DATA+AI SUMMIT
BY databricks

Simplifying Migrations to Lakehouse

Perenti Group

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Databricks
2023

Current Data Landscape

African Underground Mining Services
AMS
Ausdrill
Barminco
BTP
idoba
Logistics Direct
Supply Direct

60 Global Projects

10 Countries throughout four continents

70 Site Locations

24/7 Continuous Operations

9,000+

Employees worldwide

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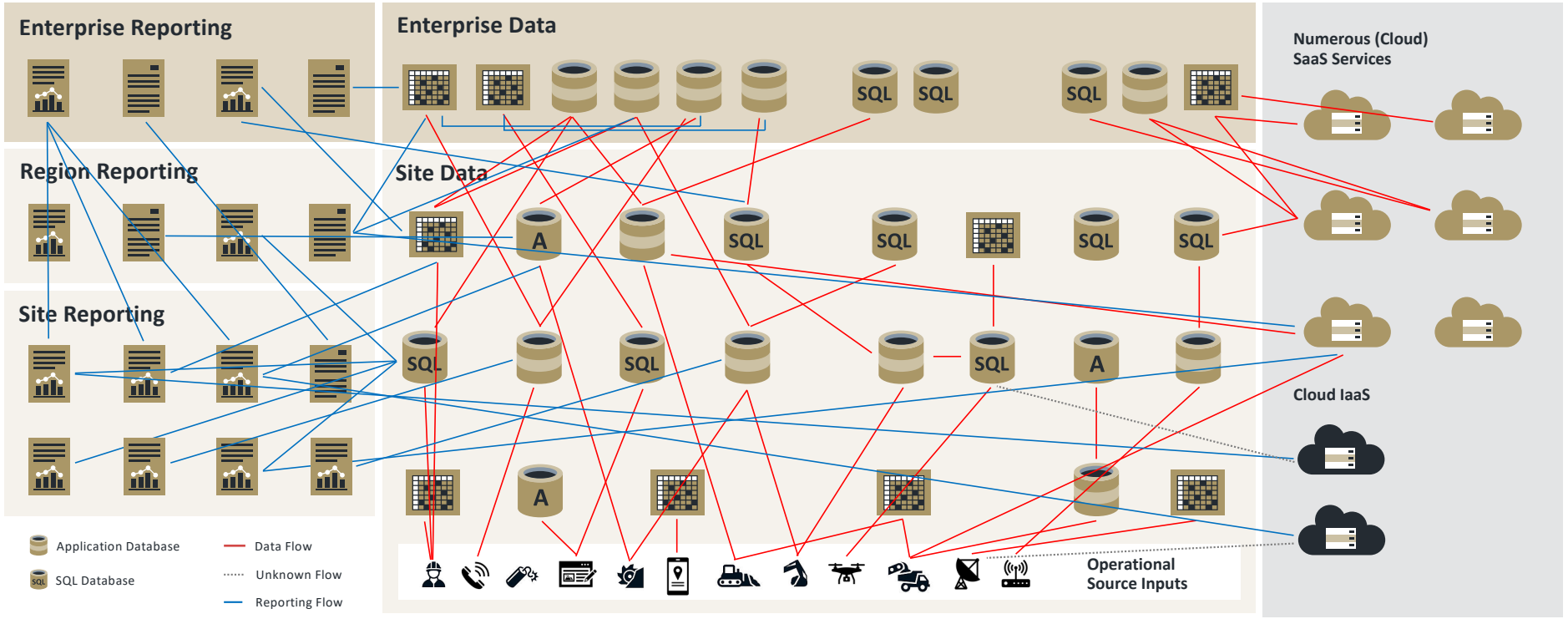
Indicative Data Creation, Store & Flow

Current State | One Site



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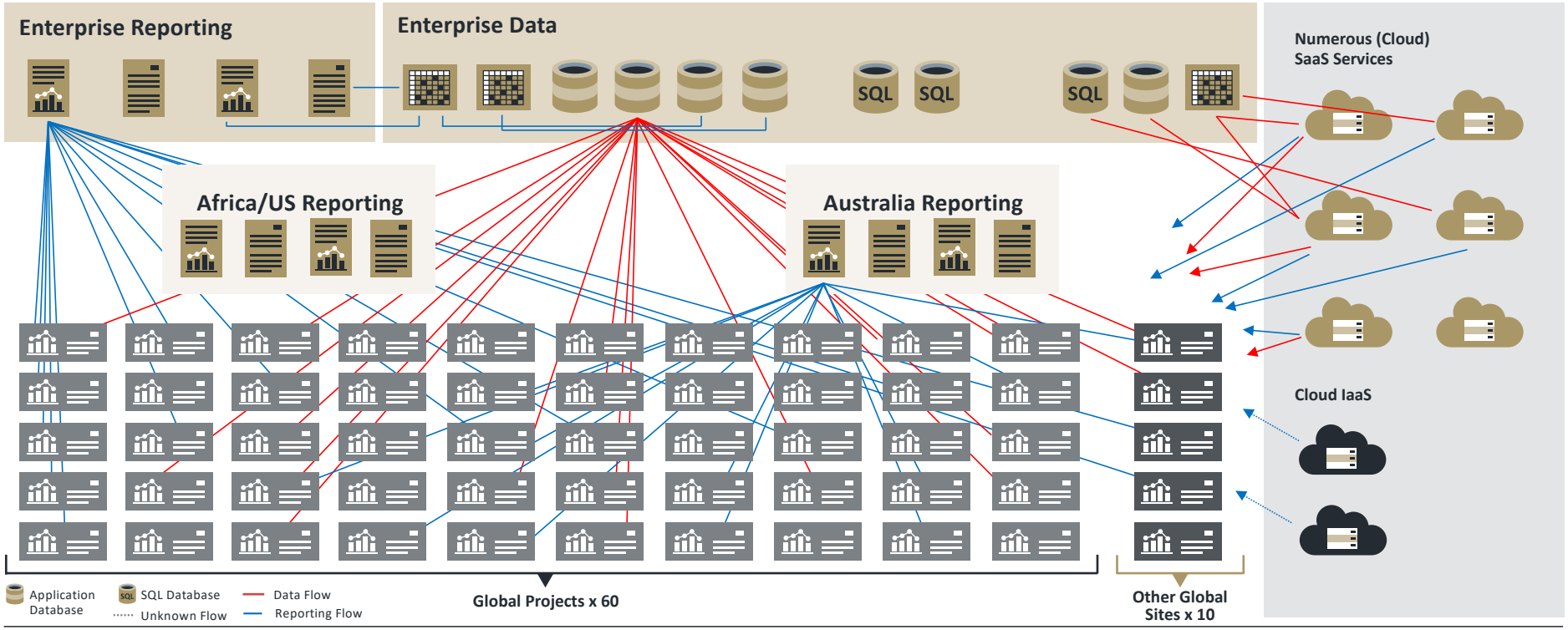
Indicative 2 x Reports & 1 x Data Flow

Current State | Compounded Globally



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Governance

Structured

Reference Data

Defines the context for recording any Transactional data or Unstructured data

Supporting reference data, used in **one** process and system.

Master Data*

Critical/Core reference data, shared amongst **multiple** processes and systems

People, Physical Things, Places, Non-Physical Things

Object	Object Relationship	Object	Object Relationship
Examples: Risk Type, Hazard Type, Issue Status.	**Examples:** Risk Type Hierarchy, Hazard Type Hierarchy, Address-Suburb/Postcode.	**Examples:** Vendors, Personnel, Tags, Work Breakdown, Sites, Drill Holes, Permits/Licence.	**Examples:** Organisational Hierarchies, Site Location Hierarchies, Site Location Hierarchy, Pit Location Hierarchy, Site/Pit/Stope relationship.

Transactional

Business activity/event data that supports business process which is captured in a specific state, at a specific time and requires reference data for context.

Examples: Invoice payment data which requires vendor master data and account non-master data.

Unstructured

Data that does not have a predefined structure. Unstructured objects requires cataloguing against references data for context and ease of search. Includes semi-structured, structured non-relational data.

Examples: Documents, Spreadsheets, Reports, Models.

* Depending on complexity, integration and business criticality the governance level increases.

Gold denotes areas of focus

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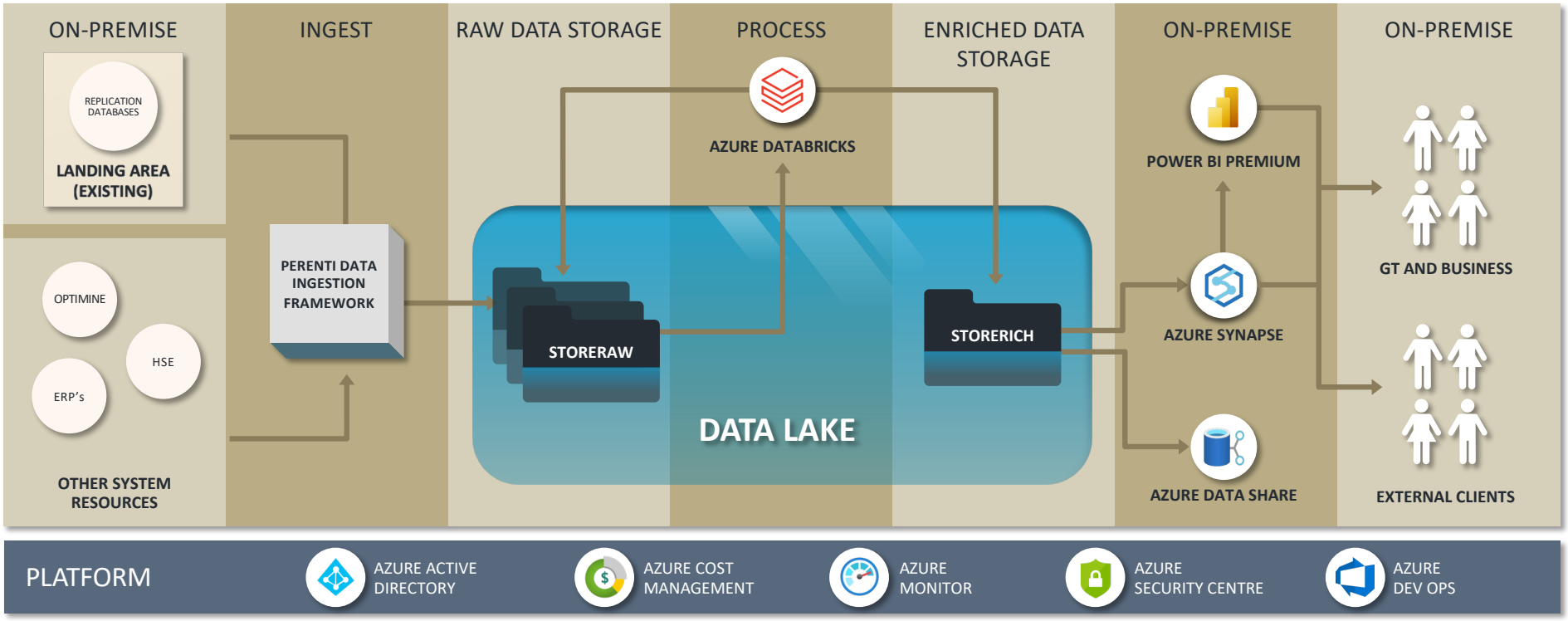
Technical Landscape | PACE Architecture



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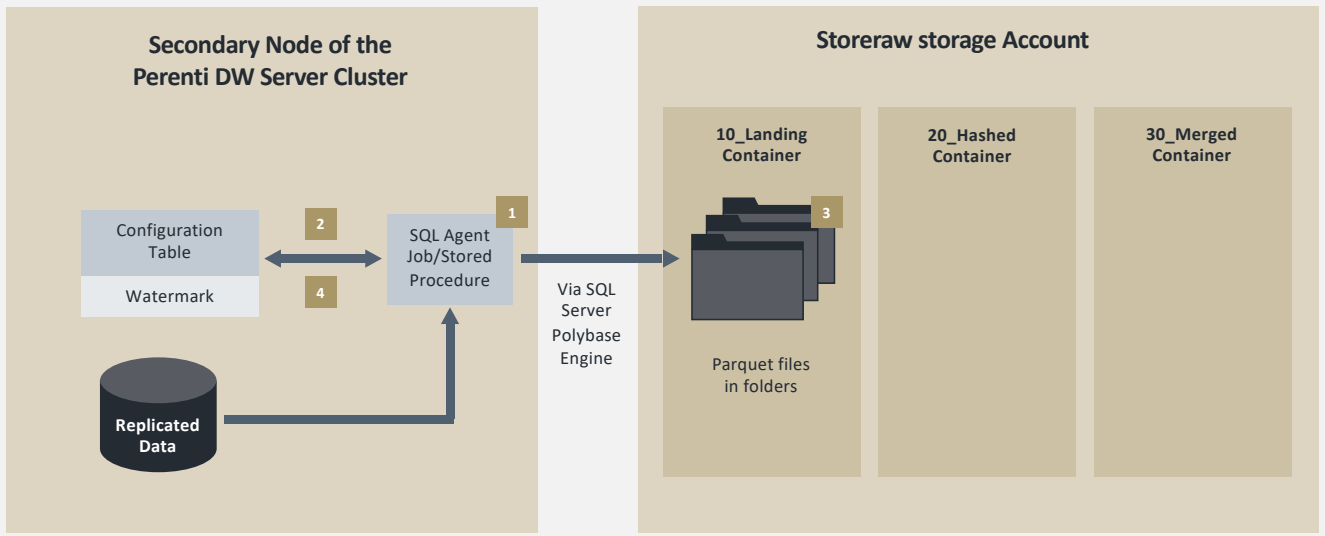
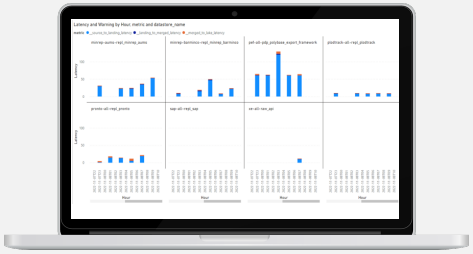
Standardisation on Ingestion

Architecture of Ingestion Patterns



Speed of data flow



Accuracy of data flow

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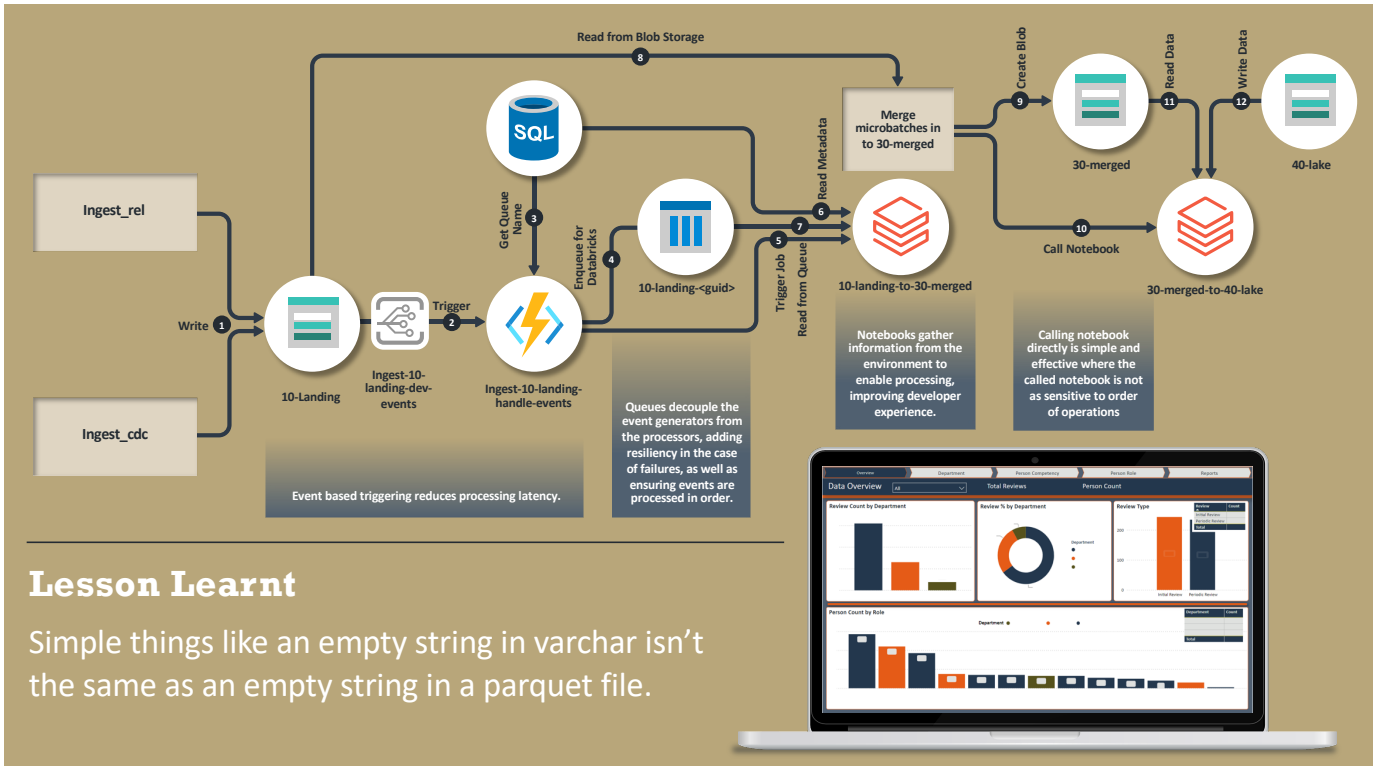
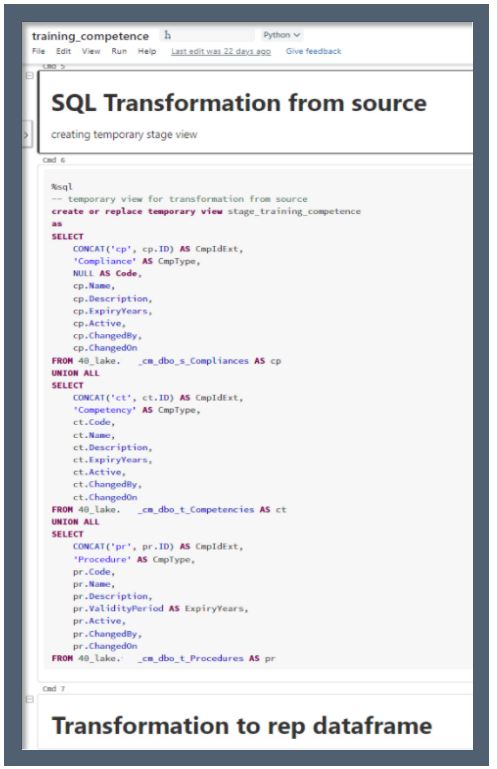
Standardisation on Processing the Lakehouse



Lesson Learnt

Simple things like an empty string in varchar isn't the same as an empty string in a parquet file.



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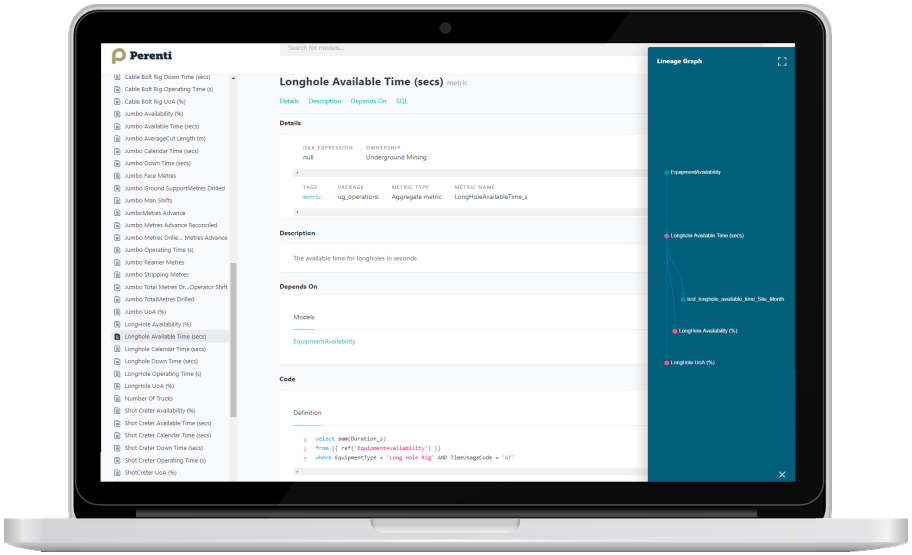
Standardisation on Processing the Lakehouse | Round 2



Data Catalogue

Data Lineage

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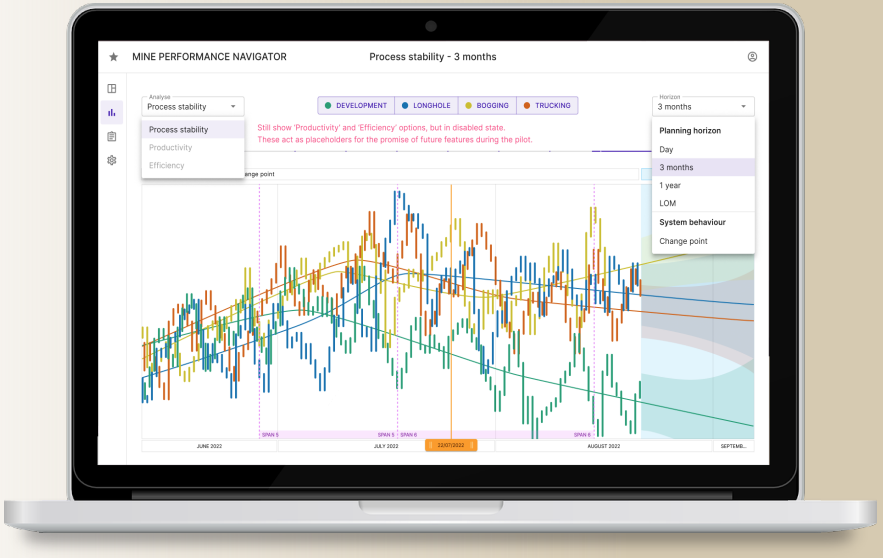
Plugging in Downstream Sources

Using a singular data platform utilizing one process and system, powerful downstream tools can be plugged in such as MPN and Gemini®. These tools will enhance analysis, visualization and simulation and transform data into powerful insights.

idoba MPN® is a new web-based data analysis and visualisation tool that will free up your time with valuable insights and analysis.

Through the application of machine learning techniques, MPN is designed to give you visual insights about your mine so you can see how your operation behaves in a simple manner.

- Evaluate the health of any underground mining process individually, or collectively.
- View your operation on a variety of time horizons, including shift, day, week, month, quarter, and year.
- Analyse past performance of ore tonnes delivered, development meters advanced, production drill meters, bogging tonnes, and trucking tonne kilometres against plan.
- Automated forecasting of three-month performance.
- Easily identify the variability of days in a mine's history.
- Ensure better decision-making through the creation of insight driven reporting.



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Plugging in Downstream Sources

Using a singular data platform utilizing one process and system, powerful downstream tools can be plugged in such as MPN and Gemini®. These tools will enhance analysis, visualization and simulation and transform data into powerful insights.

Gemini® is a mine fleet simulation tool that provides short interval simulation to validate mine schedules and support decision making.

- Simulate your plans and find bottlenecks before you have to deal with them in the field.
- Analyse your current operational challenges and determine your best possible outcome.
- Build real load and haul logic into your simulation
- Visually see how road alignments, intersections, and speeds affect your fleet and productivity.
- Model your operation in 3D, using your haulage network and infrastructure configuration
- Control your stockpile build and identify your truck queue easily
- Test and validate your plans before you execute so you know where the issues are before they are happening

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Gemini® Surface Update

- **Pilot Ready.**
- **Engaging with staff a Perenti Operated mine for Pilot trial.**
- **Orelogy staff trained for use in study support.**
- **Fully functional set**
- **3D simulation but animation only in 2D.**
- **Simulation reports in .csv output.**

Option to show 1 min video of animation pictured on left it time permits.

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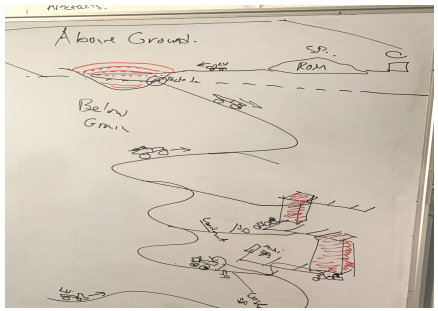
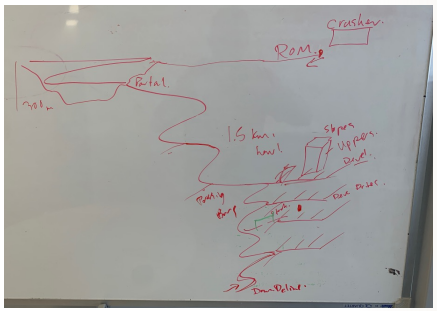
What are we doing with Gemini® Underground?

MARCH 2023

Conversations between Design, Developers, Subject Matter Experts and Orelogy Mining Engineers

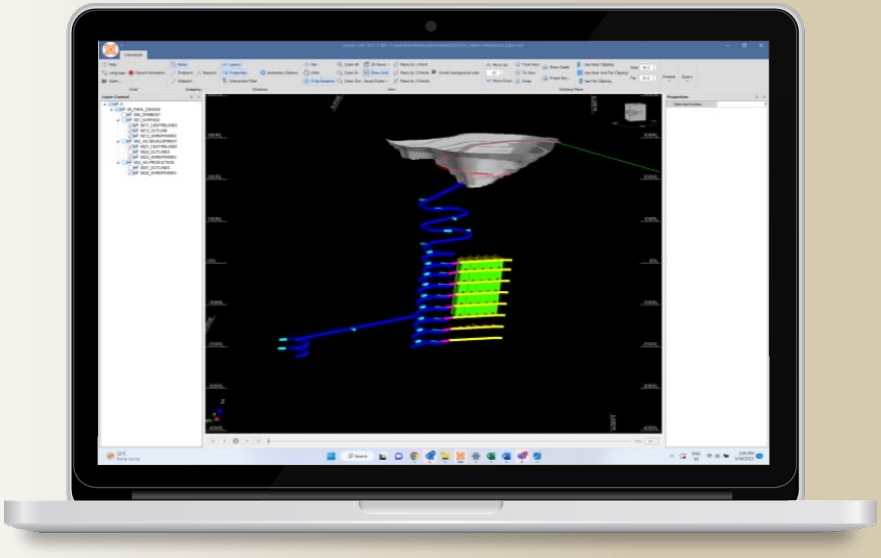
A few whiteboard sessions...





An idea to accelerate the design by assembling bits and pieces of old jobs that had already been designed

Crusher to pit ramp to portal to decline to long hole stoping levels to active development headings and an exploration drive...



...which turned into idoba's first "Frankenmine".

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What are we doing with Gemini® Underground?

...And extracted our first integrated road network from the mine design, used the Gemini engine to generate the first 2 truck simulation from Underground to Surface and back with changing velocities...

...and then we got 6 Uni students involved

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What are we doing with Gemini® Underground?

APRIL 2023

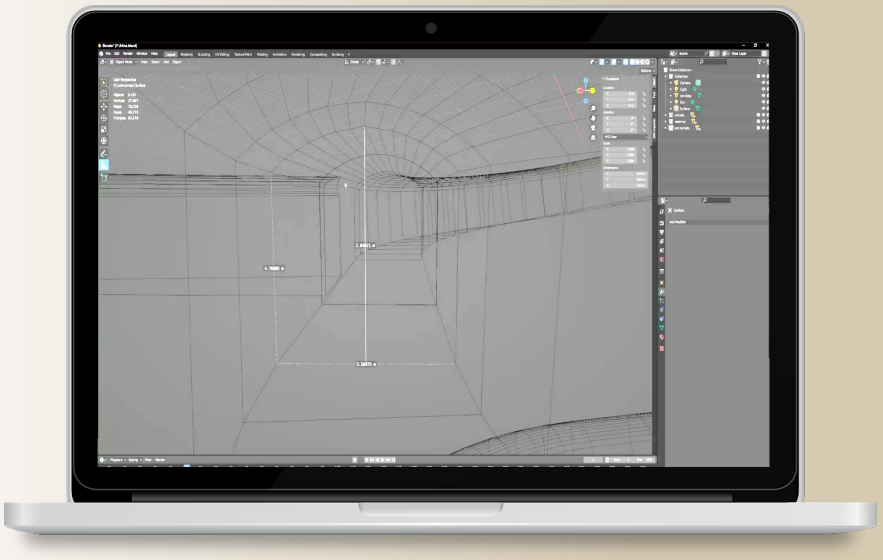
Successful import of Deswik mine designs into Blender and Unity gaming engines

This will form the 3D environment in which the mine equipment will move

We will animate our Gemini simulations in full 3D + time

Top left: open pit, decline and underground workings

Bottom left: first view inside the mine tunnel



First view inside mine tunnel

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What are we doing with Gemini® Underground?

We have our first 3D models of mine equipment inside the underground workings.

MAY 2023

Haul Truck 3D Model inside mine design tunnel

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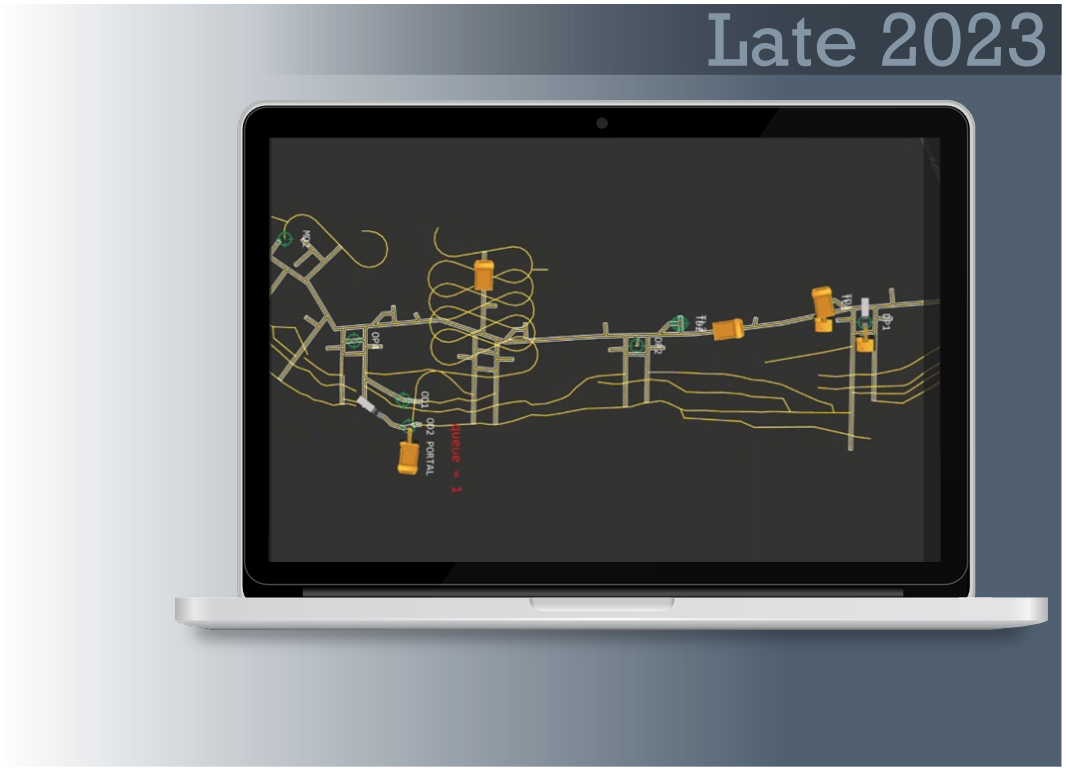
Gemini® Surface Underground

- **Proof of concept completed for Resources Company**
- **Underground Lithium mine with 1.4km long levels**
- **Proven that addition of 5th haul truck does not result in increased production due to delays, queuing.**
- **Quantified maximum productivity of boggers moving ore from production stope (ore) to ore passes (lower than initial assumption)**



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What did a move to Lakehouse give us?

- All the existing capabilities
- New Capabilities – More accessible data, predictive analytics, data sharing
- Consolidation of on-prem license and hardware costs (23 SQL instances)
- Processing of rows (800K to 14M – Now 80M)
- Material decrease in network traffic