

On-screen planning

John Chadwick looks at new products and upgrades offered by some of the major mining software suppliers and experts offer some good advice on software choices

Yvan Dionne is the founder and President of PROMINE, a developer of geological modelling and mine planning software. He notes that choosing what mine planning software to implement is a big decision. "There are many highly advanced and expensive solutions for mining engineers and geologists, and with high tech solutions come complicated learning processes and the high cost of both time invested in learning the software, and the cost of the program itself.

He suggests nine aspects to consider when looking for mining and geology software:

The first is to identify your needs. "Different team members using the software will have different needs. Make a list to ensure the software solution you are scoping out meets specific requirements by each member of your team." Be sure to understand which specific tasks these mining software companies cater to so you can choose the most appropriate for your needs.

One point often overlooked is that even if the solution you've selected is from a single provider, it will likely be comprised of various programs. "These programs may not all have the same interface or data format and may have cumbersome ways of exchanging data which is not dynamic or intuitive to your current systems," he warns. "The solution may look great on paper but when it comes to implementation, you may be met with challenges distributing the data efficiently.

"Understand which programs your potential software comes with so you can gauge its

usefulness to you, your team, and your company."

Identifying whether a given mining software company has more underground mining clients as opposed those in open pits can have a large impact on your buying decision.

It is important to understand the capabilities of your software to achieve maximum efficiency between the departments in your company. For example, the geology department at your company creates an excellent block model for a given mine. The planning department has access to it in real time but they do not have tools to filter out blocks according to certain criteria- they cannot let's say, make out an economic contour for mining because they are lacking certain mine mapping tools.

Ensure the mining software solution you select fits with all the steps required to successfully bring a project through all the required exploration and planning stages into production. There should be no missing link in what you expect from your software as it relates to your mine productivity.

"There are some tools within your software that you will use every day and other tools which you will use seldom. The everyday tools must be simple to use, get straight to the point and operate flawlessly every time without exception. Problems or glitches with these everyday tools will account for massive time loss and cause severe back-up in your company.

"Identify these frequently used tools and ensure their functions operate perfectly to maximise mine planning efficiency.

Yvan Dionne advises "it is important to be sure that the solution you are purchasing is going to be capable of doing what you need it to do."

"Mining is a production environment. You do not want to use a long and a tedious mine planning procedure which is too difficult to master. Identify a clear path with an easy to understand software interface."

"When mine planning software has a steep learning curve, there is a higher probability that it won't be used to its full potential. Also be sure to investigate a given software company's support quality. Long response times can be aggravating, bringing production to a grinding halt and ultimately cost you more money. Look into case studies or testimonials on the company's site to gain insight on these factors.

It is important to identify and adhere to the core functions you wish from your mine planning software. Don't be distracted by fancy bells and whistles which ultimately do not adhere to your vital needs. If a software company cannot provide clear and concise solutions, move on to the next.

"Find out what you are paying for and compare it with other mining software companies." Dionne suggests some questions to ask yourself:

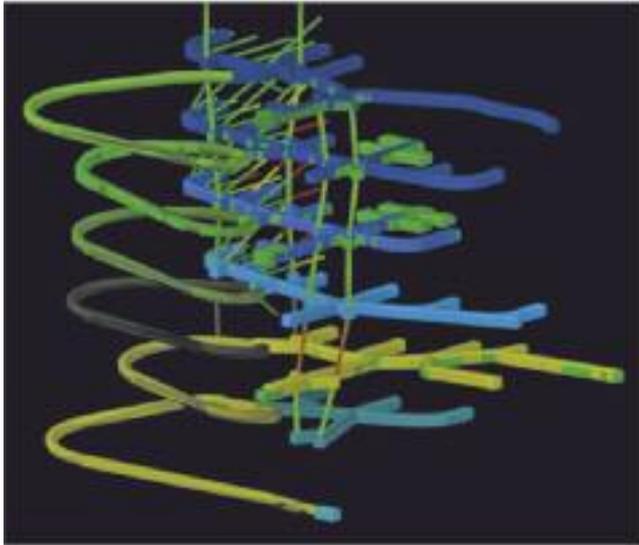
- What am I getting for this price?
- How much does it cost per user?
- What are the licensing options?
- What are the costs per year for the software?
- Is customer support included?
- What are the training costs?
- Are all costs clearly stated with an appropriate estimate provided?

He further advises that "it is important to keep in mind that it is possible no single mining software company will be able to offer solutions to meet all of your needs. A combination of services from several companies may be required, or you may want to choose a provider which offers further programming customisation after the initial purchase. It may be wise to investigate bailout costs in case the software solution you've selected proves to be unsatisfactory."

Promine says that "though AutoCAD is the industry standard design platform for all engineers, there are few solutions for mining engineers and geologists on the market."

As a licensed AutoDesk Developer, Promine has spent the last 20 years developing a variety of AutoCAD-integrated modules to rapidly increase the efficiency and workflow of mining engineers and geologists working with AutoCAD.

It reports that its "most effective extensions for mining include the Promine Filer Module, a drawing manager that enables you to customise layers within your project. The Layer naming



they increase the size of drawings dramatically. Promine's Solids Module has a command which will convert these solids into AutoCAD meshes making them much easier to work with. Users will still be able to perform Boolean operations on these meshes with the Solid Union, Intersection, and Subtract commands.

Using standardised blocks, linetypes and hatches are a great way to make drawings lighter. But what if everyone has their

own block version of the same block? convention is customisable allowing you to design the layer convention in any orientation.

“The Filer module allows you to extract only the layers which you need in your drawing. Instead of carrying all layers of a given mine level, you will only insert the few layers which you need into your drawing, greatly reducing the size of your drawing. Promine's filer is commonly used as a virtual command center on which access and modifications to the layers are granted through an effective security system.”

Working with 3D solids can be a common pain point for mining engineers and geologists as

own block version of the same block? “Standardise to one version of the block with the Library Module. This will also help you maintain your CAD standards to their most ideal.

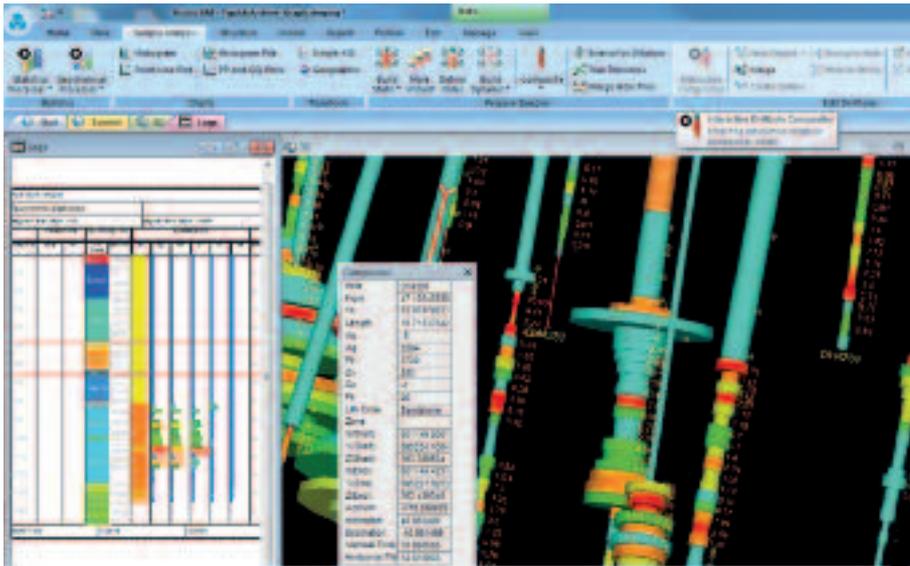
“Diamond drill hole data is incredibly detailed; generating many objects in a drawing. Instead of keeping all of this data in a drawing, Promine allows you to generate only what you need. The Insert Holes function of the Diamond Drill Hole Module is an example of selectively and locally generating data in a drawing. Once you are done with this data, you can erase it while keeping your drawing free.”

New owner of a stalwart

Constellation Software has acquired CAE's mining division, Datamine, one of the historic brands in mining software. Datamine now operates within Constellation Software's Vela Software Division. At the time of the acquisition it was stated that “Datamine provides a compelling one-stop-shop for the technology and services required to seamlessly plan and manage modern mining operations. Datamine offers solutions ranging from exploration data management and orebody modelling, to mine planning and associated consulting services to over 1,400 companies worldwide. Through its software and services, Datamine is developing the industry's most compelling technology and services to advance the efficiency and safety of mine operations.”

Datamine reported in December that Version 2.0 of Studio EM was under beta testing with expected release in January 2016. It says “Studio EM is ideal for gaining an understanding of projects at their early exploration and prefeasibility stages. It's packed with functionality including basic grade estimation and the block modelling tools that will be familiar to Studio users.”

The ability to build basic block models that represent structure and grade distribution means that you can take projects a step further than with most exploration focussed products.



V2.0 is built on Datamine's core platform and consequently has a brand new ribbon based user interface. This is similar to task focussed ribbon in Studio RM that has received such positive feedback.

Studio EM contains a host of other improvements such as improved formatting of drillhole and block model data and enhancements to statistical and correlation processes. Studio EM has the same data import and export facilities as Studio RM so data can be accessed from a wide variety of sources.

Existing projects created by products such as Studio 3 and Downhole Explorer can be opened automatically.

Downhole Explorer users are entitled to a free upgrade to Studio EM in line with their annual maintenance renewal. To access this offer and get 3D visualisation of your Downhole Explorer projects, get in touch with your local Datamine office.

Studio RM version 1.2 is scheduled for release in the second quarter of 2016 and will contain an advanced geostatistics module that is the result of Datamine's continuing collaboration with Geovariances.

This new module has a significant focus on multivariate geostatistics with the introduction of cross-variogram modelling and support for co-Kriging within grade estimation. In addition, an updated workflow for resource estimation improves both speed and ease-of-use through new simple to use user-interfaces and advanced geostatistical algorithms. The variography tools have been completely revamped and are now more responsive and straightforward to use.

Selected examples of improvements are:

- Improved charting tools for variogram visualisation and modelling including support for multivariate variogram models

- Automatic fitting of single and multi-variograms using the same algorithm as Isatis from Geovariances
- Dynamic lag adjustment in variogram fitting
- New modelling and visualisation techniques for determining anisotropy and search volumes
- Faster grade estimation on multi-core PCs using parallelised algorithms
- Additional outputs to aid evaluation of Kriging quality and reliability
- Easy to use case management for saving and restoring estimation parameters.

Datamine also reports that "Fusion continues to evolve with even more performance improvements and new features included in the second major release within a year. Web service synchronisation has been extended from Drill Holes in version 8.0 to now include Surface Samples and Maps in the Fusion 8.1 update. Check-in/Check-out processes are typically 10 times faster, and even greater on high latency (e.g. satellite) connections."

Fusion Scheduler now has extended functionality for scheduling jobs and delivering email notifications.

Partial authorisation of drillholes is a new feature in DH Logger that delivers greater flexibility when working in teams. It is now

possible for multiple users to simultaneously authorise a drillhole - limited to the specific portions or fields that they are responsible for. The database administrator has complete control to configure the access settings and workflows in-house.

Sample compositor functionality has also been added, allowing custom compositing and adjustment formulae to be applied and simple reporting of the results.

Report Manager has many new features including additional charts and general useability enhancements. One of particular interest is the new query building tool that allows users to quickly create custom database queries without any knowledge of SQL Server.

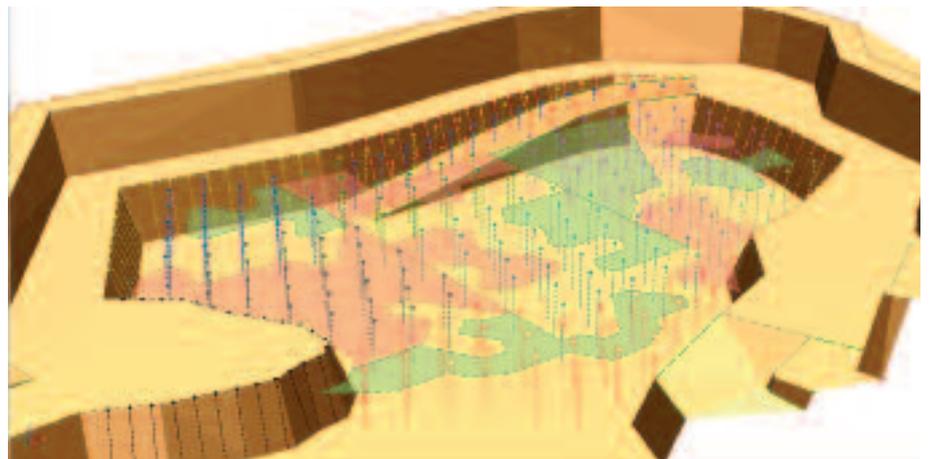
....and new Surpac

GEOVIA Surpac, the popular geology and mine planning software, was updated recently. Surpac 6.7 features design improvements for grade estimation and vast increases in the processing speed of block models. It helps users to optimise performance of block models through its support of multiple CPU cores, dramatically reducing estimation times from hours to minutes. Using all of the available CPU cores significantly increases the block model processing speed, performing estimation, reporting, and constraining of much larger models in a fraction of the time.

Surpac 6.7 highlights, as reported by GEOVIA, include:

- Up to 95% reduction in processing times for block model operations such as estimations, block maths, constraining, and reporting provides quicker results for analysis
- Up to 200 times performance improvement for inverse distance, ordinary and simple kriging, and nearest neighbour estimations when used with a minimum recommended configuration of a Quad core CPU with hyper-threading
- Advanced Drill & Blast functionality for easier editing of blast holes and animation of blast sequence.

As Surpac 6.7 uses the available processors to



Surpac solids repair rapidly converts 'non-watertight' solids from third party sources into valid solids

their fullest capacity, performance improvements for certain operations will be in line with the number of cores available.

Based in Santiago, Chile, Marco Alfaro Consultores offers services in ore deposit evaluation; specifically in the areas of ore sampling, geological modelling, geostatistics and resource estimation. Applying geostatistical theory in conjunction with the latest available technology, the firm provides practical and efficient solutions.

Andres Beluzan, a Mining Civil Engineer and Executive Director of Marco Alfaro Consultores, has been using Surpac over the past decade for geological resource estimation. A recent upgrade to Surpac 6.7 has impressed him with the efficiency of achieving estimation results at processing speeds nearly 17 times faster.

When completing resource estimation for an iron orebody in northern Chile in which 549,994 blocks were estimated using ordinary kriging, the entire processing time with Surpac 6.7 was just one and a half minutes. Previously, the same process took 25 minutes and 26 seconds with Surpac 6.5.1, and 10 minutes and 17 seconds with Surpac 6.6.1.

At the heart of the strikingly improved block model processing is the multi-threaded technology that allows the majority of block modelling functions to use all available processors or cores. The effect of using all

available cores is such that users can now expect up to a 95% reduction in processing times for block model operations such as estimations, block maths, constraining, and reporting. As well, up to 200 times performance improvement for inverse distance, ordinary and simple kriging, and nearest neighbour estimations.

Automating open pit design

Maptek Vulcan 10, set to be released in March 2016, includes a new tool for automating open pit design. Conventional open pit mine design can be time consuming. Engineers often spend a week or more to generate just a handful of potential mine designs. Market conditions resulting in staff shortages exacerbate the problem, and sites are continuously looking for ways to cut costs and drive efficiencies.

Traditional methods require a lot of work to achieve a single realistic design. It's difficult to account for design parameters such as mining width and local geotechnical conditions. Open pit engineers may spend valuable time generating models that are disconnected from what actually occurs in the mine, leading to erroneous decisions.

Maptek says "Vulcan Automated Pit Designer addresses these challenges. It provides a tool that enables engineers to quickly iterate mine designs to ultimately generate the most economical pit design possible."

The Automated Pit Designer removes the requirement for the mining engineer to manually draft designs. Instead, optimised block model results can be transformed into realistic mine design contours in a matter of seconds.

These contours serve as a base for further design work or can be used to generate more accurate analyses such as pit-by-pit graphs and long term schedules.

All designs must mirror real-world constraints. Benches, for example, can vary by elevation and height allowing for arbitrary configurations including double benches.

Design parameters - batter angles, berm widths, and pit slopes - are rarely uniform. They can vary by location and direction. In Automated Pit Designer, operating parameters such as minimum mining width and material digability are direct inputs which can be manipulated to create operational designs.

The resulting design is flexible and can be changed as new drilling or mining data becomes available, or it can be adapted to changing economics. Multiple scheduling options can be reviewed, and different design parameters can be evaluated.

Mining engineers no longer have to struggle with a single static model. The new dynamic design process allows them to work more efficiently and effectively.

Maptek says "Vulcan 10 will deliver additional



Automated Pit Designer will be included with the Open Pit Mine Modeller bundle in Vulcan 10

support for multi-threaded processors for up to 10 times better performance over Vulcan 9.1. A new Vulcan 10 block scripting engine processes larger scripts and completes the calculations 10 to 1000 times faster than previous versions. Block slicing has received a speed upgrade, running three to five times faster in Vulcan 10.”

Implicit modelling speed is also increased. Many calculations can be carried out on a GPU for accelerated computation, or with a CPU estimation process optimised for implicit modelling. The new accelerated code also supports trend models.

GPU acceleration in grade estimation tools allows estimations for some parameters to be completed faster than previously possible.

Block model attribute importing uses an intelligent process to assign values into block models several times faster.

Vulcan 10 also features a new threaded sequential Gaussian simulation module which effectively uses modern multi-core CPUs to accelerate simulations.

Other Maptek news is that it will now distribute and support the full suite of 3d-Dig products of Earth Technology Pty Ltd in Australia, North and South America. Maptek will promote the 3d-Dig excavation editor and equipment simulator in those regions in combination with its range of existing mine planning and design solutions.

The 3d-Dig software allows full 3-D simulation of all aspects of mining machine operation -

Carlson Mining 3D haul truck cycle analysis

excavation, dump and machine performance. The 3d-Dig tools can be applied to dragline operations, as well as truck and shovel and dozer movements. It is widely used in Australia’s eastern coal markets and has applicability for iron ore strip mining operations.

The release of Carlson Mining 2016 boasts a long list of improvements with added support for AutoCAD® 2016 and the all-new IntelliCAD®8.1. These improvements span the four mining modules: Basic Mining, Geology, Surface Mining, and Underground Mining.

The company reports that “perhaps one of the most significant improvements to Carlson Mining is the upgrade to the Haul Truck Cycle Analysis command, which now accounts for mixed fleets, delay points, and 3D playback of trucks along the haul route. With an in-depth explanation of the command logic, mine operators can be confident in the decision to purchase that extra haul truck.”

In the Underground Mining module, support has been added for multi-level mining with the addition of layer based level labels, allowing the processing of overlapping mine panels with ease. Common to all mining modules is added support for Gantt charts, enabling users to stay on track and optionally export their mine schedule directly to Microsoft Project.

Other new features for Carlson Mining 2016 include the ability to create and edit solid models by various methods, such as from as-built surveys, or a template design of a tunnel. Solids can then be sliced by the geologic model for volume calculation. There are new methods to import and edit fault lines, speeding up the fault line creation and visualisation. Further geophysical analysis of eLog LAS files is used to create drill holes as the software automatically

determines the intervals based on the saved parameters. Logs and core images are drawn next to the geologic column for full comparison.

Used throughout the world, Carlson Mining, the company says, “provides legendary ease-of-use, combined with powerful features and AutoCAD DWG®-based graphics. In addition to its support for AutoCAD 2016, Carlson Mining works on AutoCAD versions 2010 and up. All Carlson 2016 office software comes with the improved IntelliCAD 8.1 built-in, which offers a CAD platform for no extra expense.”

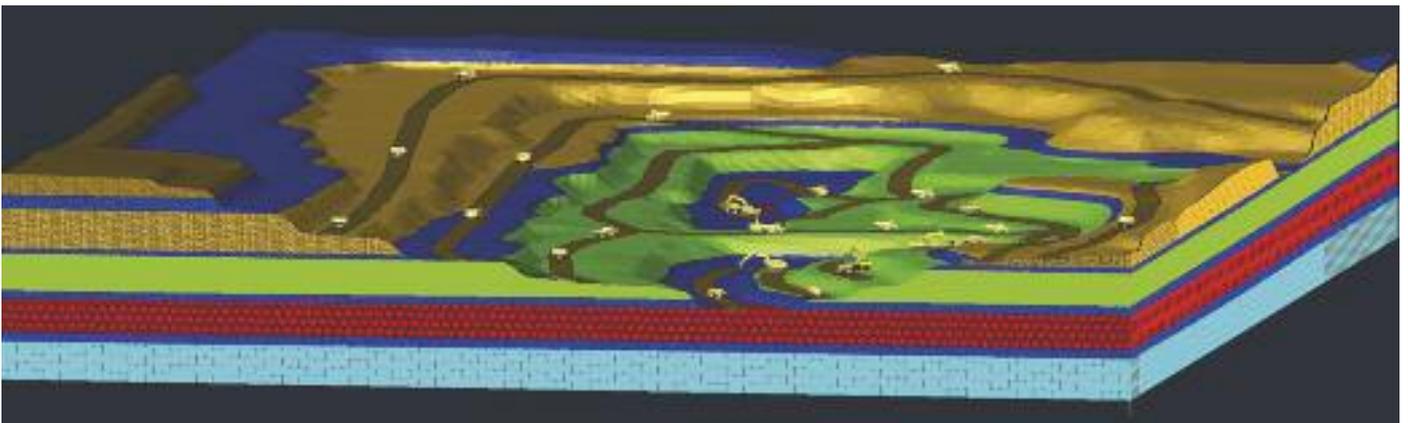
IntelliCAD 8.1 represents major improvements in its CAD engine technology, now including support for Microsoft Windows 10 along with multi-core processing when opening and regenerating files, which provides a 1.5 to 3 times performance improvement on multi-core computers.

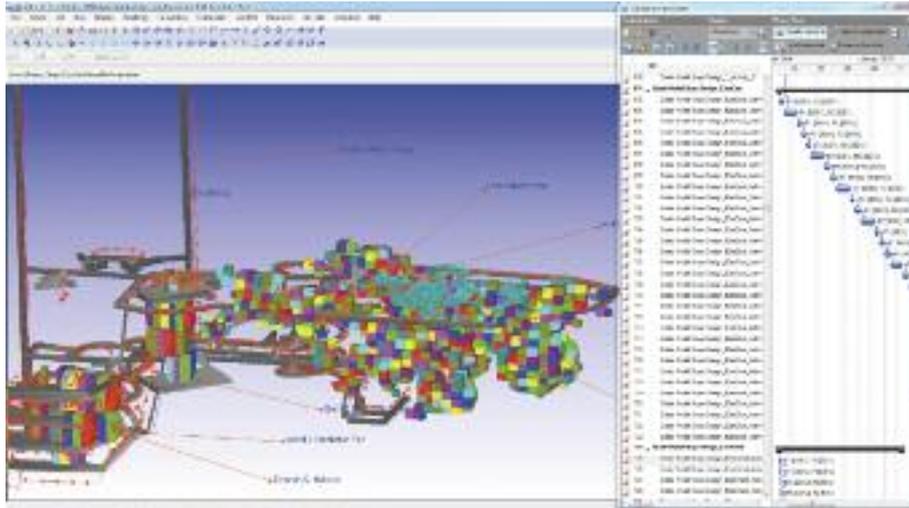
Carlson Natural Regrade is also available for mining operations. It is recommended by the U S Department of the Interior’s Office of Surface Mining (OSM) for mine reclamation. Natural Regrade helps mine operations meet and often exceed environmental standards and provides maintenance-free stability that translates to true sustainability.

Updating ThreeDify’s GeoMine

2015 was the year of integration for ThreeDify’s GeoMine mining software suite. The team focused on streamlining workflows for integrated geological modelling, mine planning, design and scheduling into a single unified workspace. The end result is a totally integrated system with no data silos. In the new system, user data flows seamlessly among all modules in GeoMine, eliminating the need for the error prone data imports and exports that have plagued many existing mining software packages for years.

Reflecting back, the GeoModeler module in GeoMine is now successfully deployed in a number of production mines for more accurate resource estimation and ore control thanks to its proven dynamic anisotropic interpolation system. Notable new developments in 2015 include native support for sub-blocking.





Schedule and Gantt chart created by ThreeDify iScheduler

The QuickPit module in GeoMine changed the way and speed in which our users design their pits because of its innovative workflow. The notable addition in 2015 was support for design reconciliation with the as-built pit.

The Stopemizer module in GeoMine was, the company says, “the first commercial stope optimiser that is based on a mathematically proven optimisation algorithm as opposed to heuristics. Notable additions in 2015 include stope reconciliation between a design and the as-built stopes.”

The addition of ThreeDify uCAD underground design module and especially the ThreeDify

iScheduler production scheduling module to the GeoMine workspace marks the beginning of a new era for the company: ThreeDify now offers an integrated end-to-end solution for geologists and mine planners ranging from resource and reserve estimation and reporting, to pit and stope optimisations, as well as life-of-mine and production scheduling.

In addition, an architectural enhancement to ThreeDify FlowPit enables the already powerful pit optimiser to directly optimise on an arbitrarily rotated block model without requiring its Z-axis to be vertically aligned. Such a block model is usually required for minimising dilutions for

shallow narrow dipping ore seams – especially for chrome and platinum as well as coal deposits.

“The importance of an integrated end-to-end solution can never be over-emphasised, the company says. “Even the best workflow offered by any traditional General Mining Package (GMP) that consists of several independent programs presents challenges to experienced mine planners due to the need of data import and export to ‘glue’ the programs together. An integrated system, on the other hand, not only reduces frictions between tasks due to the same familiar interface, but also eliminates the need for incremental import/export steps, and hence significantly increases users’ productivity.”

A typical high-level workflow with GeoMine is to start with GeoModeler to import DDHs from CSV files or from a Microsoft Access Database. You can visually inspect and validate the DDH records before creating composites. You then move onto automatically create Dynamic Anisotropic (DA) surfaces and optional wireframes (for domaining), and then conduct variogram analysis to determine search directions and ranges. Once done, you can move on to block grade interpolation with DA surfaces and/or wireframes using Dynamic Anisotropic Interpolation, Kriging or RBF. The output of



New from Hexagon Mining, HxM Athena is a performance-indicator bundle that makes sense of data from production planning, grade control, fragmentation, drill operations, and plan compliance – showing broken and mined reserves

GeoModeler is one or several block models all properly clipped by topography.

If it is an open-pit project, then you can use FlowPit to conduct pit optimisation on the chosen block model with sensitivity analysis and/or to create life-of-mine schedules. The result of FlowPit is a set of nested mathematical pits which is now the input to QuickPit. With QuickPit, you can quickly design practical phase pits by adding in-pit ramps. The designed practical phase pits can then be used as input to the iScheduler to create bench-cut activities and then production schedules with Gantt charts.

For an underground mine project, you can instead choose to use Stopemizer to create

multiple stope designs and conduct sensitivity analysis. The output of Stopemizer is a stope design which can be directly used as a reference design for uCAD to create mine development layout. iScheduler then takes as input, the output of both Stopemizer and uCAD, to create Stope and mine development activities, Gantt charts and production schedules.

In almost all cases, you will need to correct any mistakes and refine your models, designs and schedules. To do so, simply load your GeoMine project and go back to any step above, undo part of your design and create what-if scenarios. You do all these things in a single integrated workspace, without any of those

troublesome import/export steps in the middle.

Going forward, in the this quarter of 2016, ThreeDify is planning to release ThreeDify CloudMesher module for GeoMine which is designed for processing large point clouds from 3D scanners or UAVs. Survey data plays a vital role in safety management programs. Accurate information is mandatory for identifying risky structural changes over time that can affect mine planning and operational decisions. Very large point clouds with points over 100 million can already been viewed in an interactive speed on commodity laptops. Several new meshing tools are being developed to produce a 3D surface or solid that honours the original point cloud data and that can be subsequently used as an actionable mining object for downstream design purposes, such as pit or stope reconciliations, summarising sections, underdig, overdig, and percentage of volume variance.

License to explore

In December Hexagon Mining introduced License to Explore, which it describes as “an attractive lease license arming explorers with the powerful

tools they need to produce high-quality data. License to Explore recognises the need to optimise drilling campaigns while respecting tight budgets. It comprises two options, HxM Explorer and HxM Modeler. Both are highly versatile and designed for the life of a drilling campaign.”

For the field geologist, HxM Explorer delivers CAD and Surface Modelling tools for building implicit surfaces and solids directly from drillhole data. Users can quickly interpret and evaluate scenarios. HxM Explorer’s mapping and drillhole design tools enable the explorer to design drilling programs with the benefit of storing drilling and logging data and assay results in the MineSight Torque system.

Additional functionality can be added to HxM Explorer and HxM Modeler for surface meshing of huge point clouds collected by UAVs. The Torque database can be enhanced with a QAQC module for managing the validity of drillhole data. Future add-on options include a workflow management tool for developing implicit models and a field logging device that is directly linked to Torque.

HxM Modeler is designed for the office-based explorer tasked with building a comprehensive block model and analysing data gathered in the field campaign. HxM Modeler contains many of HxM Explorer’s CAD and surface modelling tools. So as well as being able to build and manage block models easily, a geologist can quickly evaluate the data collected in the field season and start planning for the next stage of project development.

Last year also, Hexagon Mining launched HxM Athena Planning, a performance-indicator bundle that makes sense of data from production planning, grade control, fragmentation, drill operations, and plan compliance. Interactive heads-up displays are integral to HxM Athena, a solution that empowers miners to transform data into knowledge and builds on Hexagon Mining’s vision of smart change.

Using a robust data integration process, HxM Athena imports, validates, analyses, and combines appropriate data from multiple sources. Real-time fleet management telematics are overlaid with geological and geographical models, planning and mine-centric KPIs. By displaying the information in near real-time in a centralised location, inefficiencies are quickly exposed, allowing planners to solve problems and improve productivity.

“This is not just another dashboard-driven, business intelligence-business analytics product,” said Hexagon Mining President Hélio Samora. “HxM Athena uses dynamic spatial renderers to address the challenge facing all mines – data from multiple sources with no single correlated source of context or relevance. HxM Athena empowers managers to understand what is going on in their

operation across multiple areas of the mining value chain.”

For example, poor excavator productivity could be related to an operator, the haulage cycle capacity, or a result of poor drill planning and blasting. If you are only looking at the excavator dig rates, other variables may be overlooked. HxM Athena assembles all this data into a single place, allowing decision makers to see the real cause of issues and make decisions to implement smart change and improve quality and productivity.

There are also new standalone MineSight solutions from Hexagon Mining, which deliver the same functionality as full MineSight products, but are packaged with a specialised viewer and toolset designed for integration with virtually any general mine planning system.

Standalone Blast: By integrating departments that previously had little to no improvement mechanisms, HxM Blast allows you to monitor and adjust a blast from design through to implementation. It provides features to validate and improve the entire blasting process. Feedback and monitoring can be used directly to continuously improve the blasting process, creating smarter designs that optimize fragmentation, and manage costs.

MineSight Atlas is a complete package for manual scheduling and stockpile management. It provides a resource-based, true calendar approach to scheduling, and manages all material movement and reclaim. It works with multiple block models and makes mine areas for open pit and underground mining easy to manage. Standalone users can import geometry, schedule and animate multiple activities, and generate detailed reports and schedules for all user-defined mining activities.

MineSight Schedule Optimizer (MSSO) will determine the optimum solution that obeys constraints, while maximizing your objective. MSSO finds the optimum schedule in one or many periods that achieve the objective while satisfying comprehensive product quality and quantity

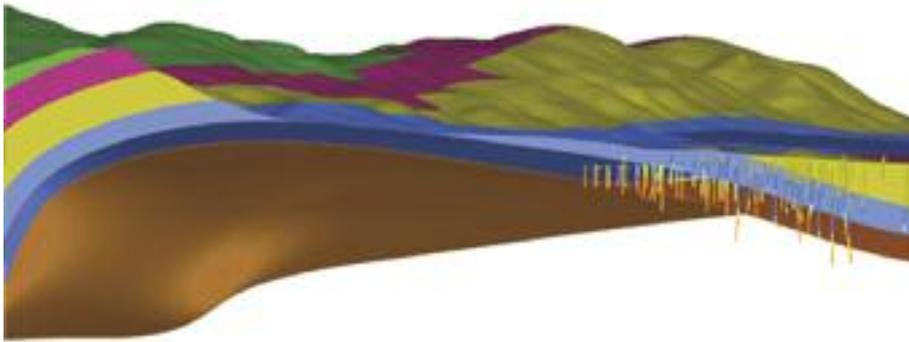
requirements, as well as physical and technical constraints. The standalone version will allow you to import geometry from a third-party system, define the constraints, run the optimization, and report the results.

Another leap forward

Late last year ARANZ Geo, developer of the Leapfrog® 3D geological modelling software, released Leapfrog Geo 3.0. This latest release “enables users to get more from their valuable data, and allows more control of the modelling process. Major advances include a powerful drillhole correlation tool that gives a ‘Leapfrog take’ on rapidly visualising and comprehending drillhole data and improved stratigraphic modelling,” the company says.

Shaun Maloney, CEO of ARANZ Geo says: “Leapfrog Geo 3.0 gives an even better modelling experience by enabling more to be completed within Leapfrog’s 3D environment. This saves time, reduces error and also saves our customers investing in often expensive third-party software.” He says all solutions are designed to harness information to extract value, bring meaning and reduce risk.

“We make it our business to listen to our customers and solve their problems. Leapfrog continues to set the standard in geological modelling as we take an innovative market led approach to development,” he says. “We’ve



already delivered market leading grade shells, vein systems, and now we've improved stratigraphic modelling."

The company says it worked closely with the

Australian iron ore industry to understand the challenges associated with modelling layered deposits that incorporate shared structure, lateral continuity and folding. As a result

Leapfrog Geo 3.0 includes features that deliver significantly more structural control, such as the offset meshes tool.

Leapfrog Geo 3.0 includes a powerful drillhole correlation tool that allows users to quickly visualise and compare lithology, assay and geophysical intervals and identify correlations.

An easy-to-use workflow introduces an interpretation table that allows users to adjust interval boundaries and re-assign intervals. The new tool is fully dynamic and any changes made to interpretations flow through to dependent models. The workflow also allows users to stay in

Leapfrog rather than breaking away to other third-party software, which decreases complexity and cost.

Resource modelling

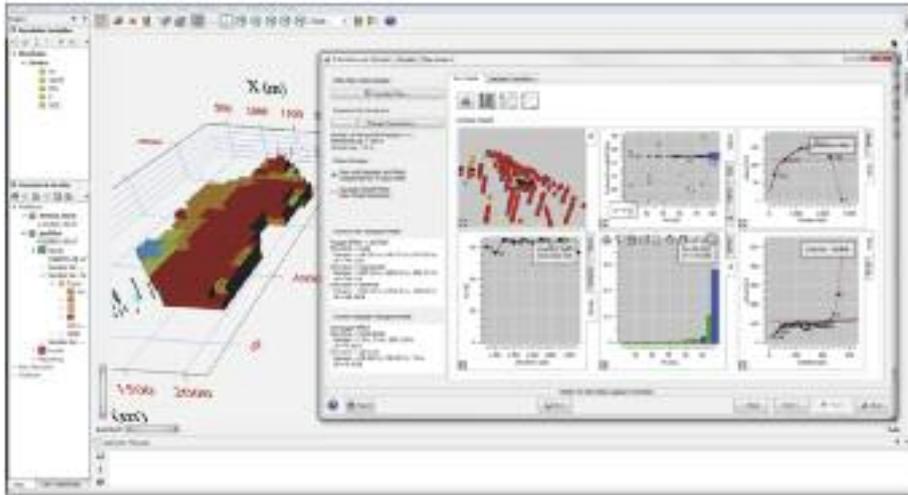
Early in 2015, Geovariances launched Minestis, its new generation software solution for mineral resource estimation. The company says Minestis "provides a simplified and optimised all-in-one streamlined workflow for mineral resource modelling, from data analysis to recoverable resource estimation. The software makes geostatistics accessible to everyone involved in resource estimation and makes it easy to generate rigorous resource estimates."

It is a secure workflow safeguarding users against errors. It automatically defines parameters with justified data driven values and provides support tools to key parameter setting such as Kriging Neighborhood Analysis.

"Minestis is at last filling a gap and bringing to resource geologists the software they need," explains Henri Sanguinetti from Melabar Geoconsulting. "They will be able, in their activities from resource estimation to grade control and reconciliation, to process data from ordinary kriging to non-linear techniques (uniform conditioning) and to simulations, without complicated manipulations and in record time. It is simplifying also our consultant-client relationship."

Minestis improves collaborative work. It facilitates the combining of mid-term and long-term models. The software is ideal for mine geologists or engineers who are required to quickly provide accurate block model updates and who would like to unify their work with that of the resource team for more coherent resource management.

"Minestis meets the specific needs from our operational mine sites. These needs are to rapidly and accurately update block models with new data by geologists who do not have tertiary qualifications in geostatistics, but are required to generate results with a high degree of rigour and provide an auditable trail of parameters," specifies Clint Ward, Principal Resource Geologist at Cliffs Natural Resources.



Minestis interface

“Operational geologists who are starting off their careers can quickly get to grip on all key aspects of resource modelling while being productive in generating resource models for the operations.” says Vasu Govindsammy, Senior Manager Mineral Resource Evaluation at AngloGold Ashanti.

The software is also useful for consultants or auditors and financial analysts who need to control resources.

“Minestis can be used to conduct resource model reviews effectively and efficiently.

Experienced resource modellers will be amazed by the speed and high level of confidence in which a resource model can be done.” adds Govindsammy.

Minestis development is based on Geovariances 30 years’ experience in various kinds of resource estimation projects. It provides all and only the necessary tools for resource estimation in a single package and particularly puts emphases on drill hole and domain quality control and validation. It embeds tried-and-tested geostatistics derived from well-proven key algorithms from Geovariances flagship software Isatis and allows coherent management of estimation domains and block models, thus

ensuring high quality estimates. Minestis also integrates a 3D viewer enabling powerful data exploration and analysis and incorporates Geographical Information System components allowing the collection, display and precisely locating of any information about the orebody surroundings: digital elevation model, photogrammetric image, geology, etc.

Geovariances says Minestis is a state-of-the-art Windows-native application with a modern and intuitive graphical user interface which implements powerful 64-bit algorithms. It is fast to learn and to use and benefits from high quality technical support from Geovariances geologists and geostatisticians.

Honour an innovator

Current nominees for the 2016 mining software inductee into the International Mining Technology Hall of Fame include:

- Alun Phillips – RPM’s Product Manager, Scheduling Solutions
- Graeme Tuder – Micromine’s Founder and Managing Director
- Caterpillar’s MineStar development team
- Paul Higgins – Founder of Dingo software.

The deadline for nominations to be received is the end of July 2016 – to john@im-mining.com. See the citations for past inductees at www.im-halloffame.com to see what we need for a nomination. **IM**