Case Studies in the Land Down Under - *Part 1 of 2*
How an Innovative Australian Survey Firm, Orion Spatial Solutions, Used Euclideon's "udStream" to Store, Share and Work With Big 3D Data on Three Unique Projects

This is the first of RIEGL's two-part article describing Euclideon's easy to use, free, web-based platform; and three case studies showing how it was used on Orion projects.

Part 1 of the article describes Orion's creation of a base map for a major mining operation. Part 2 will describe continuing services for a major roadway system, and a digital twin of an historical railway workshop. These are all applications where precision LiDAR was collected with RIEGL terrestrial, mobile and/or airborne laser scanners, that was uploaded into udStream by Orion.
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Orion Spatial Solutions and Euclideon are both based in Brisbane, Queensland, Australia. RIEGL's Australia HQ is about an hour's drive south in Southport.

Orion Spatial Solutions is a survey company based in Brisbane, Queensland, Australia. The company has been using LiDAR on their projects for over 10 years; utilizing the *RIEGL* VZ-400 and miniVUX scanners for the past five years, and more recently their new VUX-1UAV. Orion has seven ground survey crews providing a range of survey services for public and private clients throughout eastern Australia.

These crews at Orion have been putting *RIEGL* terrestrial and airborne laser scanners to good use on a wide range of exciting projects! Having embraced innovative technologies for years, they knew they were on to something with potential to fundamentally change workflows when they met with leadership from Euclideon Unlimited 3D.

Managing big files is one of the most frustrating and expensive challenges facing our design and scientific fields today. Our geospatial society is using more and more digital information to perform our work. LiDAR, BIM and imagery are exciting technologies, but if one is not careful, the file sizes become so massive that there is no practical way to share that volume of data with the intended users.

There isn't an engineer alive using big data who hasn't had to grapple with questions like *"How can I best store all this information economically? Can I easily retrieve it when I need it? How can I get this huge file to my client, who doesn't have the same computer capacity or programs as me?"* And now with the pandemic in play, there is an added challenge for our workflows - it's difficult to gather team members together physically to go over project details. Solutions are being dreamed up, and our high-tech world is anxious to see these problems addressed so that we can move along to the more satisfying part of the business - serving our clients and meeting their needs.

About Euclideon's udStream
Euclideon is a 3D software innovation firm that created udStream (Unlimited Detail Stream). This platform allows users worldwide to upload, share and work as a team with big geospatial data, such as LiDAR, BIM, photogrammetry and other detailed information files. udStream provides a highly useful 3D tool for engineers, scientists, planners and public agencies; and addresses all of the problems of storage and sharing big data.

How Does udStream Work?
After LiDAR and other visual data has been collected, it can be quickly converted into uds format with udStream. The software accepts any of the industry-standard point cloud formats. Then users can enjoy the fast rendering performance of udStream. In the Orion case studies outlined below, their teams created LAS files through *RIEGL*'s software suite, and then exported the data directly to udStream. Imagery and other data was uploaded as well.

udStream Features

- No size limit on data
- Instant loading and fast rendering without losing any details
- Easy to upload and share with others simultaneously
- Clear 3D visualization including fly-throughs without lagging
- Zoom in and out, back and forth, up and down, parts or the whole model
- Ability to measure, perform calculations, overlay datasets, historical change detection
- Support multi-map layers
- No special equipment required - can run on desktop or browser
- Can be accessed on almost any device - smart phone, tablet or computer
- Can store data locally or on your own cloud.
- FREE Basic Package, with expanded features available as an upgrade starting at $600 per year.

CLICK here to see video on how to get started using the free version of udStream.

udStream keeps all the visual aspects of the data - points are not decreased and no data is decimated. Daniel Zhang, Euclideon CEO said, *"Our program allows people to choose what they want to see in the data, and omit what they don't."*

Zhang continued, *"File size is no longer as important since udStream hosts the data on the cloud, and web-based storage is getting more affordable every day. There is no limit to how big or detailed the information can be."*

John Philipp, Orion Director and Spatial Solutions Manager said one of the benefits is that the upload function is fast, *"We can upload and convert a full day's LiDAR collection to udStream in about an hour on average."*

The storage default is that the data is hosted on the Cloud, unless the user wishes to store the data on their own server or cloud. Users can also request that Euclideon build in additional security features as needed.

**Daniel Zhang, CEO
Euclideon Unlimited 3D**

After data is uploaded it can be shared with other team members or clients via a link that can be emailed. The data can be accessed on any platform: PC or Mac computer, smartphone or tablet.

Zhang said, *"In the old days people had to save big data to a hard drive, and courier or express ship it over to the customer. More recently cloud services became available for sharing files, but often the file was either too big to download, or too slow to be viewed online. udStream gets around these obstacles by streaming point cloud data fast and smoothly without download. Users need no special equipment or software to view the data with team members, simultaneously from multiple locations."*

Their free basic package includes features that allow users to perform measurements and calculations, create cross sections, add highlighting with color, contours, annotation, markup, bookmarks, multiple map layers including nautical charts, satellite images, and atmospheric visual effects such as sun position are standard.

On the desktop version users get added tools for functions like change and/or displacement detection.

Orion and Euclideon started collaborating on 3D visualization for large-scale projects about three years ago. Following are three success stories.

Orion's John Philipp, Director and Spatial Solutions Manager (left) and David Hedgcock, Managing Director (right). Images by Orion

Upgrade plans feature industry-specific tools like cross sections at repeating distances along a path, special queries, high quality video export and additional file format support.

Case Study #1 - Mining: A Massive Above- and Beneath-Ground Survey Prior to Expansion

The mine's above-ground area spans 5000 hectares and is in remote and alternatively flat then rough terrain, with many canyons and gorges. Image by Orion

Project Client and Location: Confidential

Date: 2019 - Ongoing

Project Description:

This project involves creating detailed and highly accurate digital maps of a very large, 30 year old underground mining site to prepare for its expansion.

Orion collected LiDAR data of the above-ground area and merged it with the mine's underground datasets to create one seamless point cloud that can be viewed on Euclideon's udStream. This platform will help the engineers to visualize the entire mine footprint, above and below, in great detail, in a way not possible before.

ABOVE: A *RIEGL* miniVUX-2UAV unmanned LiDAR scanner mounted on the M600 UAV platform gave crews the ability to fly over the rugged terrain. Images by Orion.

Scans and imagery were necessary to accomplish the following:

- Create a detailed surface model from which to begin laying out new expansion plans.
- Show areas where portals and shafts currently exist, with the ability to add to the data sets as new shafts are considered or created.

Orion's crews onsite had to hike difficult, long distances (nearly 200 km) carrying large backpacks and equipment. ABOVE: John Philipp at the entrance to an underground cave. Image by Orion

-Know precise shaft locations to ensure safety above-ground when blasting or moving heavy equipment.

-Map locations of the above-ground infrastructure.

-Map drainage and stormwater conditions.

-Map and monitor vegetation.

-Provide a baseline from which to perform change detection analysis.

-Better understand the impacts of various design choices.

Challenges on the Mining Site Project:

-**Difficult Site Conditions.** Collecting the data was physically demanding for field crews due to the remote location and terrain. Vast flat areas alternated with mountains, rugged canyons and gorges.

-**Complex Flight Plans.** Detailed flight planning was necessary to map this large area.

- **Natural Predators.** There were a great number of large eagles with 2.5 m wing spans circling the site.

- **Matching and Confirming Coordinates Was Key.** Collections above and below ground needed specific coordinates so that the team could pull all the datasets together to view as one project.

- **Regulatory Compliance.** The team needed to be knowledgeable on any regulations that might affect the performance of their work such as environmental components for status quo or restoration.

- **Tight Schedule.** This project was a fast track for the initial data capture, with ongoing collections planned.

-**Enormous Dataset!** Euclideon's udStream provided the solution to both compress the files, and provide affordable data storage and sharing online.

Data Collection Tools
- *RIEGL* miniVUX-2UAV unmanned LiDAR scanner mounted on the M600 UAV platform
- Photogrammetry on a Phantom 4 and M600

RIEGL miniVUX-2UAV

About the Mining Project
This ongoing project would be impossible, or at least prohibitively difficult and expensive to perform without the *RIEGL* scanners, the UAV's, and the Euclideon udStream system to help pull it all together in an easily accessible way. John Philipp said, *"The mine owners and designers like the fact that they can know precisely what they are dealing with on the site. This gives them the best possible chance to optimize their future expansion and avoid costly or dangerous mistakes."* In addition, the datasets will help them remain in compliance with regulatory agencies.

Access road to the mine viewed in colorized 3D, split-screen on udStream. Image by Orion and Euclideon

Field work was definitely the most difficult part of the project. Once the data was collected, it was a much less strenuous time for the team to work with the data from the comfort of their offices.

The initial field work was completed in only three weeks. Orion assigned three ground-based survey crews and an aerial crew. It took one month to perform all the LiDAR processing, and then six weeks for data extraction.

Philipp said, *"Traditional survey would have taken more than six months, and the information would be a fraction of what we were able to collect in only sixteen weeks using LiDAR, from start to finish and with incredible precision."*

COMING SOON IN PART 2 OF THIS ARTICLE

Watch for publication of the follow-up article in the RIEGL International Newsroom that highlights two additional Orion Spatial Solutions case studies: the Brisbane Urban Motorway and Tunnel System, and the Historic Rail Station Workshops Digital Twin.

***RIEGL** VZ-400 terrestrial laser scanner in action at the Australian mine.
Image by Orion.*

Summary

Orion Spatial Solutions, using the *RIEGL* terrestrial and airborne (UAV and manned) LiDAR scanners combined with Euclideon's udStream, is setting new standards with their clients. They are performing the onsite collections quickly and getting highly accurate data that clients find useful in a myriad of ways.

On the back end of the deliverable, Euclideon developers have been eager to work hand in hand with companies like Orion to present the final deliverables in a format that end users can easily work with and afford. This next step of combining multiple, big, information-rich datasets in an easy to store/use/share format is a major step forward in the evolution of the 3D industry.

"With Orion capturing a massive amount of data with their bathymetry, terrestrial, mobile and airborne RIEGL scanners, udStream will be a fundamental part of the toolkit moving forward. We look forward to seeing the platform grow," said Orion's John Philipp.

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Euclideon is a 3D data technology company based in Australia, and devloper of udStream. This web-based platform solves challenges of storing, sharing and working with large geospatial datasets in an interactive, visually exciting 3D format.
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