an assay table by GM category requires the user to create a back-flag evaluation table and merge this with the assay table. Because GM surfaces are interpolated, there are normally small differences between the exact location of a GM boundary in the back-flagged table and the assay interval boundaries.

This can result in the creation of small intervals that break the original assay intervals and the splitting of originally discrete assay intervals between different categories. While the impact on length weighted statistics is usually minimal, it affects the 'count' and length and is the cause of frequent enquiries. By evaluating directly onto the mid-points of intervals, the issue of boundary splitting is eliminated.

1.3.3. ADD TRIG AND RANDOM NUMBER GENERATOR TO CALCULATIONS

Standard Trig functions have been added to the calculation engine. These enable orientation data to be used in calculations – for example, planar structural data observations from bore holes or mapping, or the local evaluation of a variable orientation.

For Leapfrog users who want to incorporate trigonometric functions into calculations and incorporate pseudo-random numbers modelling and estimation workflows to simulate variability, validate results and produce synthetic data, without needing to export data to and from MS Excel, which breaks Leapfrog's dynamic workflows.



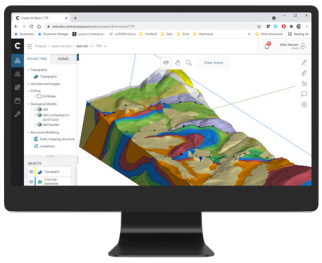
1.4. Vein Modelling improvements

The Leapfrog vein modelling tool provided a ground-breaking but somewhat inflexible workflow for rapid and repeatable modelling of thin, laterally continuous, gently curved structural geometries such as veins and faults.

A whole suite of changes has now been made, that build on the original design to bring an unprecedented new level of flexibility to this already powerful tool. This work has been ongoing over a couple of development cycles. · Vein Organisation in the Project Tree - Mid-points have been made more discoverable by moving them out from under the Reference Surface tab and placing them at the same level as Vein Segments and Mid-points.

· Mesh From Vein Segment Mid-points - This enables you to create a reference plane with as much complexity as desired, using the advanced editing options available in the meshes folder:

- Interpolant model type, drift options, sill, nugget and range
- Trend directions and anisotropy
- Direct editing with polylines or structural disks
- Addition of existing points, values, structural data, polylines or GIS vector data
- Sharing Boundary Polylines Across Veins - Until now, vein boundary polylines had to be created separately for each vein. They could be exported but could not be imported. Much more flexibility has now been added to vein boundaries, by making vein boundary polylines shareable through the polylines folder.
- Improved pinch-out behaviour - Previously, if a bore hole did not contain valid logging it was ignored for pinch-out creation, meaning vein models passed straight through bore hole traces. An additional control is provided to the user to choose whether the vein should pinch out on an empty trace (a hole where no lithology has been logged) or continue through it.
- Export/Import of Bulk Vein Edits - it is common that manual editing of vein components is required to produce the vein model you want. Until now, vein edits were only accessible from within the vein model, which made it difficult to recreate a vein from scratch, or even keep a record of edits that had been made. It is now possible to export all user-made vein edits to file, using the Export Vein Edits option on the vein object. This dumps all user made vein edits for segments, midpoints and pinch-outs to a text file.



1.5. Central Improvements

1.5.1. PUBLISH OCTREE AND REGULAR SUB-BLOCK MODELS

Now that we have completed optimisation of the storage underlying our new block model formats, we also publish these models to Central. Both regular and octree block models, along with their evaluations, can now be published for collaboration purposes and web visualisation.

Note: Regular and octree block models will only be visible in Central Portal web visualisation and will not appear in the Central Browser desktop product as this is being phased out.

1.5.2. PUBLISH IMPORTED GM'S

Prior to this release GM's that were imported from Central into Leapfrog as static GM's could not be published back to Central. This partly limits Leapfrog <-> Central workflows - in particular the use of imported GM's to aggregate a final model from separate models that have been split and dispersed into separate 'working areas.'

You can now publish imported GM's to Central, removing this limitation and making it possible to view aggregated GM's in Webviz and available for linked workflows that require the full aggregated GM.

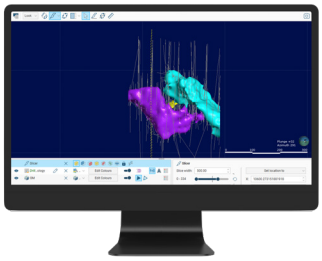
1.5.3. PUBLISH SECTION LINE WORK

A key input to Geostudio slope stability models is 2D sectional representations of geology. Cross-sections of three-dimensional Leapfrog geological models can now be published to Central, opening the way for workflow connections into Geostudio slope stability analysis (in development).

1.5.4. PUBLISH ADDITIONAL META DATA

Volume attributed objects in Leapfrog (combined models, numeric models, indicator interpolants, distance functions, geological models and refined models and their static variants) now include those attributes when published in Central. This allows those volume attributes to be viewed in Central web visualisation and imported back into Leapfrog.

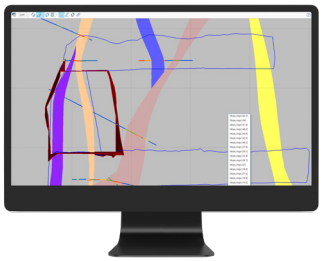
1.6. Slicer Sets



1.6.1. ASYMMETRIC THICK SLICE

Many modelling environments require an asymmetric slice through the objects in the 3D scene. For example, in an open-pit mining environment, the modeller will often want to see a certain distance above a bench or flitch height but a different distance below it.

Until now, the thick slice mode of the slicer has been symmetrical. Now, the user can slice asymmetrically, using a different distance back and front of the slice plane.

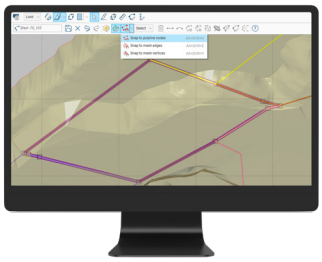


1.6.2. SLICER SETS

The original Leapfrog slicer revolutionised the navigation of 3D data sets, providing a quick and intuitive way of controlling the visualisation volume using a fluid slicing and sliding motion. Such freedom is invaluable, but in many modelling situations, such as landfills, site remediation or open-pit mining, activity is focussed on pre-defined sets of visualisation planes, which the user needs to be able to return to rapidly.

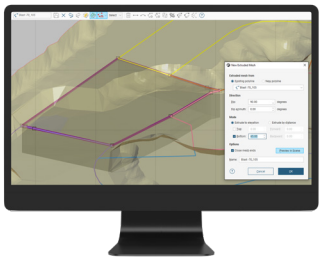
In this release, we are pleased to bring you a new feature - the 'slicer set' - that combine dynamic slicing with pre-defined sets of planes, enabling you quickly, precisely and repeatably locate yourself in space.

1.7. Polyline Improvements



1.7.1. GENERAL TOOL CHANGES

A new feature has been added to the polyline editor that allows you to 'snap' polyline nodes to existing polyline nodes, points, mesh edges or mesh vertices, providing an accurate and predictable way of placing a node. This polyline creation behaviour allows you to be more 'explicit' about polyline creation, which is particularly useful when needing to create polylines that interact with engineered structures, such as foundation designs or underground mine openings, or that need to dovetail against existing polylines, such as for creating dig-block outlines.

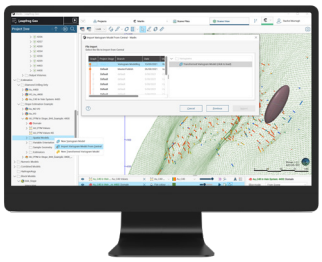


1.7.2. EXTRUDE MESH FROM CLOSED POLYLINE

Users have consistently asked for the ability to make simple geometric volumes by triangulation from polylines, without the necessity to create and isosurface an interpolant. Examples include, creating simple foundation geometries, developing 'cookie cutters' for clipping solids and the ability to create a dig-block volume from a polyline digitised on a bench surface.

In this release, we are pleased to introduce an easy to use, intuitive new tool allowing users to create mesh volumes by extrusion of polylines.

1.8. New Variogram Sharing workflows



1.8.1. VARIOGRAM MODELS: PUBLISH TO/IMPORT FROM CENTRAL

A regular or transformed variogram model can now be published as a versioned object in Central and can now also be imported back from Central into any domained estimation object.

Sharing via Central will enable new workflow possibilities such as the establishment of a 'master' variogram for production workflows, or the sharing of a variogram from a well-informed domain into minor domains. Variograms can be shared between branches of a project, or between projects.

1.8.2. EXPORT/IMPORT VARIOGRAM TO/FROM FILE

For Edge and CEx customers not using Central, variograms can now also be transferred between domained estimation objects via export to and import from a Seequent external file format. The file format is human-readable in a text editor, where it can be reviewed or edited. Version tracking is not supported.

1.9. Maintenance improvements

1.9.1. CHANGE ARCHIVER

Current Central (3.0.2, 3.1.1, 4.0) archiver uses Zpaq. The problem is that as files are compressed for storage in Central the process requires the system to have up to 2x the storage capacity of the original files. A more efficient alternative, namely ZSTD, will provide lossless compression. This HTTP compression can be built into web servers and web clients to improve transfer speed and bandwidth utilisation. Existing project data files in Central will not be unpacked during migration, therefore will continue to be Zpaq packed.

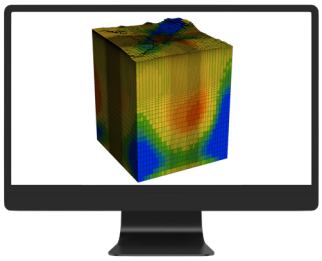
1.9.2. LEAPFROG STORAGE PERFORMANCE IMPROVEMENTS

Significant gains have been made in improving the storage performance of Leapfrog projects.

The biggest improvement comes from changes to the storage format of image files along with the compression of result arrays, while further optimisations have also been made in the storage of octree models.

Reduction in project size will vary a lot from project to project, depending on the types of data stored. Projects containing large or numerous images, or with large octree block models will benefit most - with testing showing 60-90% reductions in size on disk. Not only does this free up valuable disk space but backing up and publishing projects to Central is much faster.

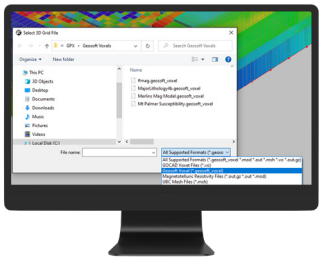
1.10. Geophysical Data handling



1.10.1. RATIONALISE 3D GEOPHYSICAL GRID STORAGE

The previous release of Leapfrog has supported geophysical grids in GoCAD, UBC and MT format. However, each was a separate implementation with different visualisation features and performance. Support for these geophysical formats has now been rationalised with consistent importation, evaluation, and visualisation.

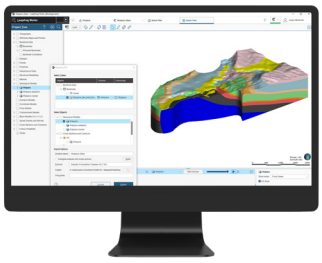
All imported grids are now stored in an optimised internal storage with visualisation improvements in performance, transparency, filtering, subsetting and index slicing. The new grid storage paves the way for publishing of grids to Central for web visualisation. This was a step required to better support Oasis montaj Voxels, and for when we complete the publishing Geophysical Grids to Central.



1.10.2. IMPORT 3D GEOSOFT VOXELS FROM DATAROOM

To allow seamless consumption of Oasis Montaj voxels in Leapfrog, which would allow for the support of geophysical data inputs into geological modelling workflows, Leapfrog now can support the importation of Geosoft voxel grids (.geosoft_voxel file format).

1.11. New IFC Support for better BIM interoperability



Leapfrog strongly supports the introduction of open standards for data exchange and have been strong supporters and early adopters of the IFC format of BuildingSMART. We are pleased to announce two major new enhancements to our support of IFC.

1.11.1. IFC 2X3

Leapfrog entered the BIM space two years ago with support for IFC 4.0.1, and we continue to push the evolution of this emerging open standard data exchange format in this release. However, we also recognise that many other BIM softwares do not yet support the more recent IFC versions. In response to customer requests, we are pleased in this release to improve our capability for export of boreholes, meshes and models in the older IFC 2x3 format. This will improve our customer's ability to exchange data within BIM projects to Autodesk BIM 360, Revit, Navisworks, Trimble Connect, Solibri Anywhere, Civil3D, Bentley Viewer, BIMvision,

1.11.2. IFC 4X3

The footprint of BIM usage is rapidly expanding from building project management into management of linear infrastructure projects such as roads, rail, tunnels, bridges and ports. A new version of the IFC format (IFC 4x3) has recently been released that includes ground specific data types.

In an industry first, Leapfrog now supports the export of IFC 4x3 files with purpose designed definitions for geological model volumes, cross-sectional views, boreholes and meshes. As yet, few other softwares support the IFC 4x3 file format, but we anticipate a rapid adoption as the value of recognising these data types is realised and are pleased to be leading the industry towards open data exchange.

Other changes to IFC support include:

- Improvements to the existing 4.0.1 borehole export option.
- The additional of a global IFC export option from the main menu.

1.12. Flow Modelling Improvements (Hydrogeology)

1.12.1. FEFLOW

FEFLOW grid creation has been streamlined with a new wizard that combines the 2D and 3D steps into one. In addition, all grid editing, evaluation and material properties tools have been relocated to a single dialogue on the parent.

Initial contaminant conditions in a FEFLOW model can now be set from numeric models or estimations, using simple workflows for evaluating contaminant concentrations per lithology onto grid centroids or nodes. Prior to this release, estimators couldn't be used as parameter inputs for initial conditions.

1.12.2. MODFLOW

When modelling several contaminants in a project, users want to apply the contaminants to MODFLOW and FEFLOW grids as initial conditions so that the contaminant concentration and location can be simulated through time. Prior to this release, estimators couldn't be used as parameter inputs for initial conditions.

Numeric models and estimators can now be used to create initial contaminant conditions with the following:

- Addition of material field to the Modflow and Feflow material parameter dialogues for Contaminants
- Per lithology - select a contaminant or numeric model or a constant value input.
- Export evaluations as initial conditions. Evaluate numeric models and estimators onto centroids and nodes.

Leapfrog Works Point Release 2021.2.3

The following issues have been resolved:

Issue Key	Issue Addressed
LF-43557	Fixes an issue with Interval Selections built from Grouped Columns. Customers with projects in Leapfrog 2021.2.2 should upgrade to this release.
LF-43537	Resolves an issue where projects with broken blocks cannot be published after upgrade. Previously publishing was blind to presence of broken blocks.
LF-43097	Fixes an issue when combining drillholes for which no survey table is present.
LF-43681	Resolves an error when upgrading a Central mesh from 2021.2.2 to 2021.2.3.
LF-43666	Resolves a traceback when upgrading Geo-2.0 projects.
LF-43618	resolves an issue with retention of source information for meshes reloaded from Dataroom.
LF-43599	Resolves an issue with flat section mesh projections not publishing correctly.
LF-43587	Resolves an issue with duplication of face dip values on upgrade of meshes from Central.
LF-43568	Resolves an specifc issue with missing filters that causing project upgrade to fail.
LF-43569	Resolves an issue when publishing projects that contain errors to Central.
LF-43458	Resolves an issue with upgrading of old points tables.
LF-43414	Resolves a traceback occurring on merged drilling tables.
LF-43247	Resolves a path error in serialisation.
LF-43245	Resolves an issue occuring when Central licence requests are made with an invalid token.
LF-43239	Fixes an issue with Central projects tab.
LF-42971	Resolves a specific issue with evaluated columns (new functionality).
LF-42957	Resolves a traceback from duplicate lithologies in an interpretation table.