



CASE STUDY

Makai Ocean Engineering uses Octave GeoMedia to lay over 1M km of world's subsea telecom cables



Industry

- Government & Public Sector

Solution

- Octave GeoMedia

Challenges

- Precise cable placement and slack management
- Complex environmental and regulatory constraints
- Managing real-time deployment in deepwater environments

Results

- Dynamic visualization of seabed environment
- Precision cable routing and placement
- Typical subsea cable lifespan extended

In Hawaiian, *makai* means "toward the ocean," and that direction defines **Makai Ocean Engineering's** vision. The innovative Hawaii-based technology and engineering firm develops advanced software used worldwide to plan, simulate and execute the installation of subsea cables.

Submarine fiber optic cables form the foundation of global connectivity, transmitting terabits of data across oceans every second. Today, nearly all intercontinental internet traffic travels through these undersea cables.

Makai's software is used on a staggering 90% of all telecom cable-laying vessels around the world. Embedded in its suite of products is Octave GeoMedia (formerly GeoMedia), which integrates multiple GIS layers into a single, dynamic visualization of the seabed environment. This allows engineers to make informed, data-driven decisions for cable routing and installation.

The backbone of global communication

"There are currently around 1.4 million kilometers of active submarine cable laid in the ocean," said Adrian Jelffs, submarine

cable group manager at Makai Ocean Engineering. "We estimate that MakaiLay has been used to install roughly 1 million kilometers of that."

Jelffs added, "Undersea cables carry approximately 99% of all intercontinental telecoms data. These critical links enable global communication and commerce."

Placing these cables is critical — and meticulous — work.

The art and science of cable placement

To minimize the risk of faults, engineers must carefully control cable positioning and slack.

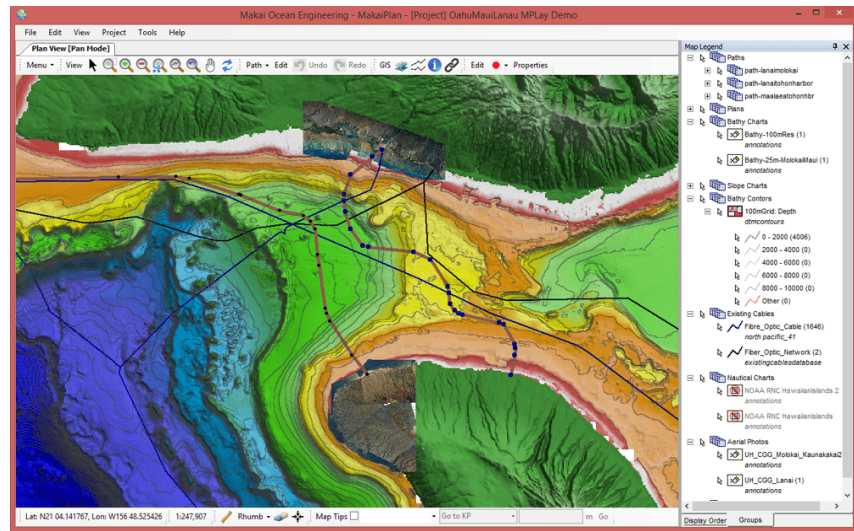
"Cables need the right amount of slack for the terrain," Jelffs explained. "Too much tension can cause suspensions and potential breaks, while too much slack can lead to loops and ultimately kinks. MakaiPlan, which is built with Octave GeoMedia, helps prevent this."

Beyond mechanical stress, installation teams must navigate a maze of regulatory and environmental constraints. "There are

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Adrian Jelffs

Submarine Cable Group
Manager
Makai Ocean Engineering



MakaiPlan - Submarine Cable Route Planning Software

many rules in place — where you can and cannot lay cable, how to cross existing infrastructure, how close you can get to other cables, and how to avoid steep or unstable terrain are just a few," Jelffs said.

That's where Makai's software plays a pivotal role. "You load in all your GIS information and bathymetry (depth information), and a MakaiPlan engineer can plan and design the route. Then, MakaiLay is used onboard the installation vessel to ensure the cable is placed in the correct location, with the correct amount of slack," he added.

This precision extends the typical subsea cable lifespan.

Route design with geospatial intelligence

MakaiPlan integrates GIS datasets and can help engineers visualize seabed profiles, predict mechanical stress points and adjust slack profiles accordingly. The software's tension modeling capabilities help prevent suspended spans that could cause fatigue over time.

At the core of this functionality is GeoMedia, a powerful GIS platform that allows users to aggregate information from multiple sources, analyze it dynamically and share insights.

GeoMedia's open architecture and flexible file handling enable MakaiPlan to access diverse geospatial databases. Engineers can import different data layers including bathymetry, shorelines, soil composition,

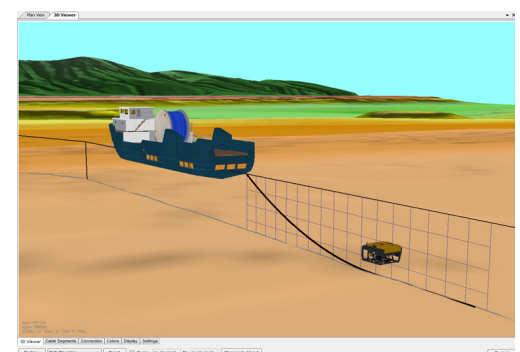
existing cables, navigational charts and protected marine areas.

These datasets can be toggled, reordered, or adjusted for transparency within a unified plan view — delivering clear, high-value visual context. Key tools include click and drag route creation, coordinate-based inputs, route position list and kilometer-point (KP) calculations. The software also produces bottom profiles, depth charts and slope diagrams for technical reporting.

MakaiPlan Pro extends these capabilities with 3D dynamic installation simulations, supporting operator training, pre-installation validation and post-installation analysis. This ensures optimized cable placement and reduces operational risk.

Real-time modeling for deepwater deployment

Once a route is finalized, the operation moves to sea. Modern cable-laying vessels —



MakaiLay 3D Viewer with ROV

some capable of storing thousands of kilometers of cable — deploy fiber across depths exceeding 5,000 meters.

Here, physics and timing become complex. "When deploying at great depths, the vessel might be 20 to 30 kilometers ahead of the point where the cable actually lands on the seabed due to the cable being very lightweight," said Jelffs. "As the ship moves, there can be a delay of hours before the touchdown position responds.

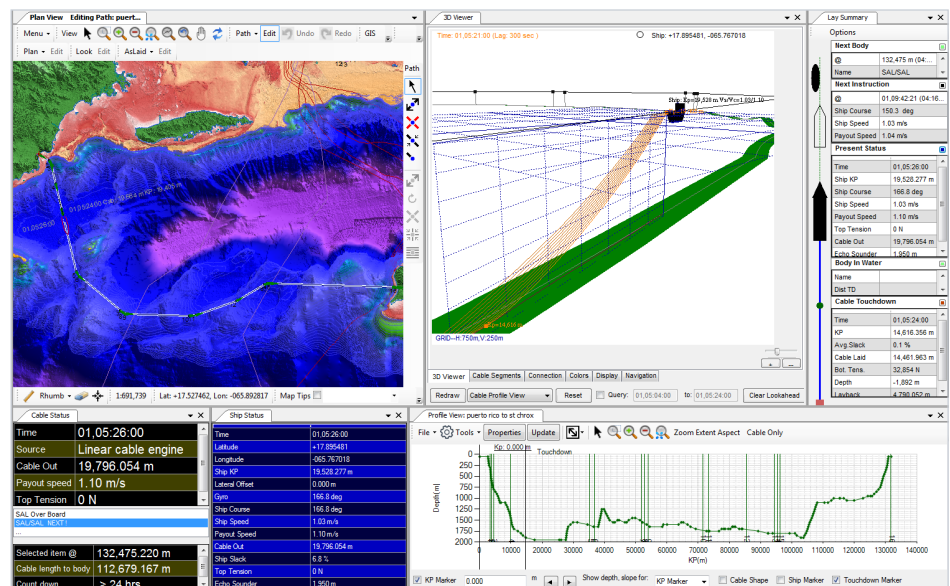
"The system calculates how the cable will behave as it descends through the water column, so you can plan exactly where to position the ship and how much cable to pay out," Jelffs explained. "For example, when moving upslope, you usually pay out less cable to prevent loops. MakaiLay can look ahead into the future using the mathematical

model to design the correct course and payout speeds for the ship and cable engine to follow."

Security, redundancy and risk

Subsea cables face a range of security concerns. The most common source of damage is accidental human activity — typically from fishing gear or ship anchors. Near shorelines, cables are often buried and reinforced with protective metal sheathing. In deeper waters, they are usually surface-laid, where they remain more exposed to potential hazards.

Protecting these vital arteries of communication — through redundancy, careful routing and monitoring — is critical to maintaining reliable global connectivity.



MakaiLay - Submarine Cable Installation Software

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property, and assets – for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency, and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

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