

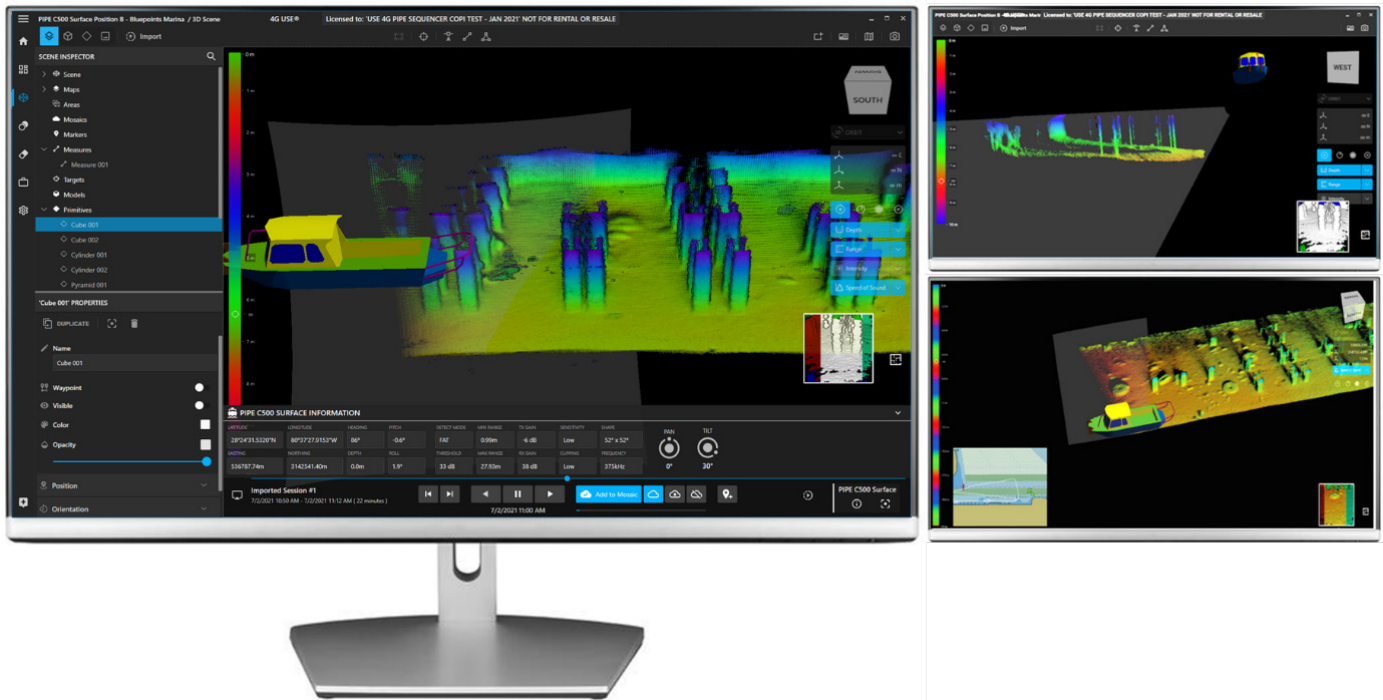


**Coda Octopus**  
Sound Underwater Intelligence



# 4G USE<sup>®</sup> Overview

**Our New Generation of Multi-Deployment and Multi-Sensor Software Platform for Real Time 3D Acquisition and Visualization**



Version 1.10.7.21

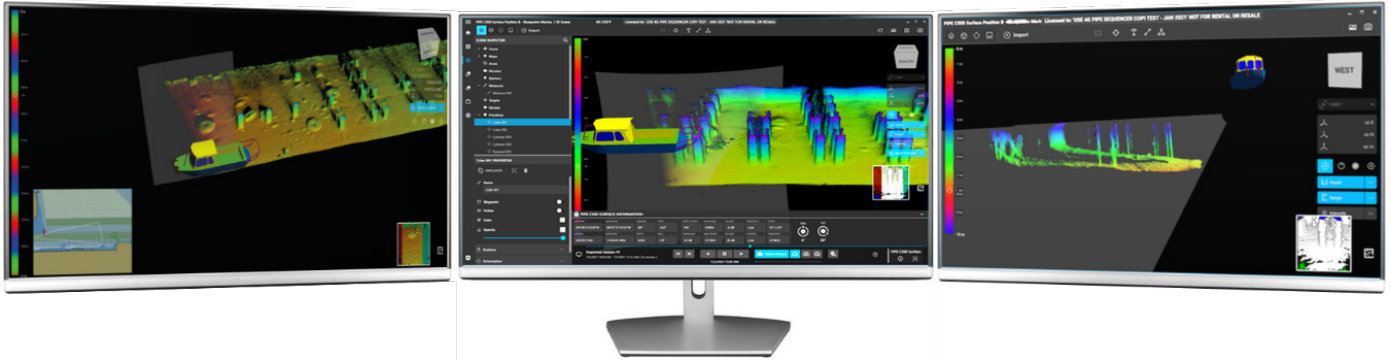


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# Product Summary

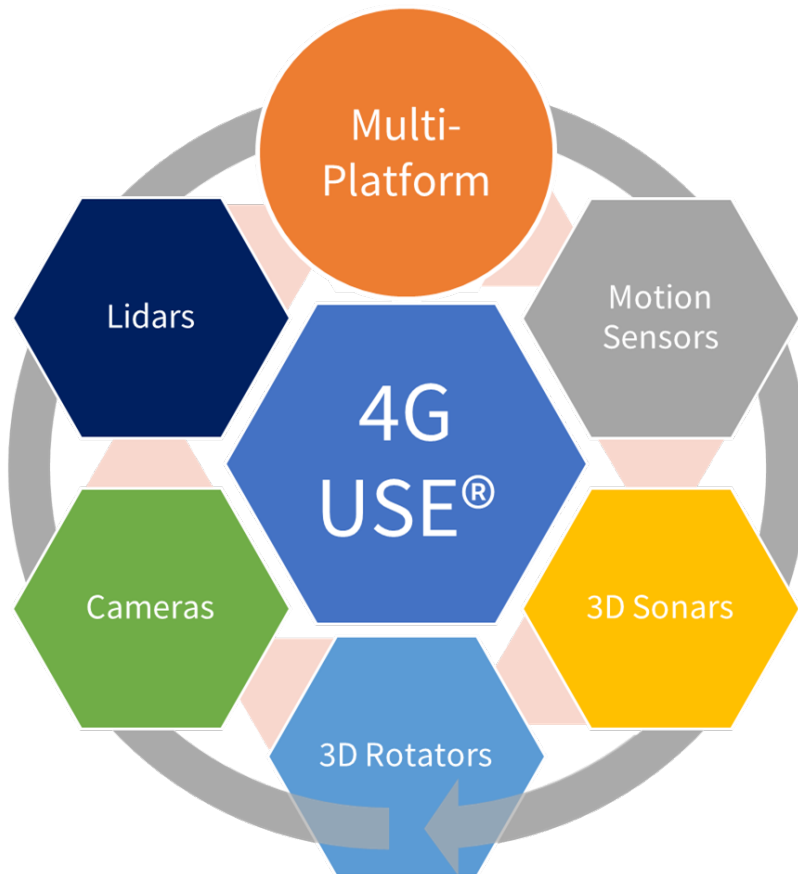
## About 4G USE®

Coda Octopus is pleased to announce the release of its new generation of software - a multi-deployment and multi-sensor platform for comprehensive integration of all data sources. 4G USE® is an enterprise class software package which allows control of, and processing of data from, multiple sonars and other sensors on different physical platforms enabling multiple subscribers of the live 3D data to independently view and process the 3D data in real time with parallel and sequential real time data output.



*4G USE® shown in a triple monitor setup with independent 3D Data Windows shown in real-time*

4G USE® is at the heart of its capability a multi-deployment and multi-sensor platform allowing for comprehensive integration of all data sources, visualization, and processing.



# Product Summary

## About 4G USE®

4G USE® introduces a number of new capabilities, which include:

Multi-Platform, Multi-Sensor, with Position and Motion acquisition redundancy	4G USE® permits the setup and operation of complex installations seamless within the same intuitive 3D real-time visual environment. Multi-platform setups allow the tight integration of for example a survey vessel and an ROV or multiple ASVs to capture and control the entire project workspace in a single real-time visual environment. Each platform may additionally host Multiple Sensors at the same time including sonars, above water cameras, rotators, and INS systems. Finally, all available navigation and attitude sensors can be configured and acquired for additional data redundancy and post-processing requirements.
Multiple Independent Data Windows	<p>4G USE® provides the ability for multiple additional data windows over the main 3D view, allowing users to visualize the live 3D data spread with different profiles and complete flexibility for the viewpoint, data filtering, coloring rendering and additional 3D scene enhancement.</p> <p>The additional data windows are completely resizable and can be moved to any number of attached monitors to the host computer.</p> <p>Specifically in surveying navigation applications, viewing the data from different viewpoints and with different visual enhancement greatly simplifies real-time decision making.</p>
Multiple Data Subscribers in real time	4G USE® allows any platform sensor to be broadcast live to additional licensed local network users running the USE Live Processing application suite. This real-time feature allows different streams of data to be subscribed to where different data users can view and process the data independently in real time. This greatly enhances workflow and deliverables with additional redundancy of data recovery.
Multiple Sensors Visual Consolidation	<p>4G USE® allows users to set up and control multiple sonars together for real-time imaging of the same underwater target (for example a Pipeline or underwater structure) and the consolidated image from two sonars rendered in the same 3D visual scene.</p> <p>For seabed and navigation applications, the sonars can be configured as independent sensors with typically one 3D sensor in forward-look imaging mode and the other side-look imaging on the seafloor. The user has complete independent control of each sensor and may additionally chose to view these individually on separate displays or in a consolidated 3D view.</p>
Above and Below waterline Sensor Fusion	4G USE® allows users to combine multiple above the water sensors (such as cameras or lidar sensors) along with sonars at the same time, again as independent views, or consolidated 3D view. This modality is particularly beneficial for structural surveys in shallow water for bridge and port and harbor inspections.

# Product Summary

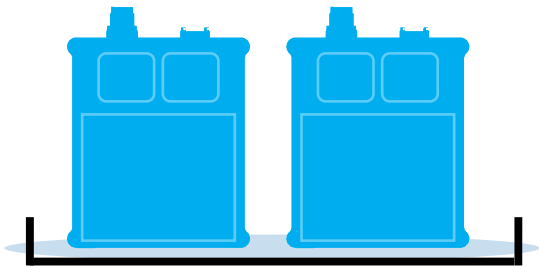
## About 4G USE®

Underwater Survey Explorer “USE Processor”	A Module of 4G USE®, USE Processor allows multiple users to visualize the live 3D data with different profiles and complete flexibility for the viewpoint, data filtering, coloring rendering and additional 3D scene enhancement.
Vantage “Vehicle Edition”	<p>A Module of 4G USE®, tailored for vehicle live navigation and surveying, allows live data to be viewed in real time with multiple prescribed views. Vantage provides a traditional 2D Sector view, a Forward-Looking 3D view and a customizable profile view for horizontal or vertical slices, in addition to a standard volumetric 3D view.</p> <p>With pre-built ranging and angular grids, pilots can easily judge flight paths and control of the vehicle from the Vantage view.</p>
Sequencer	A Module of 4G USE® allows users of Echoscope® PIPE Sonars to pre-program a sequence of up to ten (10) different real-time 3D acoustic data captures using different acoustic and processing parameters such as frequency, range, pulse length, TVG, transmit receive gain or sonar processing parameters such as filters, bottom detection methods or sidelobe clip levels. This gives the user the ability to capture and view in real-time up to 10 different 3D datasets, with different capture or processing parameters, all of which can be viewed in real-time from different perspectives - thus providing a more comprehensive understanding of underwater targets/structures being imaged and visualized in real time. The captured data can also be viewed in the 3D Data Window by multiple users - using independent 3D Data Windows.

# Summary of Core Capability of 4G USE<sup>®</sup>

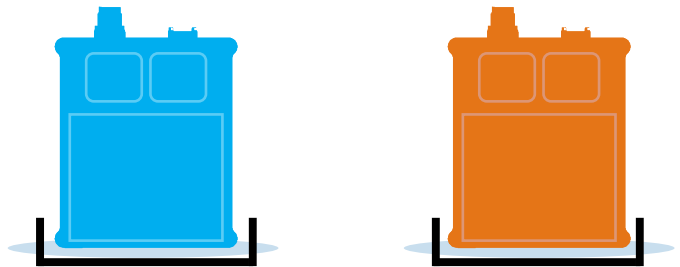
## Controlled Together Mode

For imaging same underwater target and displaying consolidated 3D images



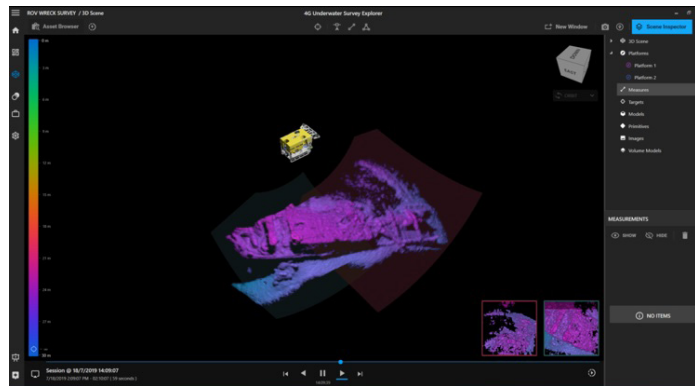
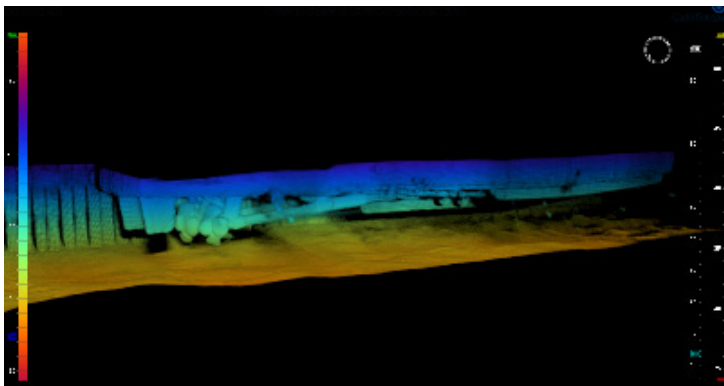
## Independent Mode (Controlled Independently)

For imaging independent underwater target and displaying independent 3D images



This is a mode in 4G USE software allowing users to use and configure at least two sonar devices (and accessories such as IPT or ISARS) and control these sonar devices together. When the Controlled Together Mode is enabled, the 4G USE user interface allows one set of controls for the two sonar devices. The Controlled Together Mode is usually where the user requirement is for increased swath coverage of the underwater target which is being imaged and/or visualized in real-time and the sonars are synchronized and imaging the **same target**.

This is a mode in 4G USE software which allows users to use and configure at least two sonar devices (and accessories such as IPT or ISARS) and control these sonar devices in the software interface independently. In this mode, each sonar device has its own set of controls so parameters can be set to different values for each sonar device. The Independent Mode is usually where the user requirements are to visualize and/or image in real time **two different underwater targets** – so sonar is pointed in different directions.

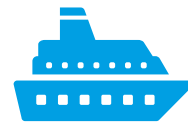


# Summary of Core Capability of 4G USE<sup>®</sup>

## Survey Vessel and Inspection ROV

## Survey Vessel

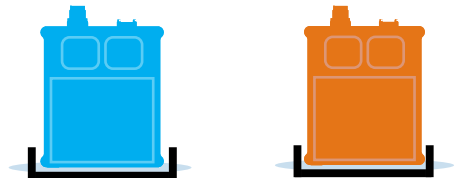
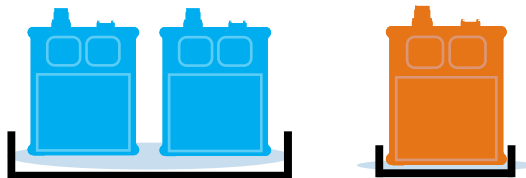
Installations



GPS & Sensors



Sonar & Motion Platforms



This scenario provides a dual Echoscope survey platform on the vessel for increased swath coverage in **Controlled Together Mode** with a 3rd Echoscope mounted on an Inspection ROV with independent GPS and Sensor and Motion Platform.

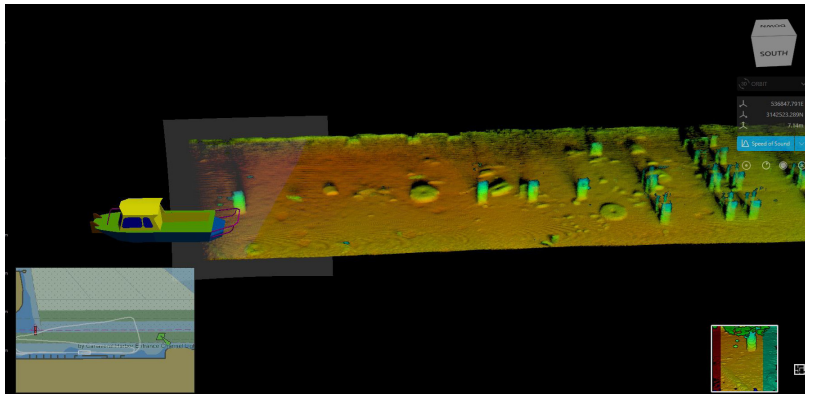
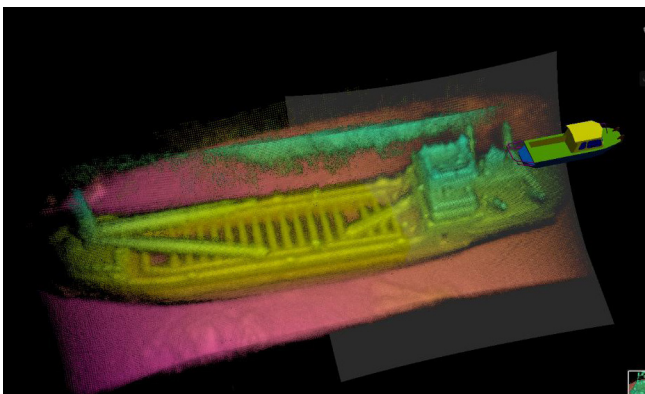
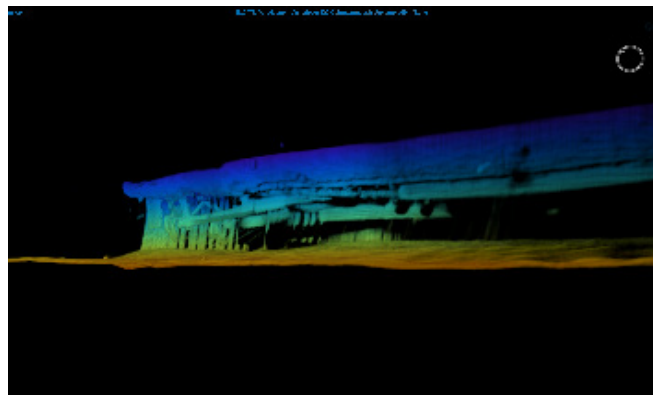
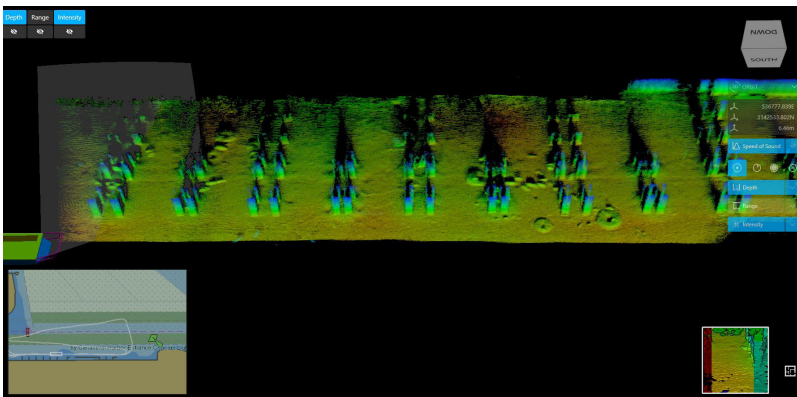
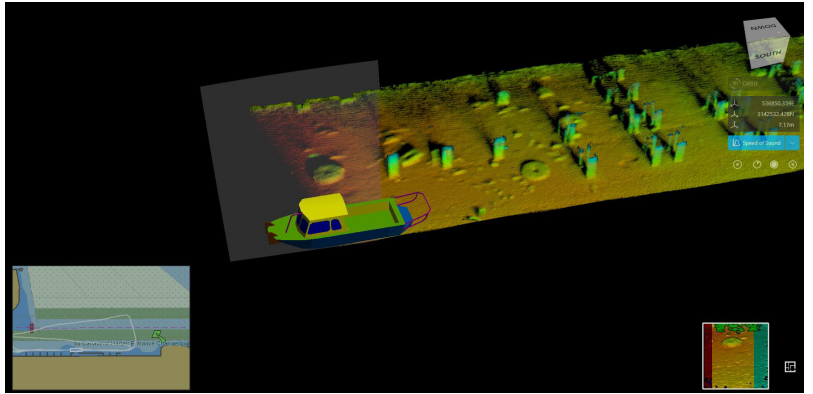
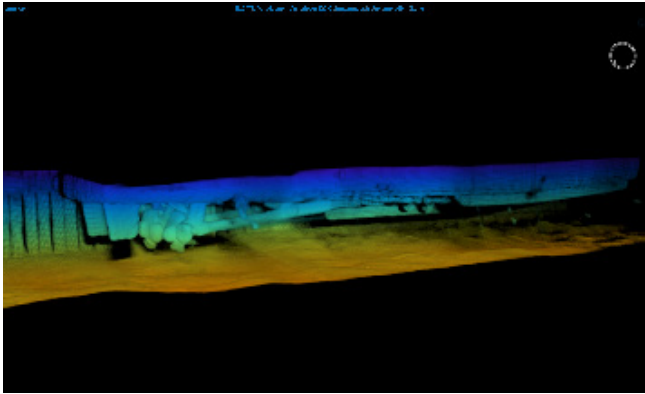
Operators need only control two groups of sonar – the Survey System pair and the ROV sonar. Navigation and Positioning is provided by a ship based motion sensor and an independent ROV subsea positioning sensor. All real-time data though all data can be consolidated in 4G USE or monitored independently.

This scenario provides two independent Echoscope systems on independent Motion Platforms. Both Echoscopes share the common Survey Vessel Positioning and Attitude data but are on independent Motion Platforms allowing completely independent control. This mode is useful when one Echoscope is in Forward Looking mode for OA and the other is for seabed mapping.



# Product Summary

## Image Gallery



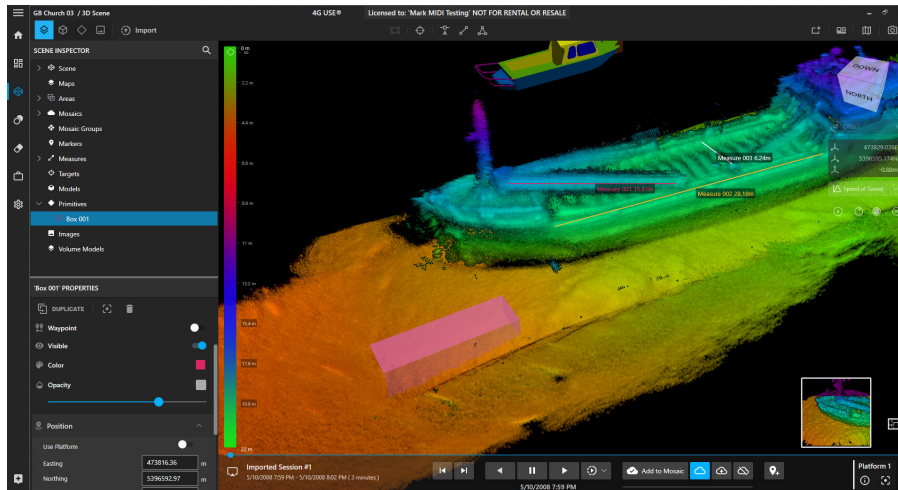
# Product Summary

## 4G USE® Features

### Quick Setup of Sensors and Supporting Devices

The built-in configuration menu allows for the quick and easy setup of any new setup. Images are designed to be as clear as possible and match exactly with what a current setup may be.

If your setup is a Custom one, the Sonar and Motion Platforms menu allows for the configuration of any of our Echoscope, PIPE, and Air series sonar and supporting equipment, along with custom integration of third party and industry standard motion platforms.



**Figure 1: Scene Inspector highlighting the ability to select individual models/assets and modify their settings**

### Total 3D Scene Control

4G USE is an all-in-one solution for collection data from above and below the water, and then using visual aids to complete project objectives. Designed from the ground up to easily manipulate the 3D Scene created with your Echoscope and Echoscope Air data, there are many options available to visualize and enhance your projects.

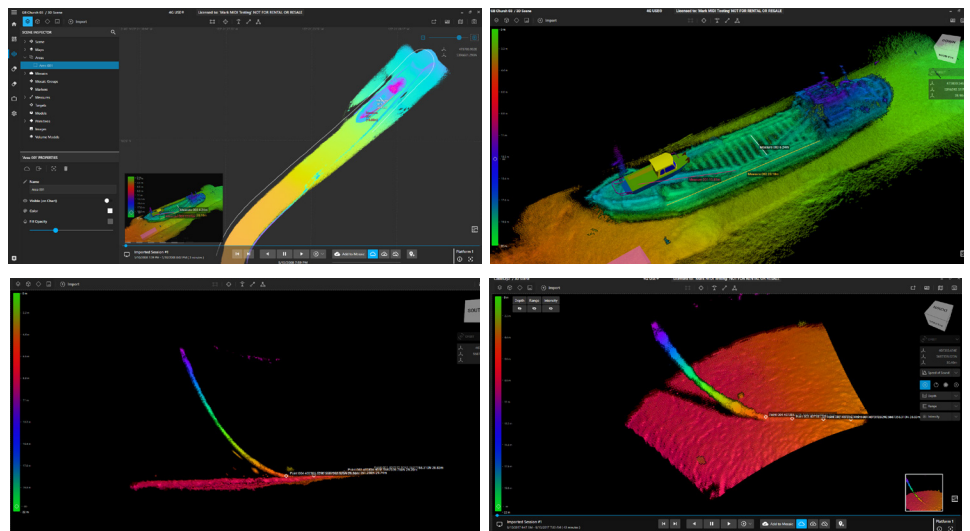
### Multiple Windows

4G USE allows for the creation of multiple independently controlled data windows that can be displayed on multiple monitors. Your survey vessel can then be set up with the exact combination necessary to complete the job.

Investigations: View a target from Multiple Angles simultaneously, providing context for your operations and enhance your inspection capabilities.

Bathymetry data: After importing local charts, your vessel captain will be able to fully view them and use them to pilot the vessel and collect the full set of bathymetry data, while your Echoscope operator can focus entirely on the data and ensure its highest quality. Each having their own window allows them to access the most important information as quickly as possible, without interfering with each other.

ROV Inspection: You can independently display independent platforms and sonars in independent windows, so that your ROV pilot can view the data from their ROV platform, while the vessel captain can view separate data from the vessel platform. Never again miss the data you need while sharing project objectives.



**Figure 2: (TOP L & R) Chart View and Sonar Data in two separate windows. (BOTTOM L&R) Side View to check cable bend radius and 3D view for normal touch down monitoring operations in Cable Lay Project.**



# Product Summary

## 4G USE® Features

### Chart View

The Chart in 4G USE can not only be displayed in its own window, independent of other 3D Scene items, it can also be overlaid conveniently in the corner of the 3D Scene. Maps imported to 4G USE will display on the Chart view and, while Navigation information is available, will automatically position the vessel in the correct location.

Display items on the Chart View can be controlled in the Scene Inspector menus, while items such as models, measures, and markers can be displayed to facilitate navigation. Once you find your target and identify your location and mark it, you'll never have trouble locating it again.

While recording and collecting data, a small subset of the data will populate on the map, indicated actual coverage of your data and eliminating any doubt on the completion of your survey project.

The Chart View can also be used to create a mosaic quickly and easily or export the data as a default or custom-designed XYZ CSV file. Simply click the "Define an Area" tool and drag across your desired export area. Then, use the newly created area in your Scene Inspector to make a mosaic or export the data.

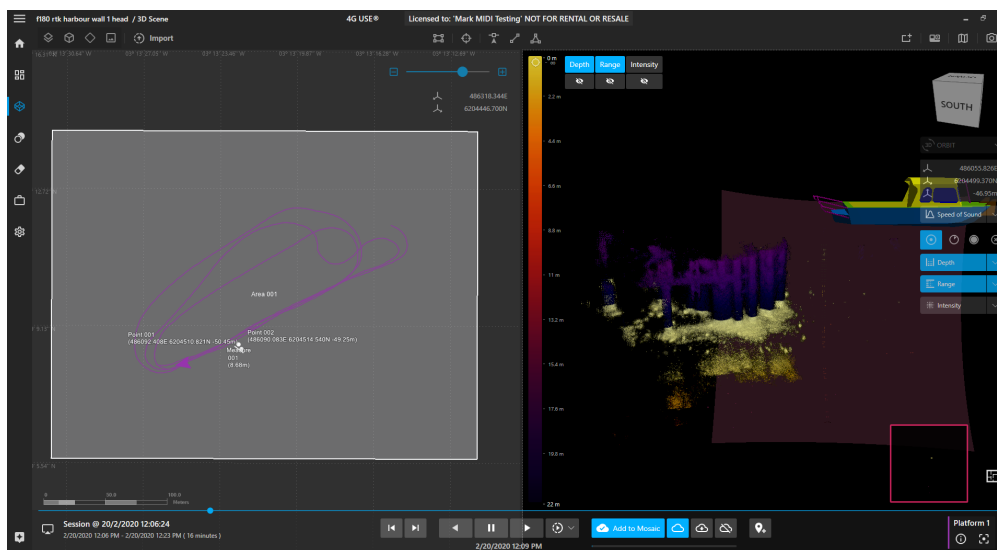


Figure 3: Area selected for export in Chart View

### Topsides View

4G USE allows for the simultaneous application of our newest technologies. Including the topside laser and optical camera, the Echoscope Air, and the Parallel Intelligent Processing Engine (PIPE) series of sonars. In a single program we can combine laser data from the surface with sonar data from below the surface to create a single and coherent point-cloud image in Real-Time.

### USE Processor

4G USE allows real-time sharing of sonar data with Underwater Survey Explorer letting you realize the benefits of 4G USE as an acquisition engine while allowing your existing Survey Explorer workflows and integrations to continue to operate seamlessly.

You can share data with as many Survey Explorer clients as you need, each one focussed on a specific goal. Each client can independently view, interpret, record, and even output the data using all your familiar Survey Explorer features as if you were connected to the sonar directly.

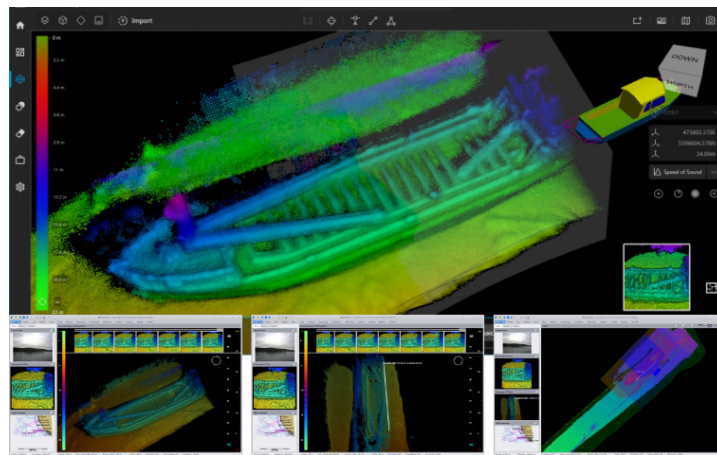


Figure 4: 4G USE and USE clients with different views of the data

# Product Summary

## 4G USE<sup>®</sup> Features

### Live Mode

Live mode enables users to view and record real-time 3D Echoscope sonar and Echoscope Air topside camera data. All sonar and camera parameters can also be modified on-the-fly, with real-time preview showing the impact of your changes. Coda Octopus strongly advocates the use of feature-rich tools and capabilities in Live mode to assist with operations and to collect the cleanest data in real-time significantly reducing the need for post processing and data cleaning. The efficiency driven approach means that over 90% of the feature set in USE is available in Live mode including deliverables production during or in between survey lines.

Customize your live mode setup to control multiple sonars with multiple sets of acoustic settings as needed. 4G USE allows for the collection of multiple data sets in a single pass, saving time and effort.

Live data is not restricted to just the Echoscope family of sonars, our Echoscope Air allows recording above water in both image mode and point-cloud mode. This combination of Top and Bottom data can be invaluable for marine construction and inspection applications. To assist with enhanced spatial awareness, we can also take position and motion data from multiple other sensors or platforms to visualize these in real-time with 3D moving models. This for example would allow an Echoscope mounted to an ROV to also visualize where the surface vessel is or the location of divers and other tracked assets in real-time.

### Project Sessions (Replay Mode)

4G USE allows for the creation of multiple sessions within a single project. This allows you to organize, maintain, and preserve Asset Manager libraries of images and models to use across multiple separate surveys and session projects. You can easily flip between these sessions to replay the data and post-process as necessary, while keeping individual notes for each session and an all-in-one library of survey events. You can flip into Live mode at any time to create a new session in the same project.

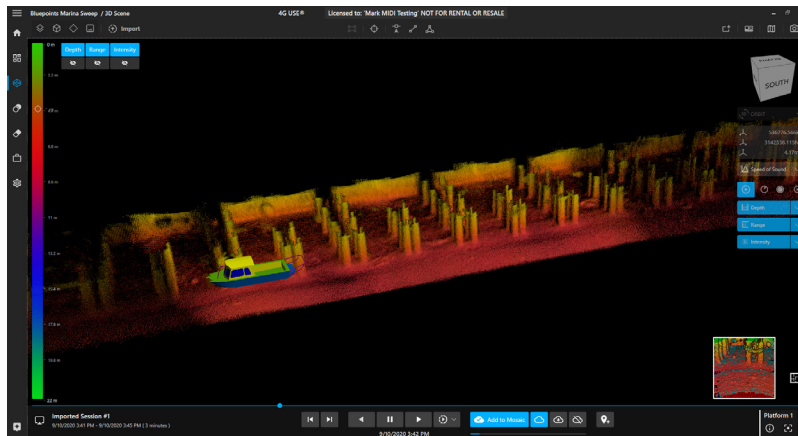


Figure 5: 4G USE Data

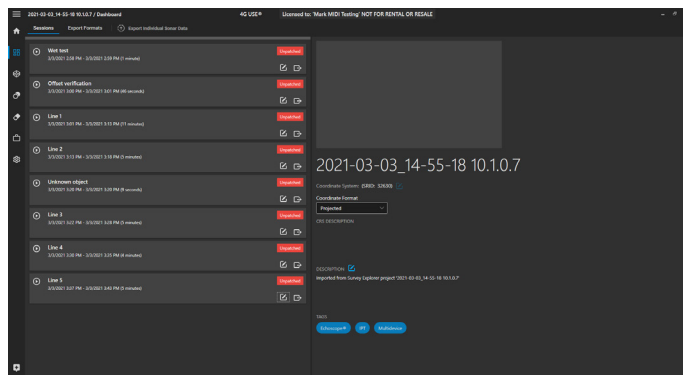


Figure 6: Sessions menu showing several session

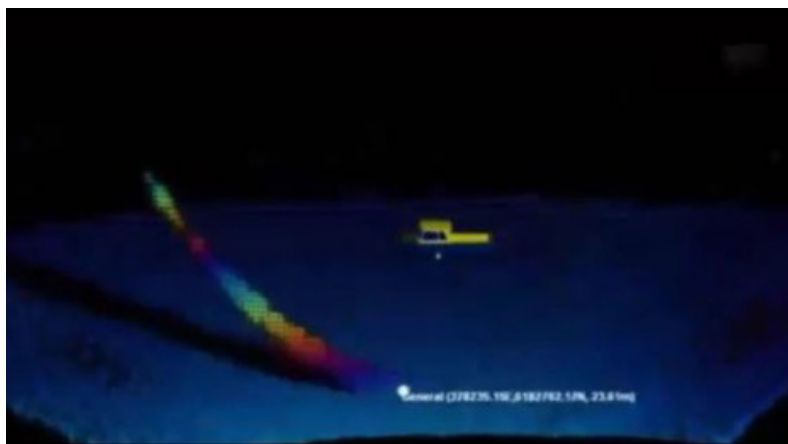


Figure 7: 3D MATT tracking Cable Touch Down Points

### 3D MATT

3D Multiple Automated Targeted Tracking (3D MATT) is a real-time multiple target tracker that uses the 3D data from our flagship real-time 3D volumetric sonar technology, the patented Echoscope series.

Using 3D MATT users are able to define a target to be tracked that is visible in the real-time 3D sonar data and through a set of specifically designed constraints. 3D MATT can accurately track targets in real-time and at the maximum Echoscope ping rate of 20 pings per second.

3D MATT is fully aligned with our real-time 3D sonar and any object that can be visualized by our sonar can be the subject of tracking by 3D MATT.

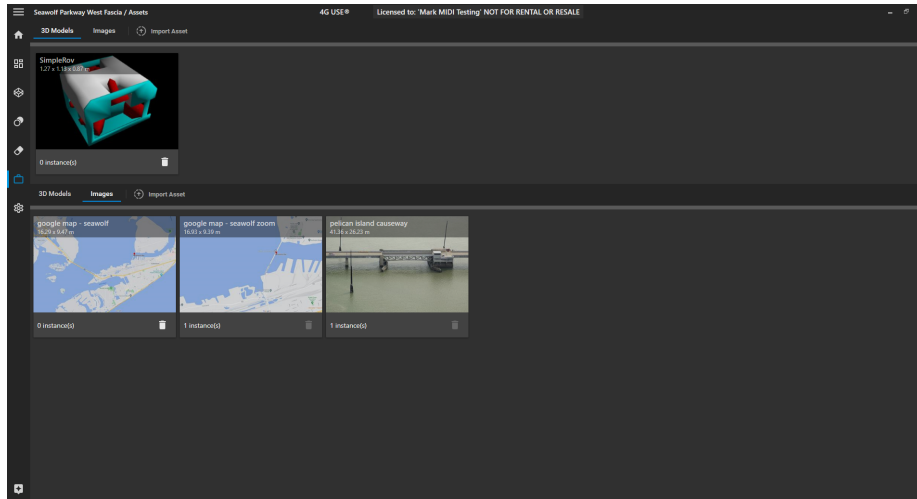
Some applications which can use 3D MATT include Cable Installation and Survey, Diver Tracking and Support and Vehicle Target Tracking.

# Did You Know...

## How USE Improves Subsea Applications

### Scene Inspector

4G USE allows for the manipulation of each item present in your current project 3D Scene, from the rendering and lighting of the data itself, to the models and images present. These display items are controlled through the Scene Inspector, a series of drop-down clearly labeled for each task. Prepare for an upcoming project by inserting pre-made models at a known location to assist in search and inspection efforts, using the scene inspector to specify their exact real-world coordinates. Quickly find and zoom into measures of data previously collected to evaluate the severity of the under-bridge scour. The Scene Inspector, like a majority of 4G USE features, is usable in both live and replay modes.



### Asset Manager

Supported image and 3D model file types can be imported for instant insertion into any 3D scene. The Asset Manager is a quick-search library to organize and view your currently available and loaded assets. These assets are tied to each individual project and do not need to be re-imported when you open and close the project for different sessions, saving time and effort.

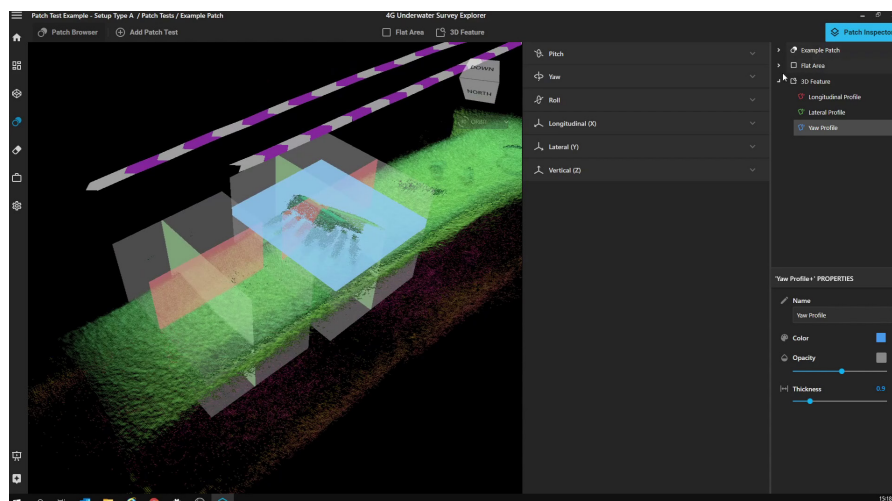
Figure 8: Complete Asset Manager with 3D Models and Images imported.

### Import Data from USE

Echoscope and Echoscope Air data collected in Underwater Survey Explorer and PIPE Core can be imported quickly and easily into a 4G USE project. This allows you to merge old data sets with new ones for continuity in your project history.

### Coordinate Reference Systems

4G USE allows for the quick switching between the Geographic and Projected Coordinate Reference Systems as needed. We support all CRS formats in line with the EPSG database.



### Drag and Drop Patch Test

Linear distances and angular differences measured between the navigation Central Reference Point (CRP) and Echoscope CRP, entered into the project configuration, are calibrated to align all Echoscope data recorded. Different fragments of the projects are compared and checked for alignment in multiple planes/datums. The final product is a clear, aligned project with a greater accuracy. An absolute must for any mapping or survey tasks. The Patch Test in 4G USE guides you step by step through the Patch Test process, which allows you to drag and drop a cuboid over your Patch Test features, and then follow the process to completion.

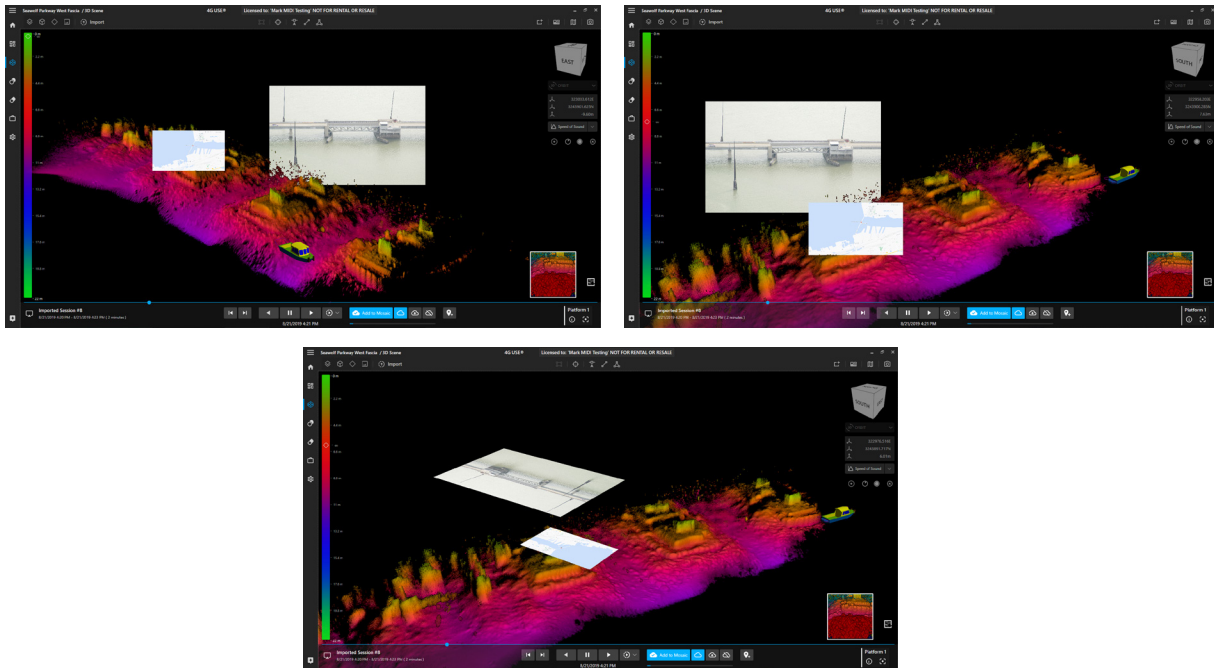
Figure 9: Cuboid being dropped over the standard Patch Test data feature

# Did You Know...

## How USE Improves Subsea Applications

### Images

Images of many commonly supported file types (.jpeg, .bmp, etc) can quickly be loaded into your scene to quickly highlight and provide context to your data. Billboard mode allows the image to persistently face the user, even when rotating and moving about the scene. The images can later be moved manually in the scene if needed, and easily renamed and deleted. Make striking video playbacks of your data that use images and acoustic data to highlight what the client really needs to see.

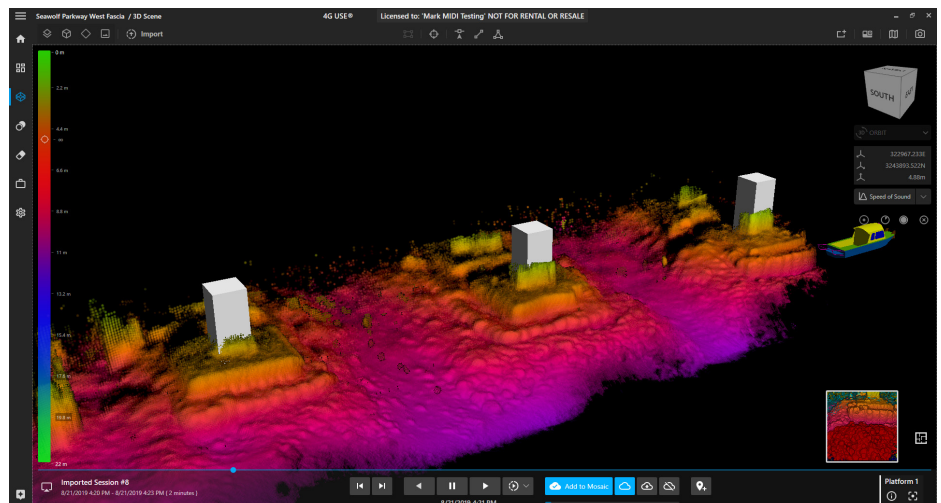


**Figure 10: (TOP 2) Image in Billboard mode showing several angles as the user rotates around the data but the image still facing the user. (BOTTOM) Image in Normal Flat mode.**

### 3D Models

A series of Primitive models come pre-loaded with every project. Boxes, cylinders, pyramids, and many others can be inserted into the 3D scene with a single click. These models can be used to mark areas of interest in an immediately and easily visible way. Model colors can be modified, names changed, and position within the 3D Scene can all be edited quickly for each model in the Scene Inspector menu. Primitive model transparency can also be adjusted, which will allow users to see Echoscope data through the model. Additionally, we support several formats including Wavefront (.obj), 3D Studio (3ds), AutoDesk (fbx), Collada (dae), DirectX (.x) or .dxf meaning software models can be quickly imported into your Asset Manager and thereafter added into the 3D Scene with a single click.

**Figure 11: Models highlight bridge pylons**





# Did You Know...

## How USE Improves Subsea Applications

### Data Filtering

Quick Access data filters in the 3D Scene window allow for the independent control of masking filters for depth, range, and intensity. Small drop down menus within each allow you to specify the range of values that you would like to mask for each of the filters. These can then be turned on and off with a single click, saving time and effort during real-time operations and post processing. Depth filters can make it easier to ignore surface clutter such as wave aeration or prop wash, while range can be used to exclude fish between your Echoscope and target when you are unable to adjust your minimum and maximum acoustic ranges. Intensity is used to filter out and remove weaker acoustic returns that may not be excluded by a threshold, a particularly important feature in MAX mode. It is important to note that Data Filtering options do not delete or remove data, only mask it.

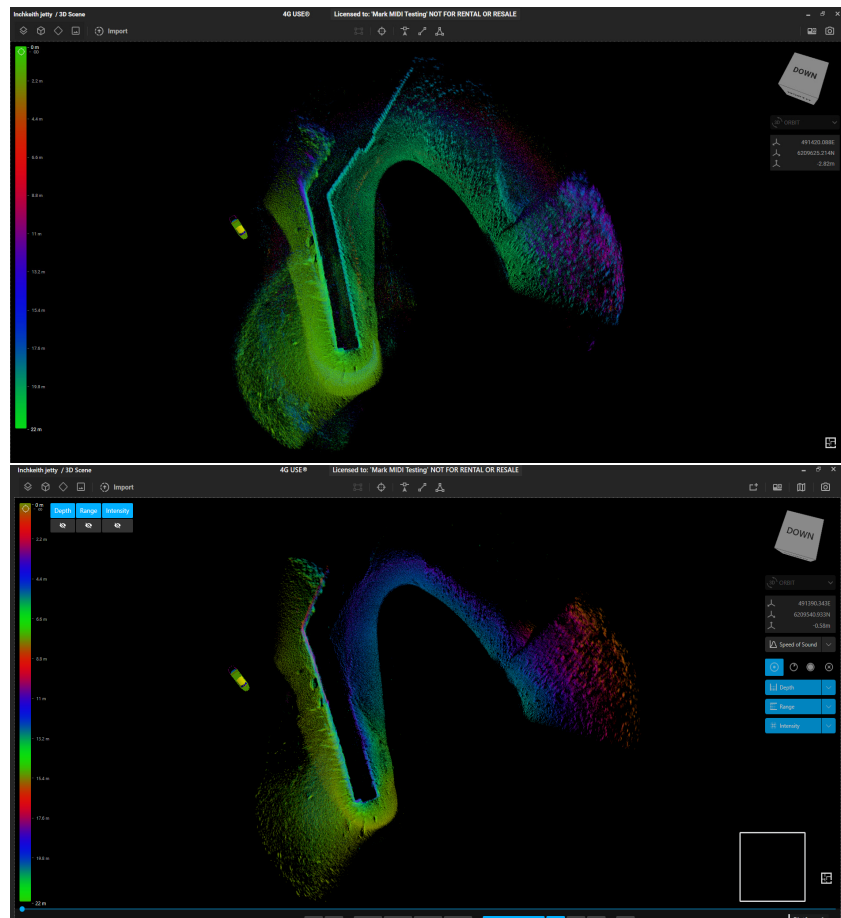


Figure 12: Before and After of applying Intensity and Depth filters to clean up a mosaic.

### CRS Designer

When using a more specific and uncommon CRS, a built-in designer allows you to build any CRS that may be required. Simply enter the EPSG code of your NAV data, enter the EPSG code that you would like the project to be in, and the Designer will AUTOMATICALLY create your required conversion.

### One-Click Measure and Point

In both real-time and Post Processing, you can click a single button to take as many measures, points, and angles as necessary to complete your inspection or survey.

### Volume Model Import

Volume Models created in Underwater Survey Explorer are easily imported into 4G USE. Use your old models to inform your new survey efforts and inspections.

### Project Auto-Save

You will never again lose your work and effort as 4G USE automatically saves changes to each project and asset.

### Custom Telegrams (Position and Attitude)

4G USE natively accepts many industry standard NAV telegrams and formats for position and attitude data. When these are unavailable or undesired, the Custom Telegram applet allows you to view incoming RAW telegrams over serial or UDP connection and build a custom decoder to extract the information you need. If raw telegrams are unavailable, a copy and paste feature allows you to test your decoder functionality ahead of time.

# Did You Know...

## How USE Improves Subsea Applications

### Map Import

Import industry standard ENC and other charts directly into 4G USE Chart View. Chart View will display all of the electronic details of the map and allow you to select which of these features are displayed at any one time.

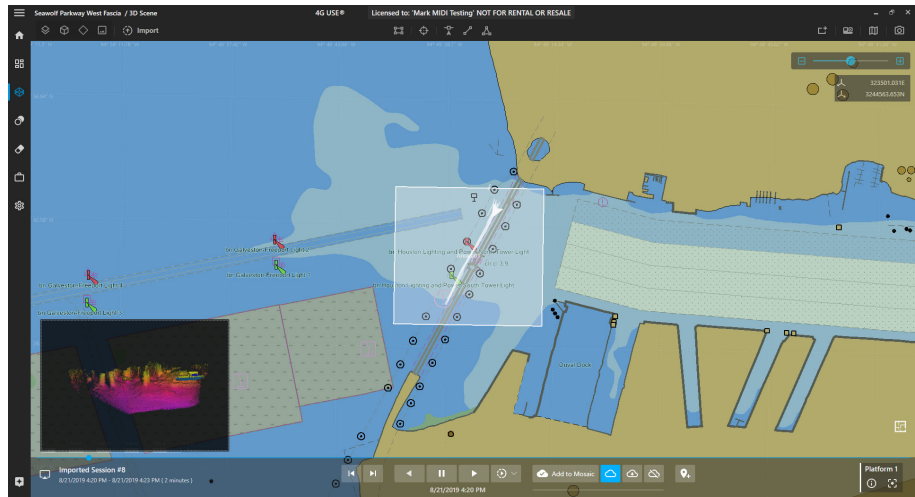


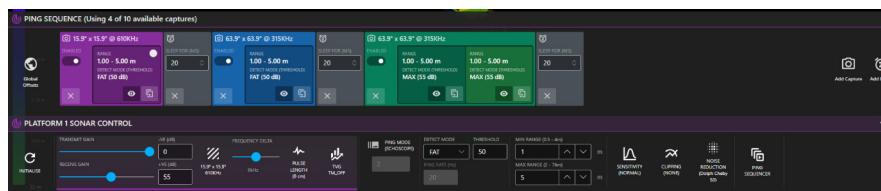
Figure 13: Chart View with an ENC chart imported, showing survey track and other chart features

### Rotator Controls

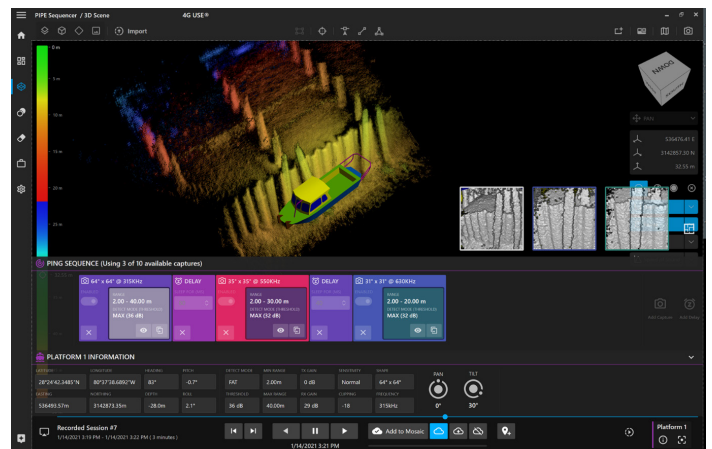
With the use of our Integrated Single-Axis Rotator (ISAR) or Integrated Pan and Tilt (IPT), the project can be optimized. Control the orientation of the rotator to allow for the best view of the chosen target and ideal geometry for the Echoscope image.

### PIPE Sequencer

Sequencer allows users of Echoscope PIPE® sonars to pre-program a sequence of up to ten (10) different real-time 3D acoustic data captures using different acoustic and processing parameters such as frequency, range, pulse length, TVG, transmit and receive gain or sonar processing parameters such as filters, bottom detection methods or sidelobe clip levels. This gives the user the ability to capture and view in real time up to 10 different 3D datasets, with different capture or processing parameters, all of which can be viewed in real time from different perspectives – thus providing a more comprehensive understanding of underwater targets/structures being imaged and visualized in real time. The captured data can also be viewed in the 3D Data Window by multiple users – using independent 3D Data Windows.



Sequencer capability removes the requirement for running the same survey line multiple times at different frequencies or for other acoustic parameters. It also removes the need for deploying multiple sonars to go over the same survey line and significantly reduces the risks of collecting poor quality data or missing important information about underwater targets/structures being imaged. This capability is also ideal for autonomous platforms and missions through the ability to pre-program the sonar using multiple capture and processing acoustic parameters. The ability to acquire 3D Data in real time using different Capture and View parameters such as range, frequency, and processing filters brings a new and powerful capability to real-time 3D underwater imaging – not only does it reduce the time of these operations but, from a single mission, provides multiple 3D data sets using different data collection or processing parameters, each of which can also be used in real time by different users or for different operational requirements. It also removes, in a large number of situations, the need to make decisions around compromise (resolution versus coverage, data density and field of view).





# Deliverables

## Color Palette

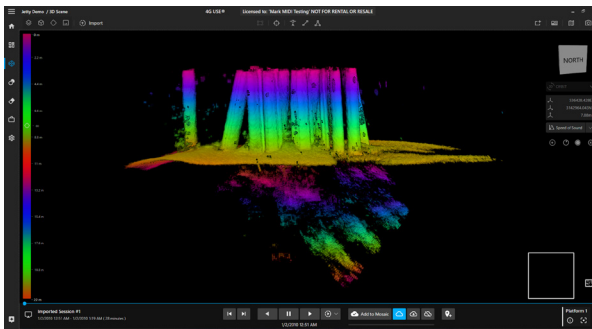
The Color palette in 4G USE is completely customizable in the Scene Inspector, allowing you to adjust your imagery to the greatest effect.

## Mosaics

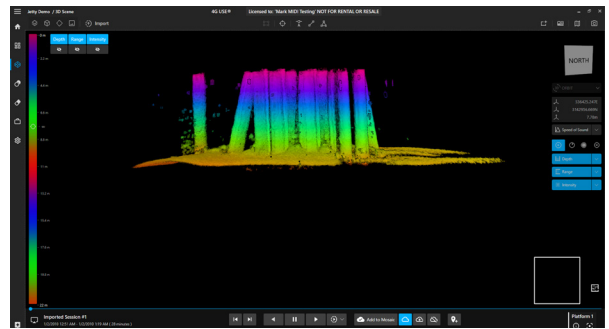
A Mosaic is a collection of pings that are saved together as a unit and can be chosen for display at a later time. Mosaics can be generated by using a Toggle option in the 4G USE 3D Scene and can be saved or cleared at any time. Mosaics allow you to capture areas of interest or concern for later review without having to watch the project again! These mosaics can then be easily converted into an industry standard XYZ CSV file, or used to take screenshots, edit, and highlight for client deliverables.

Mosaic Collections allow you add your desired mosaics to a grouping that will allow you to show/hide/export the mosaics within a collection.

### BEFORE EDITING



### AFTER EDITING



## Exporting

### XYZ

- Data collected can be output as an XYZ file for use in third party softwares
- These can be raw or binned format

<b>Raw XYZ</b>	This will simply export every 'dot' of the mosaic.
<b>Binned XYZ</b>	This will create a point cloud made up of stacked boxes. This is typically the best used for structures with overhanging elements.
<b>Binned XY Raw Z</b>	Grid when viewed on plan but draws every Z value for each of the XY positions. This is best for verticle structures only, e.g. a wall.
<b>Binned XY Binned Z</b>	This simply creates a single Z for every XY position of the grid. Like bathymetric multi-beam data.

### 2D Images

- Bitmap
- JPEG

# Deliverables

## Lighting Controls

The Scene Inspector also allows for the control of the LIGHTING in the 3D Scene and the rendering of the data. Adjusting the lighting of your data can often highlight areas of interest and make for the clearest deliverables.

## Markers

Markers are an eventing tool which can be used to simply create an instant bookmark in the data. USE Markers enable the user to save any points of interest discovered during an inspection. These can be reviewed upon completion of the survey or during the survey (without having to pause the inspection). Markers are instantly added to the Chart View and can be renamed to assist the vessel captain in returning to the area of interest if necessary or guide post-processing efforts.

Once you click the Marker button, you can then simply press the space-bar to create more.

## XYZ Data Exports

XYZ point cloud outputs allow Echoscope and Echoscope Air data to be exported as a generic point cloud data. This allows data gathered in 4G USE to be viewed in any 3rd party software that uses the XYZ format. Echoscope® data can be combined with other 3D point cloud data to create a more complete 3D environment (e.g. bathymetric scans of a seabed from a multibeam sonar combined with a more complex 3D Echoscope® data set of assets on the seabed or structures). Various types of binning formats and bin sizes are available.

Exporting your data as a CSV is as simple as selecting the chart view and dragging an area around the data that you wish to export. Then, export that area as an XYZ point cloud in standard or custom-built formats.

## Areas and Area Mosaics

Exporting data as a point-cloud is as easy as clicking and dragging an AREA box on your chart view around the data you wish to export. Simply find this Area in your Scene Inspector and Export as a standard XYZ or custom CSV file.

## Playback Videos

The 4G USE renderer is designed to create the smoothest and most visually appealing videos of your data. With lighting control, palette control, and the ability to move your view in any direction and zoom level, you can direct the video that will highlight any areas of interest or survey points.

# How To Access 4G USE Software

4G USE is available for outright purchase, daily rental, or added to an annual subscription package.

PC Specifications for 4G USE®	
<b>Hardware Requirements revision date</b>	September 9, 2020
<b>Processor</b>	Intel® Core™ i7 Recommended
<b>RAM (Computer Memory)</b>	Minimum 8 GB Recommended
<b>Disk Space (Software)</b>	100MB for installation (approximately 3.0-3.5 GB per hour, dependent on ping rate)
<b>Disk Space (Data Storage)</b>	500 GB Recommended Data storage rate is typically up to 3.5 GB per hour (dependent on ping rate, UIS camera and charts and model data loaded)
<b>Graphics (Laptop/Desktop)</b>	nVidia® Geforce GTX 1060 or higher (Recommended) with 4GB RAM <i>NOTE: AMD Radeon™ GPUs is not supported.</i>
<b>Operating System</b>	Microsoft® Windows® 10.
<b>Ethernet (LIVE Operations)</b>	1 x 10/100/1000 Port Minimum 2 x 10/100/1000 Port Recommended
<b>USB 2.0/3.0 ports</b>	3 minimum 6 recommended

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