MAPTEK™

Forge

June 2020 Newsletter

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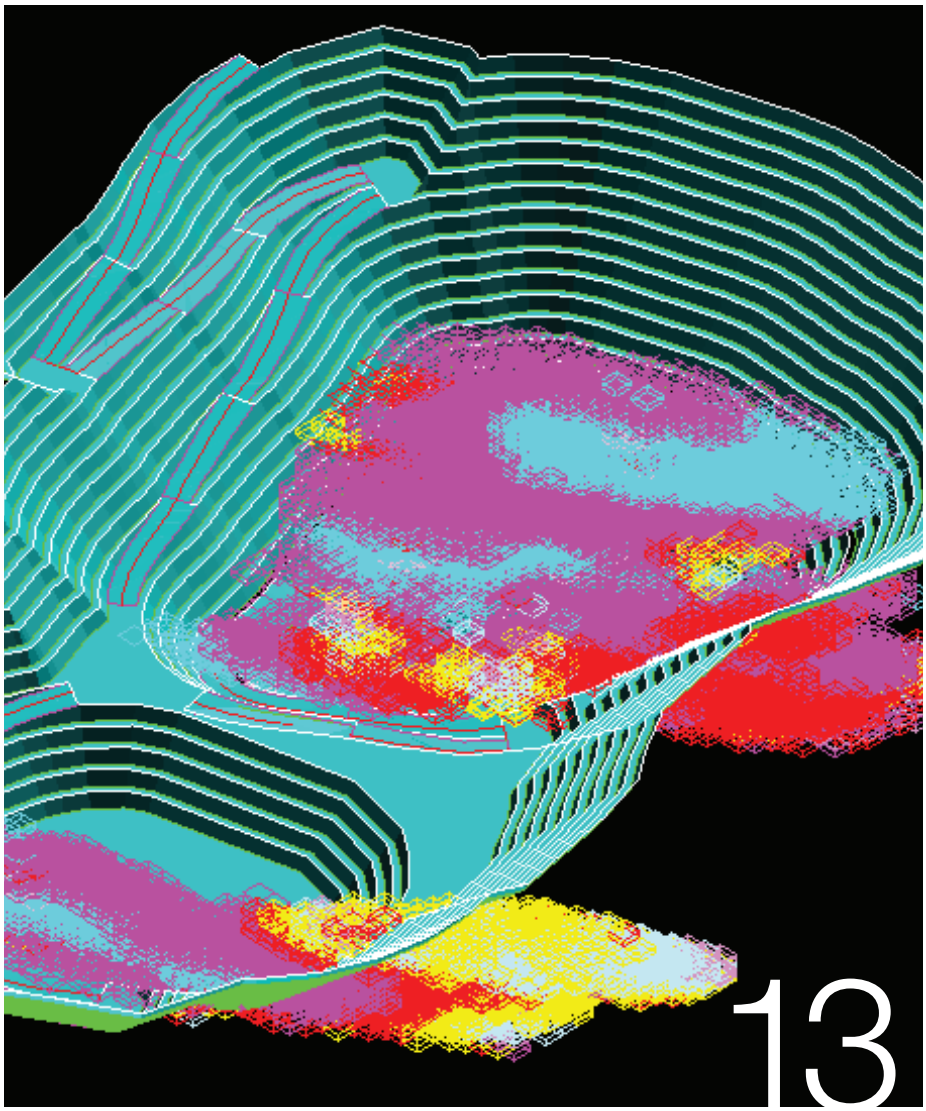
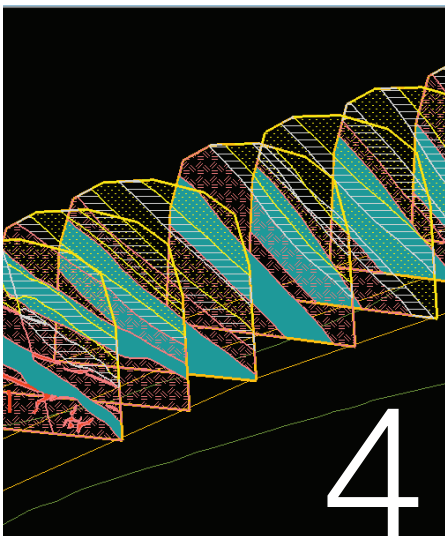
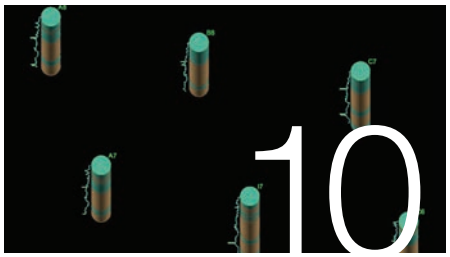
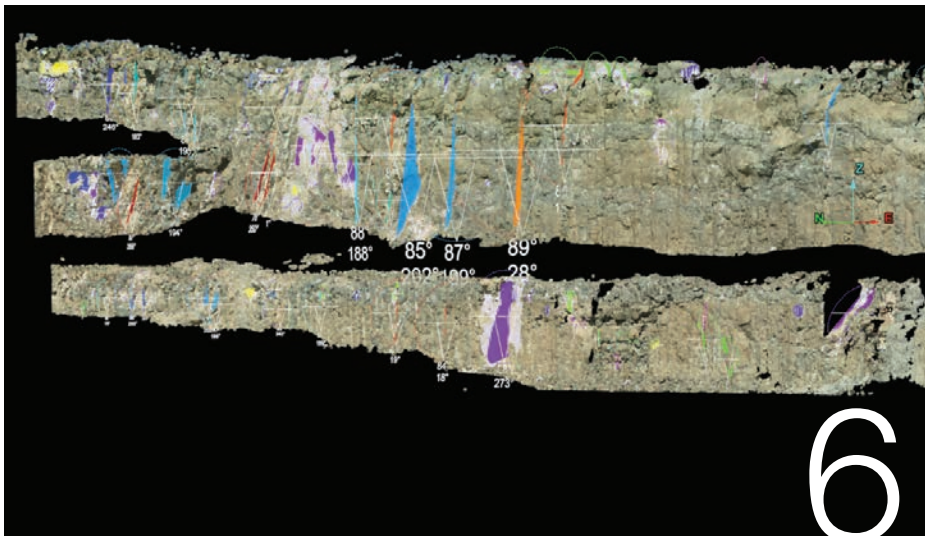


Welcome to our Forge newsletter for June 2020







On the cover

Maptek solutions target applications that improve performance across the entire mining value chain

Businesses face challenges every day. The particular challenges arising from COVID-19 were on the whole unforeseen.

With challenges come opportunities. Maptek is well-positioned to help customers navigate new ways of working and communicating.

In April we commenced a series of live streamed technical forums around innovative modelling, planning and scheduling applications. The sessions are tailored to help people work from home through sharing knowledge and automated workflows.

Maptek Account is enabling companies to deploy licences more flexibly regardless of where their staff are working. Individual and group training sessions have been run on demand and implementation of new solutions has been facilitated by customised video tutorials.

One thing that remains unchanged is the desire for automation and digitalisation across mine processes. Going digital is transforming geological mapping and modelling, and drill and blast performance.

Safe and efficient laser scan survey continues to drive more agile, accurate and efficient mine planning.

Machine learning, access to extension applications and other initiatives are improving business outcomes for customers.

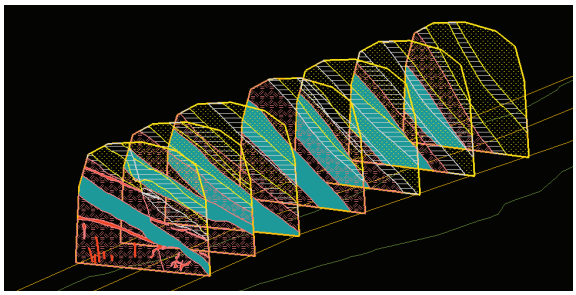
We hope you enjoy this issue and welcome your feedback.

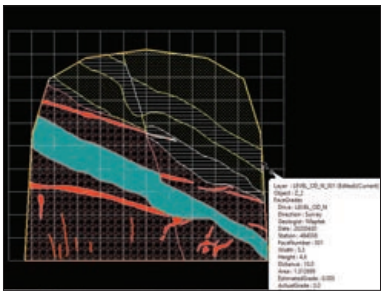
Eduardo Coloma
CEO

Contact us: forge@maptek.com

Digital mapping drives efficiency

Transforming a paper-based process into a digital workflow has reduced the time taken to complete underground mapping by two-thirds.





Newcrest Mining is the largest gold producer listed on the Australian Securities Exchange and one of the world's largest gold mining companies.

Newcrest's Telfer Mine is located in the Pilbara region of the Great Sandy Desert in Western Australia. Its annual production of some 450 koz gold and 15 kt copper comes from an extensive underground operation and two open pits.

A Maptek™ digital solution introduced to the site in late 2019 allows geologists to map underground faces directly into Maptek™ Vulcan™ in the field using a ruggedised tablet.

CAD lines and polygons can be drawn over georeferenced scan data or images to quickly and clearly illustrate the geology.

The Maptek tool automatically builds mutually exclusive polygons, allowing accurate polygon areas to be calculated. Auto-calculation of weighted face grades eliminates manual calculations using a planimeter and spreadsheets.

Attributes such as grades can be recorded, structure types captured, notes entered and measurements digitised and written back to corporate databases for use with other Vulcan tools, such as those for geotechnical analysis.

Users can adjust the face position (and associated sample line) after it has been mapped, to align with survey pickup data.

Victoria Peterson, Specialist Geologist – Geological Modelling for Newcrest Mining, explained that underground mapping was previously conducted either in the traditional pen and paper form, or retrospectively using georeferenced images in Vulcan.

'Both methods take considerable time to complete and are onerous in a dynamic production environment, which can impact the accuracy of the data captured,' Peterson said.

The new solution allows geologists to map all lithologies, mineralisation and structures observed as well as create sample lines across the mapping area. On returning to the office from underground, the mapping data is instantly uploaded into their geological database, along with the sample lines that are converted into drillholes.

At this point, all geologists in the team, including staff working in head office, can access the data for use in downstream processes such as 3D modelling.

The digital mapping solution reduces the time taken to map and process an area to around one-third of that using older methods.

'And because every feature mapped is flagged and stored in a database it is easy to filter the information. This is especially useful given the size and geological complexity of the deposit,' continued Peterson.

'Working with Maptek has been a pleasure; both parties understand and are driven to improve the processes and tasks essential to mine geologists. The solution is well thought out, easy to use and efficient,' she said.

The next step is to explore applying the digital mapping approach in the open pits at Telfer.

Maptek Technical Services Consultant, Daniel Owen has worked closely with Telfer on the development and implementation.

'One thing that we geologists all seem to have in common is a dislike of having to scan and digitise face maps in order to bring them into our 3D digital workspace,' Owen said.

'It's exciting to see this digital mapping approach in action. We can work with Telfer and other sites to create potential new avenues for greater efficiency using these tools.'

An upcoming face mapping feature will flag and export hanging wall and footwall data points for each domain. This will greatly enhance the workflow for incorporating mapping data in implicit modelling and machine learning.

Thanks to
Victoria Peterson
Specialist Geologist – Geological Modelling
Newcrest Mining

Closing the planned versus actuals gap

Digital twin models can increase the accuracy of orebody knowledge to close the gap between planned and actual operational performance.

Maptek™ and PETRA have leveraged their combined technology and expertise to enable effective, functional connection between the mine planning and modelling environment and advanced predictive models describing the execution and physical state of the mine equipment, plant and material.

PETRA's industry leading MAXTA digital twin models are well established as an optimisation solution. Their application at various functional stages within the mining value chain already delivers great results for customers.

At every stage, various geological, geochemical or metallurgical factors combine, often in non-intuitive ways, to impact on mining processes. MAXTA uses the huge resource of historic mine performance data to learn the relationships between these factors and then create simulations and predictions about future performance.

MAXTA is able to make fast, accurate predictions block by block for an entire orebody about how the downstream value chain processes will behave for various geologies. This is a quantum leap in the value of orebody knowledge – a geological model that contains information about how your plant will behave with that particular ore!

MAXTA can be automated to update and retrain as new data becomes available, making it the world's first live digital twin for mining operations.

For example, the regular addition of blasthole sample data to geological or geochemical data allows MAXTA to develop more accurate and detailed models.

Integration with Maptek™ Vulcan™ means this data can be applied in conventional mine planning and scheduling systems. Miners can then plan not only for certain objectives and constraints within the mine, but across the entire value chain, including consideration for optimised plant performance and product.

Drill and blast design can be conducted with consideration for optimal plant throughput and mill energy use. Grade control and stockpile blend planning can be done with understanding of beneficiation plant recovery performance as a function of variance in the blend.

> A holistic view of optimised mine performance can now be generated – the plant and the mine can be managed as one system.

Plant setpoints can be adjusted with knowledge about the ore being mined and how it is expected to impact plant recovery. Decisions and compromises about grades, recovery, tonnes and timing can be made within the context of understanding plant throughput and metal recovery.

Mine planning and scheduling can confidently target specific products at the mine gate, or for delivery to customer order.

With Maptek Evolution customers get an advanced planning system allowing optimisation of mining schedules and plans across all time horizons, from life-of-mine to in-shift tasks. The simple graphical interface makes the functionality accessible for daily use by planning engineers.

Behind the scenes a powerful optimisation engine allows engineers to consider every stage of mining and optimise at multiple time horizons to best meet mine performance targets.

The Evolution-MAXTA combination allows new possibilities to emerge. For each possible future mining scenario, considering each block of ore and the many constraints and processes and objectives for the operation, MAXTA informs Evolution about the dig rates, behaviour of the plant and processes for the specific rock and blending and tonnes being considered in the plan.

Evolution will consider that unique scenario and evaluate others with the benefit of direct connection to the MAXTA digital twin of the plant. In this way, a holistic simulation is created of the future of the mine.

As more data about the orebody is collected, the MAXTA models can be updated and the schedule refined or adjusted. As business priorities change, future scenarios around plant setpoints and configuration can be evaluated with more confidence.

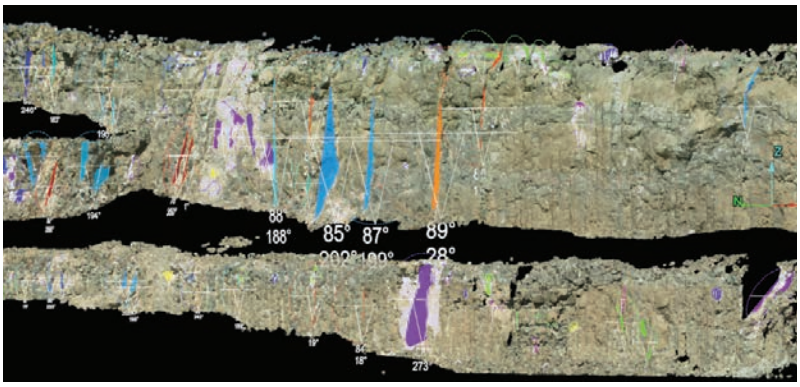
The day to day function of mine technical disciplines has evolved incredibly in the past 10 to 15 years. We are about to see the next shift in how mines operate – geologists, planning engineers and plant operators all working together in a common environment and across a shared understanding of the data, with the objectives and the variables able to be moved to best meet the objectives of the business.

Thanks to
Peter Johnson, Chairman, Maptek
Dr Penny Stewart, Principal and Managing Director, PETRA

Slope stability risk management

Maptek™ laser scanner technology is ideal for volumetric survey, geological and geotechnical data analysis, and tactical and strategic slope deformation monitoring.

Fixed point monitoring station



Automatically mapped basalt face, different colours depicting joint sets

Letšeng Diamond Mine is an open pit mine in the north of the Kingdom of Lesotho. At 3100 m above sea level, it is one of the highest altitude diamond mines in the world, and is famous for the production of large, top quality diamonds.

Two kimberlite pipes bearing low-grade ore are currently being mined as consecutive pushbacks via conventional mining methods.

Safety is very important to the operation and Letšeng is keen to embrace technical innovation to ensure timely and accurate detection of unstable slopes.

A Maptek™ XR3 laser scanner is used to acquire point cloud data for geotechnical analysis, volumetric calculations and rockfall assessment. Compared with traditional methods laser scanning provides direct, detailed 3D geometric mapping, quick and accurate measurements and significantly faster data processing, as well as cost reductions.

Letšeng Geotechnical Manager, Nkopane Lefu commented that the system was very user friendly and that Maptek staff provided responsive support. 'Working with Maptek is a good experience.'

Geotechnical data analysis

The 3D technology can deliver the detailed and dense data required for geotechnical analysis, creating a high resolution point cloud over large areas in several minutes.

Laser scanning has improved the mapping database because now all areas including inaccessible and unsafe areas can be covered. Discontinuity properties including orientation, spacing, surface roughness and persistence can be determined remotely and accurately over long distances.

The scans are imported into Maptek™ PointStudio™ software for analysis. Scans can all be georeferenced at the same time, and after filtering of trucks, vegetation, snow or dust, a complex 3D surface is created for geotechnical mapping.

Various methods for extracting discontinuity data are used, including automated techniques that examine orientation trends and a semi-automated method that depends on user structural interpretations of specific features.

Manual point cloud analysis gives the geotechnical engineer the same control as in the field, with the benefit of unrestricted data coverage.

On the other hand, the automated method is quick, uses more detailed data and reduces the potential bias of the geotechnical engineer. Every visible joint plane is assessed and characterised.

The orientations of the geological defects are then plotted on the stereonet to analyse and determine discontinuity orientations and major joint sets. The data can also be exported as a csv file into rock mass analysis software.

PointStudio geotechnical tools allow for accurate measurement of surface roughness. The selected surface is divided into grids depending on the user preference. The results are then used to determine the joint roughness coefficient (JRC).

Data from one Letšeng pit was used for kinematic analysis to determine possible modes of failure, by analysing the relationship between the major joint sets/planes of individual joints, the slope and the basic friction angle.

The results indicated that possible localised failures are restricted to bench scale and inter-ramp failure is not likely. The data can be used in limit equilibrium and numerical modelling packages for detailed slope stability analysis.

Mapping of blast blocks is vital for blast design to minimise highwall damage and to achieve controlled and desired fragmentation.

At Letšeng, highwall control is of high priority because of the recently implemented steep slope. Every trim block is mapped and geological information is analysed for geological defects and rock mass strength. PointStudio can extrapolate joints throughout the trim blocks to predict blast integrity.

Slope monitoring

Open pit mining best practice calls for timely detection of potential rock slope instabilities and effective management of identified instabilities, making both strategic and tactical slope monitoring an integral part of any mine program.

Letšeng deploys prisms for long-term deformation monitoring, radar in critical areas for tactical monitoring, and the Maptek XR3 laser scanner for hazard identification, strategic and tactical monitoring.

The scanner is used for both periodic and continuous slope monitoring. Scans must be taken from a fixed point for periodic monitoring, so beacons are constructed strategically around the pits. Scans are imported into Maptek Sentry office software for data processing and analysis.

Continuous monitoring is conducted using Sentry field software hosted in the Sentry DMS system in a deployable trailer.

The DMS comprises a Maptek XR3 laser scanner, built-in tripod, solar panels, weather station, standby generator and Wi-Fi antenna mast for communications. Scans are downloaded automatically into the built-in computer for processing.

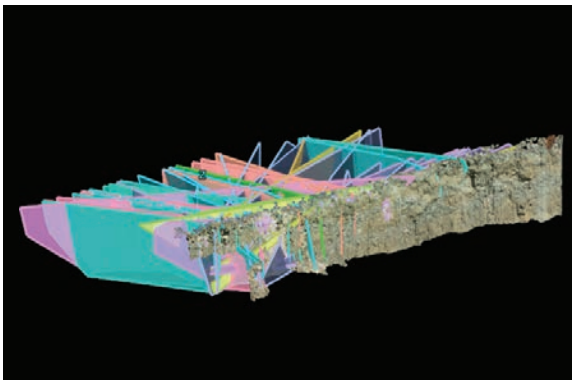
Output data includes displacement, velocity, moisture intensity and inverse velocity time graphs. The behaviour of each graph can be related to environmental factors such as rainfall, wind direction and intensity. Trigger alarms can be set and notifications sent through local mine networks.

Benches are the fundamental building blocks of the pit slope and their geometry and behaviour often controls the inter-ramp and hence the slope design. Letšeng has implemented rigorous quality control and quality assurance on the highwalls to ensure that the required catchment is achieved.

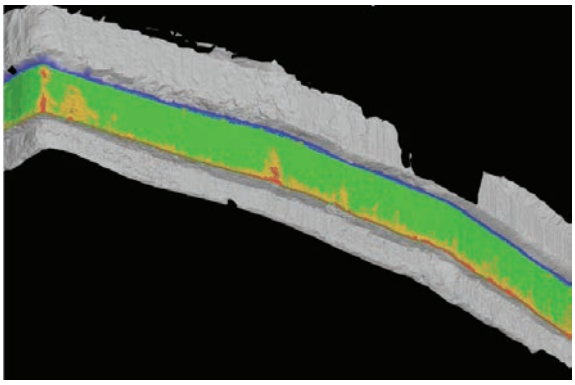
The 3D point cloud data is used to compare the actual slope to design, which quantifies the frozen toes as well as crest damage. Crest compliance is calculated by comparing actual and design crestline, while toes are determined by comparing the actual bench face with design. Intensive rock barring is performed on the crest above where it has been compromised beyond an allowable 10 m.

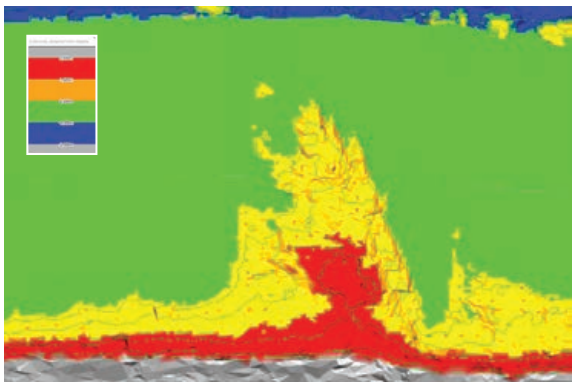
Overall slope compliance is assessed in PointStudio where cross-sections of the actual slope are overlain on the designed slope.

Since acquiring the Maptek XR3 laser scanner geotechnical engineers at Letšeng can collect significantly larger datasets more safely. The smart PointStudio geotechnical tools are used to characterise geological defects and determine possible failure modes.



Mapped face and extrapolated joints





Frozen toe depicted by yellow and red colours

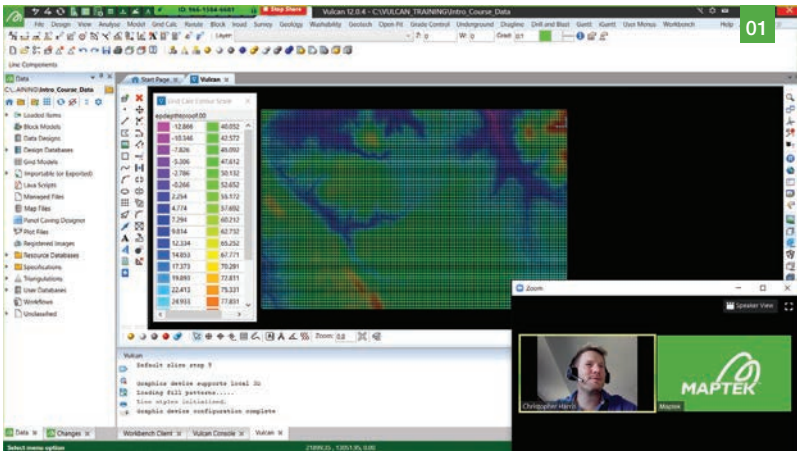
Sentry technology handles slope deformation monitoring as well as mining compliance measurements.

Management can now make more informed safety-related decisions based on slope behaviour.

Thanks to Nkopane Lefu
Geotechnical Manager
Letšeng Diamond Mine

Training that meets your needs

Maptek™ offers a range of flexible training options that can be accessed from the convenience of your site or office to fit in with your daily operational workflow.



Remote Vulcan training

Remote individual training interweaves practical learning sessions within an everyday working environment.

Maptek™ provides online support and training to ensure customers are up to speed with our solutions and are able to work as effectively as possible. Sessions can be hosted on platforms such as Zoom where our experts deliver one-on-one and group training and support.

Chris Harris is a Brisbane-based Thiess Civil Engineer specialising in drainage. While working from home, he completed an *Introduction to Vulcan* course through a series of online sessions with a Maptek Technical Services instructor.

'The training's been fantastic, I've absolutely loved it,' said Harris. 'It's one-on-one so I get an expert all to myself.'

Harris, whose role includes the planning, design and construction of water management infrastructure as well as civil road and pad design, said it had opened his eyes to more Vulcan applications.

'I don't use Vulcan all day every day so I'll often be guessing what's the best way to do something, or if it's possible with Vulcan.'

> 'I realised there's a lot of efficiency gains I can make as well. Some of the ways I was doing things weren't incorrect, they were just slow and inefficient.'

The training approach suited Harris' circumstances perfectly as he was able to apply and reinforce his knowledge as he learnt.

'The short training stints worked really well around work. I'm doing several other tasks in the background. Learning this way has worked better for me than being in a classroom, following along doing all the steps.'

'I have to bring a lot of project data back into Vulcan before each lesson so I've become used to quickly setting up a workspace and honing those rudimentary skills that can take extra time when you're not accustomed to a software package.'

A key benefit of remote training for customers is that it can be delivered around other commitments.

Classroom training may take them away from important work tasks for too long. Remote training allows shorter sessions to be scheduled around these pressing deliverables.

Customers can be confident that their training needs will be met, and that Maptek Technical Services teams are ready to help.

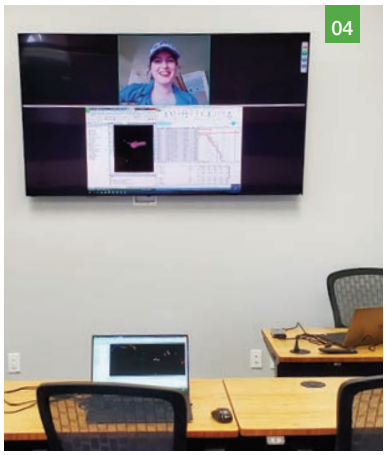
Virtual classroom training

More than 500 Shandong Gold staff from 30 operations in China recently completed web-based *Introduction to Vulcan* training led by Chinese instructors.

The Maptek™ training was delivered across a fortnight in April by reseller Pioneering Inc., with the cohort divided into two groups, each receiving a week of training.

Pioneering trainer Murphy Fu said the training had been well received by the 512 participants from 23 mines, three exploration companies and four head offices.

01 Remote one-on-one training for Thiess
02 Vulcan training at Shandong Gold
03 Virtual classroom training at Shandong Gold
04 Remote individual training setup



'The aim to quickly become familiar with Vulcan was fulfilled and the customers were pleased with the outcomes.'

Software licences were granted through Maptek Account which provides flexible online licensing and convenient, secure options for offline use. Having a Chinese language version of Vulcan facilitated fast take-up of the new software skills.

Several local Pioneering technical service team members acted as online support for the trainees while the primary presenters delivered the course. Pioneering appreciated that Maptek Australia staff were on hand to offer their technical expertise.

Feedback from the training will help guide Maptek development and improvements to the software.

Online Training courses

It is not always convenient or cost-effective to travel off-site to attend courses. The Maptek Online Training platform provides self-paced learning via pre-recorded videos.

Videos are short and easily fit into busy schedules. Additional exercises using training data are included to reinforce the learning and gain confidence in applying the new skills.

Online Training gives companies the opportunity to easily assess and meet training needs and ongoing professional development. Learners can download course certificates upon completion of a final exam, or choose to post achievements to LinkedIn.

Online Training courses are available for up to six months, providing time to review video content while applying new skills, in conjunction with live training, during implementation procedures, or while learning new workflows.

'Our new geologists and engineers quickly become familiar with basic concepts in modelling and mine design. We can also scope training needs for various professional teams – both short and long term.'

Remote implementations

When sites upgrade processes or software, Maptek can customise the implementation procedure to your needs.

Online Training courses allow site personnel control over the timing and pace of preparation for new software and processes. Learning about new functionality early on allows site personnel to better collaborate with Maptek to develop the most effective new workflows. Meaningful conversations at this stage streamline the implementation and change management process.

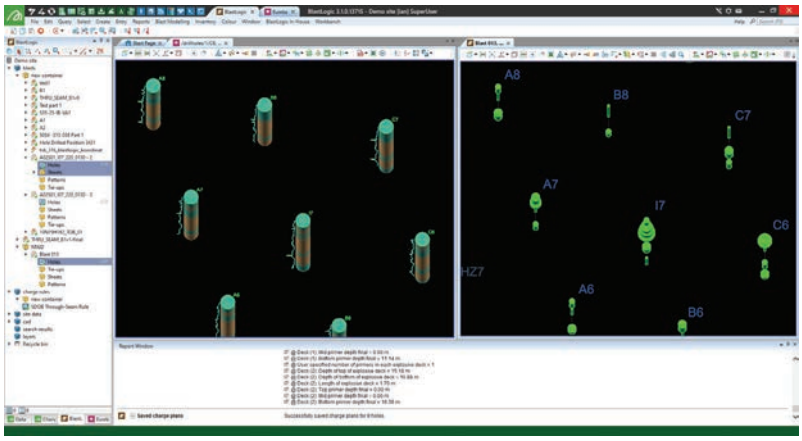
After site personnel learn the basics, Maptek instructors can customise training with site data to focus on specific processes.

Custom courses can occur in person or in a remote setting utilising platforms such as Zoom or GoToTraining. Shorter sessions can be selected to better balance implementation training with production needs.

In this way, implementation and production work can continue side-by-side without interruption.

Measurement while drilling data

Advances to interoperability between Maptek™ BlastLogic™ and Maptek™ Eureka will help operations improve geological modelling and their drill & blast outcomes.



Despite widespread industry interest in using Measurement While Drilling (MWD) data to improve mine operations, few systems have proven to be capable of interpreting this data so that it can be used in drill & blast in a standardised and repeatable fashion.

At the heart of this is the fact MWD data is susceptible to variability due to geology, sensor and equipment calibration, and operator influence.

Upcoming releases of blast design solution Maptek™ BlastLogic™ and interpretation platform Maptek™ Eureka will help customers bring their downhole drilling data to life.

'One issue is that the raw MWD data from the drill navigation systems hasn't been validated – exceptions or anomalies to the data can be missed,' Maptek Group Product Manager, Mine Operations, Mark Roberts said.

From inception BlastLogic has provided a direct interface to drill navigation data and a function to validate and associate the as-drilled information to design holes.

While Maptek has led the way in this capability, the nature of the data collection has left a gap which prevents the full picture being seen.

'About 30% of data doesn't match – ad hoc or unplanned holes, re-drills, missing information that makes as-drilled data more difficult to match to a design hole, or the hole is too far out of tolerance to be linked to a design,' Roberts said.

'Using the as-drilled data has traditionally been a secondary thought. BlastLogic raises the profile of that as-drilled data and references it to perform a reconciliation to how well the drilling matches design.'

Streamlining the process for passing the data between BlastLogic and Eureka has strengthened this functionality.

Eureka provides a standard repeatable way to visualise drillhole geophysical data and automatically assigns lithology boundaries based on changes in the drillhole geophysical properties, quickly identifying different bands.

Intervals are created in BlastLogic from the resource model and passed to Eureka with the MWD data. Eureka interprets and updates the intervals.

'It's an automated tool so the data processing can happen fast, whereas if you had to do it manually it could take days,' Roberts said.

This is important in the dynamic mining environment where holes are loaded within hours of drilling.

Validated data is brought back into BlastLogic and the charge plan and timing design can be automatically updated using the most up-to-date geology.

Matching blast design to validated geology allows more accurate charge placement, which provides more even fragmentation.

> Safety is improved – risks from overcharging, fly rock and overpressure, and potential dilution of materials can be mitigated through better knowledge of the geology.

'You can ensure you've got the right amount of charge exactly where you need it,' Roberts said.

'MWD data is noisy by nature and a lot of factors impact its usability. Maptek tools and the compatibility between them give geologists and engineers a chance to quickly generate the most complete and up to the minute picture possible.'

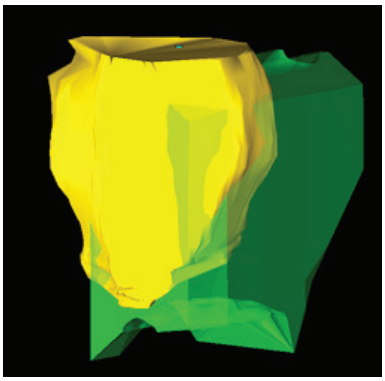
'While there's automation to increase speed, there's still the capacity for geologists to see the correlations to the resource model and further refine or correct the data association.'

Roberts is excited about the potential to use MWD data with Maptek DomainMCF, which uses machine learning to rapidly generate block models directly from grade control drilling data.

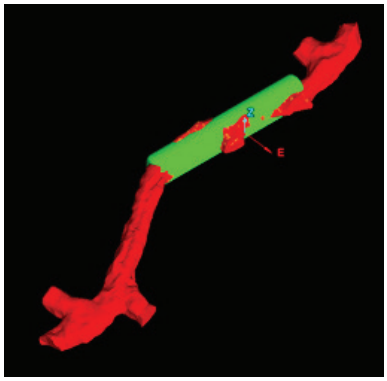
Similar benefits could be realised for BlastLogic. Fast cloud processing provides the ability to run many scenarios on the same data and gain a high confidence level in the results.

Safety and agility for mine development

Maptek™ laser scanning is promoting agility and adherence to mine planning at Mineração Caraíba SA.



Reconciliation of the final stope in PointStudio



Reconciliation of the completed gallery in PointStudio

Mineração Caraíba SA is an underground copper producer which has been operating for more than 40 years in Brazil.

Located in the north of Bahia State, its activities began in 1979 under the name Caraíba Metais, 105 years after the discovery of copper reserves in the region.

Mineração Caraíba SA was acquired by Erro Copper Corporation and in 2019 reached a record production of around 40,000 tons of copper concentrate. An increase to 43,000 tons of concentrate is expected for 2020, combining the production of the Pilar and Vermelhos mines.

Before implementation of Maptek™ laser scanner technology, Mineração Caraíba SA used total station survey equipment. Performance was well below that needed for efficient survey, taking into account the size and demands of the various mine sectors.

Delivery of results was slow and work focused on the measurement of mining advances and stockpile volumes, where safety was compromised by the need for employees to access areas of risk.

In 2012, the company acquired its first laser scanner, the Maptek™ 4400. Its efficiency was proven from the start, with fast and accurate delivery of field results from the more than 150 km of existing galleries across the mine.

The time saved was converted into analysis and interpretation of data collected in the field.

Another important factor was the increase of safety in the field, allowing remote survey of places that represent risk to employees.

In 2019, a new Maptek™ SR3 laser scanner with in-built camera was acquired. This dedicated underground technology helps to capture information from the various sectors of the mine, down to more than 900 m.

Maptek™ PointStudio™ software contributes to the reconciliation of mining faces, mine operations, stockpile survey and geological and geotechnical studies.

> The equipment is effectively in 24-hour use across the site.

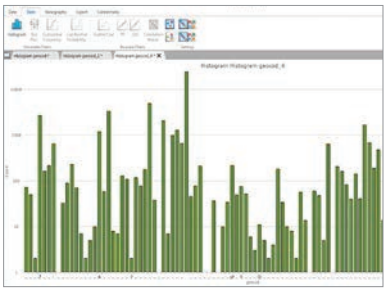
In addition to incorporating modern systems, the Maptek SR3 scanner brought more agility to field activities. Lower weight and size contribute to easier transport along the galleries and accesses, increasing productivity.

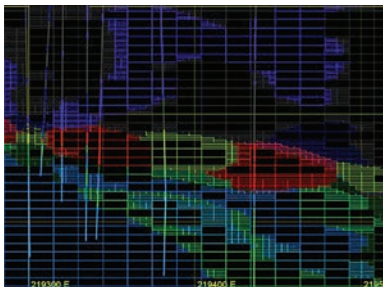
The SR3 laser scanner data processed in PointStudio software brings a closer match to reality. This allows accurate planning of mining operations, reducing expensive equipment costs, increasing the recovery of ore during extraction, reducing explosives costs and optimising the fleet.

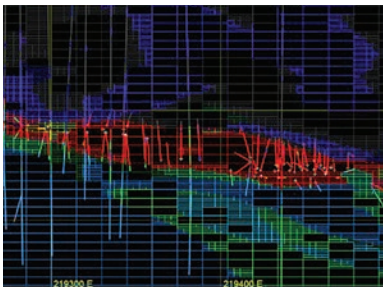
Thanks to Mineração Caraíba SA

Accurate domain modelling

Making the most of machine learning for rapid creation of accurate models requires attention to data preparation, validation and management.







Machine learning algorithms can quickly analyse big, dense and complex data way beyond human capabilities. But algorithms aren't wired to understand nuance or shorthand and make assumptions in the way people can.

Maptek™ DomainMCF uses machine learning to generate domain boundaries directly from drillhole sample data for rapid creation of resource models.

For decades, solutions such as Maptek™ Vulcan™ have given operations the tools to work with accurate, validated mining data. Steve Sullivan, who recently celebrated 25 years with Maptek, has been helping customers understand their geological data throughout that period.

Sullivan is part of the team behind the creation of DomainMCF and has tested it against more than 100 different deposits, covering historical datasets, operating mines and exploration projects.

Sullivan said the results had proven DomainMCF's ability to build accurate models in a fraction of the time of traditional methods but reiterated the importance of proper data preparation, validation and management.

'It's a slightly different way of thinking,' he said. 'When we work with other humans, we make decisions as we go.'

'For example, when geologists see NL in a database they know, or infer that it means not logged – they can dismiss the information and move on. But a machine doesn't know that – it may 'think' NL is a mineral or attribute code and does not know to ignore it.

'With machine learning we still need to teach the machines how to learn and give them context. When setting up a project for machine learning our decisions need to be taken beforehand to give the machine the best chance of identifying a meaningful answer.'

'Our data needs to be squeaky clean. This can be challenging. Mines often have FIFO workers who use subtly different logging styles and may see different things as important, for example, vein percentage versus alteration assemblage.'

Processing the information is about setting up standards and applying them, Sullivan said.

> 'The raw data doesn't change, people's interpretations of the data change.'

'As every orebody is different, a separate set of standards must be tailored for each deposit. These standards are based on a series of logical steps. If a certain condition is met, then this is the correct action to resolve the issue.'

Database manipulation can be performed manually, each step at a time, or alternatively the standards can be applied through a series of processes or scripts. The advantage of the latter is that an audit trail is kept for reporting. Processes can be set up and run as a sequenced standardised workflow for repeatability.

'This sets up the opportunity to leverage machine learning operations, enabling data science and IT teams to collaborate and increase the pace of model development and deployment.'

'What at first may seem like an arduous task of preparing the data and standards is a valuable time investment as it unlocks the true power of DomainMCF,' he said.

With machine learning, instead of modelling a resource deposit once a year or every six months, users can generate a model every day as the incremental data comes in, because all the standards are there and ready to go.

This is no longer a static model of an operation, it is a live, dynamic model where engineers and geologists are making decisions using the latest data.

The importance of being able to make decisions based on current information is evident when the metals prices are erratic, as they are right now.

Automated Pit Designer

Vulcan 2020 sees the release of the latest iteration of the Automated Pit Designer tool.

Maptek™ Vulcan™ Automated Pit Designer (APD) is an open pit mine design tool that allows mine planners to rapidly iterate between designs based on output from pit optimisation runs along with dynamic manipulations including haulage ramps.

Major enhancements to APD include the addition of dump design functionality, ramp insertion and the ability to dynamically modify the pit. The user interface now provides a more intuitive design experience.

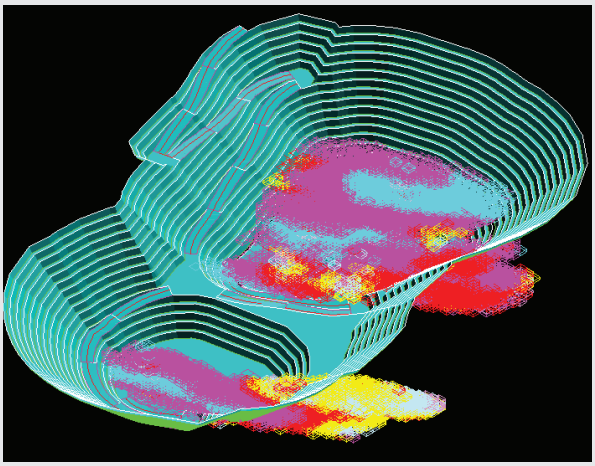
The addition of ramps and dynamic pit editing provides users with a full function design tool that takes the results from their pit optimisation run or previous design iterations and generates an updated design.

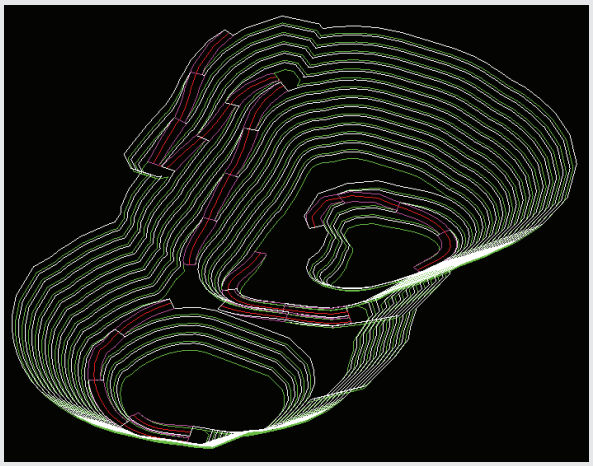
Traditionally, when engineers need to design pits with single or multiple ramps, the iterative process can take extended amounts of time and effort. If the desired results are not achieved, then the process must start again.

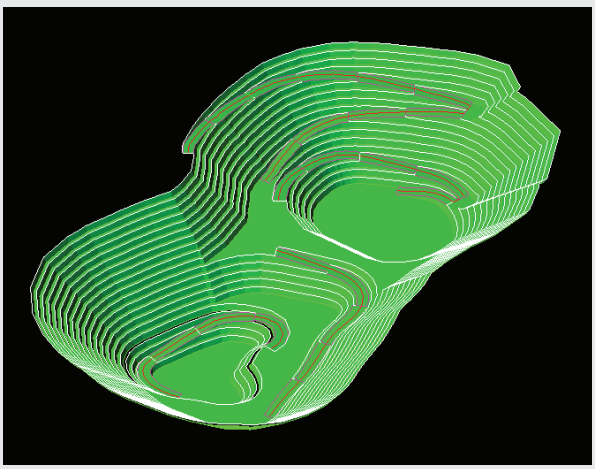
APD decreases that turnaround time dramatically, allowing users to quickly make changes to ramp and wall locations so that the most desirable solution is identified in a short time. This in turn reduces the overall time to proceed from pit optimisation to a final design, facilitating long term mine planning analysis.

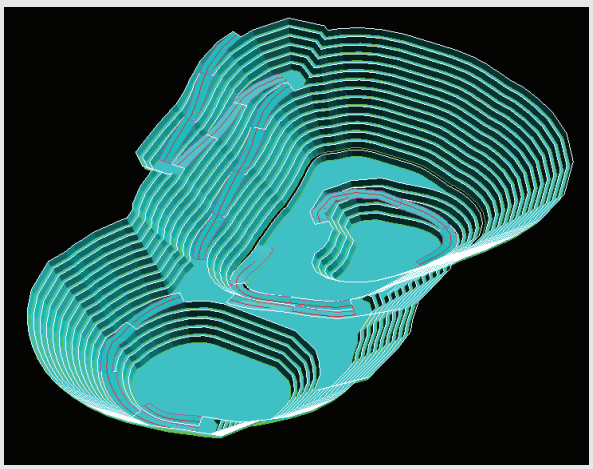
Increased productivity for engineers means they can devote more time to evaluating different scenarios. This results in a faster feedback loop throughout the design process and delivers quicker updates to the scheduling solutions.

These enhancements represent the springboard for automating the design process. Future development plans include optimised ramp solutions as well as streamlined workflows throughout the mine planning cycle.









Core technology futures

The software and systems which underpin the Maptek™ product suite enable efficient interoperability between high-performance software solutions.

Group Product Manager, Jeremy Butler leads the Maptek™ Core Technology development team. On the back of the launch of application extension toolkit Maptek Extend, one of the projects he has been driving, Butler shares his vision and expectations.

What informs your strategy?

Our vision and strategy provides necessary frameworks, integrations and shared technology components for Maptek products to interoperate, look, act and feel similar while preparing for transition to adopt new technologies and paradigms.

We're identifying and taking action to expand our horizons and extend what customers can achieve with Maptek technology, beyond end-user products.

What trends are you seeing?

Customers everywhere are trying to solve novel problems themselves. Different approaches include citizen-developers (writing scripts, internal applications, designing workflows or standardising processes), integrating disparate solutions, engaging with consultants and third-party providers as well as employing data scientists and developers.

I focus on how Maptek can provide solutions and technology for those customers who are pursuing greater optimisation and automation objectives.

Where a Maptek product group tackles specific problems, the Core Technology team aims to help by design of distributed data models and systems, cloud computing frameworks, integrations, workflow orchestration technology, APIs/SDKs and pathways for our solutions to assist with customers' digital transformation agendas.

It may sound like we're setting our customers up to compete with us in software development, but these avenues help drive customer success in alternative ways that also support integration and solve niche problems requiring higher levels of agility or aren't well suited to productisation.

What are you focusing on?

Automation: High on everyone's agenda, whether for machinery, decision making, software or data.

Citizen-developers and low-code development: Enabling technologies and simplified integration pathways can give everyday users far greater control over automation pipelines and empowerment in delivering operational efficiencies.

Transparent, performant and distributed data technology: Many organisations would like digital twins that cover every imaginable scenario. While no single solution caters for this, it's more achievable with several integratable solutions configured to suit a set of needs. To adequately solve mining industry problems and edge computing requirements – until high-speed internet becomes universal across the globe – some solutions will need to work in a distributed environment to cater for hybrid cloud/site scenarios and be fault tolerant against internet and network connectivity variability.

Distributed computing: We no longer have to rely on our main desktop or laptop to do all the processing work or even need a high performing machine to get as much done. Instead, using distributed computing technologies and supporting infrastructure allows us to spread work across many real or virtual machines. We can also test hypotheses, get more done in the same time frame and string together operations in an automated way.

Maptek already has products that embrace these spaces and will continue to exploit them. An industry wide appetite for artificial intelligence and machine learning applications is also being explored through Maptek DomainMCF and our strategic partnership with PETRA.

How do you keep up?

It can be challenging at times. I read a lot, keep up with industry groups, get involved with RFQs and RFIs, monitor hundreds of support cases and talk with people. I am also a user of our products, allowing me to keep track of how they're going and maintain a level of expertise.

How do you balance customer requests with blue sky thinking?

Core Technology differs from other Maptek product/solution groups. We aim to deliver enabling technology rather than a final end-user solution to a specific problem. The flow of customer requests can be direct and indirect depending on the software context.

There's a delicate balance between maintaining existing products, providing technological pathways forward for them and enabling entirely new products to emerge.

How much creative space do the development teams have?

Maptek has plenty of experience with developments that start with a degree of uncertainty and require creativity and discovery. This is my preferred pathway as it allows an idea to grow into fulfilling a need more naturally. What you need may end up different to what you think you need.

Maptek Extend establishes the groundwork for access to a more robust and comprehensive application extension toolkit. This enables customers to expand the capabilities of Maptek software.

University partnerships

Maptek™ supports universities, helping equip students for future mining careers.

In January 2020, professional practice and training courses were offered in Viña del Mar, Chile at no cost to students.

Claudia Monreal, Geostatistical Mining Engineer and Trainer, told us that Maptek™ intern programs have been a great success among the major Chilean universities.

The course covering Maptek tools and applied mining examples is very popular and 200 students apply every year. The 40 who are selected to participate are evaluated every week and cannot continue the intern program if they fall below a 75% grade.

'We provide expert tuition and software experience hoping for future skilful users and to raise their employability in a very competitive market,' said Monreal.

Homero González, Post-sales Mining Engineer and Trainer, said: 'This was my first time leading the course, and it was totally enriching. It is not easy to train 22 participants in the theory and software and also pass on the knowledge gained from field experience. Students in their final years before facing the working world have many queries and concerns of different kinds.'

The four-week course ran from Monday to Friday and started with basic Vulcan™. Several students had Vulcan knowledge through the Maptek agreement with universities, however it helped them to learn even more and resolve some important fundamental questions.

In the second week students were keen to learn about Open Pit Mine Design and Optimisation and analyse mine planning issues.

The third week's training in Underground Mine Design resulted in great student projects, which impressed González and his Maptek colleagues.

Claudia Monreal taught Resource Estimation in the final week. The students were very grateful for this opportunity to learn from an acknowledged expert in the subject.

González concluded that the challenge to train the 'next generation' is taken with great responsibility. 'We need to adapt how we use the software in this new era that we are experiencing.'

Participating students from universities across Chile: Universidad Católica del Norte, Universidad Santo Tomás (Viña del Mar and Santiago), Pontificia Universidad Católica de Valparaíso, Universidad San Sebastián, Universidad de Talca, Universidad Andrés Bello

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