QPS

acquire, process, visualize, share

1987-2017

30 YEARS QUALITY SERVICES

QPS 30

SPECIALISTS IN SOFTWARE FOR MARINE GEOSPATIAL DATA

QPS

solutions for maritime geomatics data
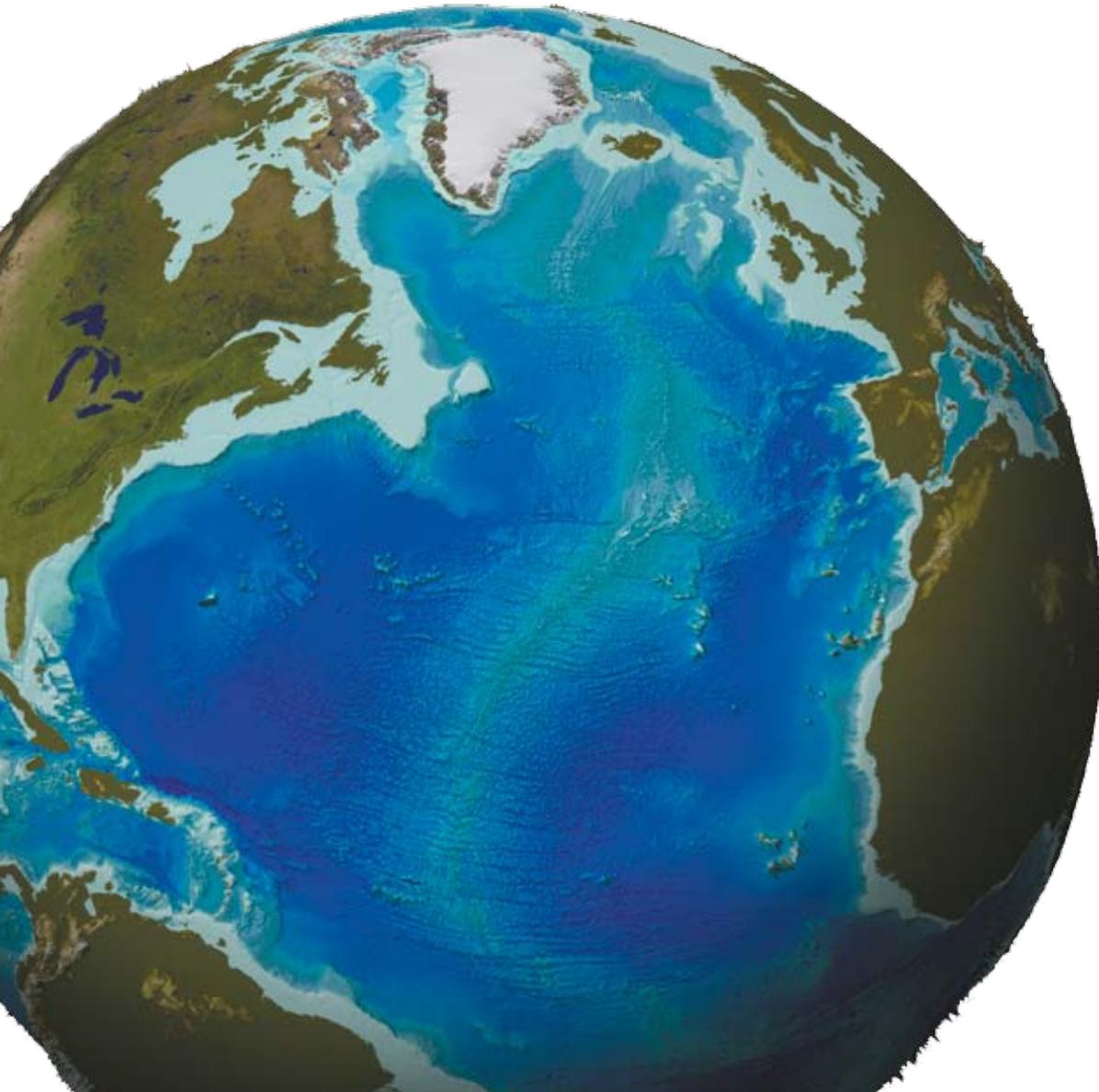
GLOBAL PRESENCE

Software company Quality Positioning Services BV (QPS), headquartered in Zeist, The Netherlands, was founded in 1986. QPS subsidiary offices are located in Portsmouth USA, in Fredericton Canada, and in Banbury UK.

A dedicated team of some fifty full time professional staff provide a broad range of experience and expertise. Globally QPS has a network of Business Partners, able to represent QPS and can manage professional advice, training and support on a local level.

QPS is focused on the system integration of survey sensors, the development of software used for maritime geomatic surveys, Portable Pilot Units and Electronic Navigation Charts (ENC) production. QPS is seen as market leader in these fields.

In 2012 QPS partnered with Esri, who's ArcGIS for Maritime is part of the ArcGIS system to solve problems and gain efficiencies for ocean, marine, hydrographic, and related business.

Since 2012 QPS has been member of the Saab (Traffic Management: ATM & MTM), group of companies.

SAAB

Professional support solutions

QPS makes every effort to ensure several product updates each year. Latest versions typically include a balance of new functionality, sponsored developments and improvements as a result of feedback received.

QPS Support Ticket System: We have an Internet based support ticket system, JIRA. With it, QPS staff and customers are able to report issues or provide feedback, and then follow the progress of such items. With QPS staffed support departments at our offices in Europe and North America, plus an excellent support network via our global network of regional resellers, and also up-to-date maintained documentation provided with the software products, QPS tries hard to ensure customers always get assistance with questions, feedback and possible workarounds.

QPS offers consultancy services, and training courses at our offices or at the offices or vessels of customers. Furthermore, QPS regularly organizes webinars and workshops, during which we share the news of latest developments and discuss best techniques. QPS Annual Support program, includes: phone support during QPS office hours, regular updates with new functionalities, bug fixes and access to the QPS Support website.

International language support

Other than English, our products presently have support for Chinese, German, Russian and Spanish.

SOFTWARE SOLUTIONS

QPS navigation and positioning software (QINSy) is used on board offshore construction vessels, pipe-lay barges, drilling rigs, seismic research vessels and hydrographic survey vessels. QPS has a fast growing market share in the offshore oil and gas industry, dredging industry and port communities.

Qimera is the simplest yet most powerful bathymetry processing application available today. Built on the latest technology and designed to be extremely easy to use. It supports all the major raw sonar file formats and has revolutionized the way that data files are handled by creating a Dynamic Workflow.

Our 4D visualization software (Fledermaus) is used extensively by blue-chip Oil & Gas and Offshore construction companies, as well as national Hydrographic Offices and international survey companies, and many academic & research institutions around the world.

Qastor is our Electronic Chart System (ECS) that enables navigation, piloting and precise docking, as well as several other applications such as Oil & Gas FPSO/SPM mooring, patrol vessel or tugboat operations, and most recently as voyage remote monitoring system. As a result of extensive use in canals, ports and riverways around the world, Qastor now includes a wealth of options and features.
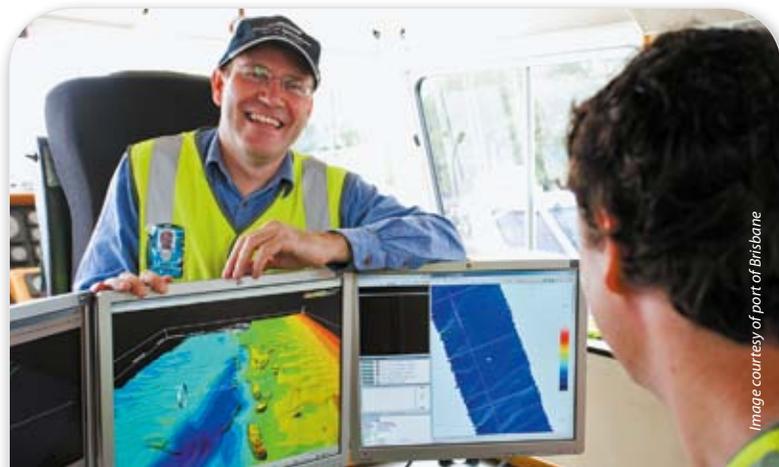
Image courtesy of port of Brisbane

Tested rigorously

Before a release candidate is made available to Customers, hundreds of tests are undertaken using a fully automated software test system, which rigorously tests the outcome of a great variety of typical operations against benchmark results. Tests are undertaken on a number of operating systems, and also under non-English regional settings, in order to replicate the global and varied uses of our products.
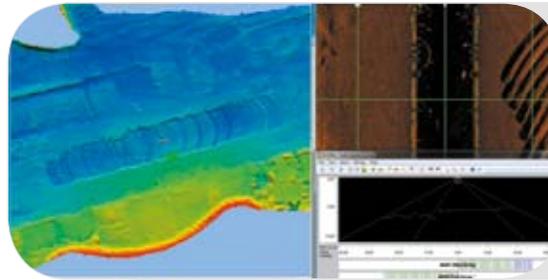
QINSy is a hydrographic data acquisition, navigation and processing software package. The suite of applications can be used for various types of surveys, ranging from simple single beam surveys up to complex offshore construction and engineering works.
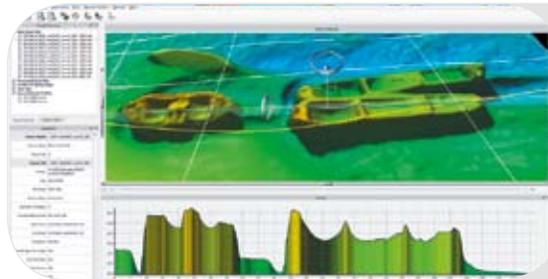
Qimera guides the hydrographic processor through data processing steps, simplifying what has traditionally been a complicated process. It's unique IO Balanced Multi-Core Engine is specifically designed to process bathymetry data as rapidly as possible. Qimera also contains some of the most advanced tools for troubleshooting installation and data issues.
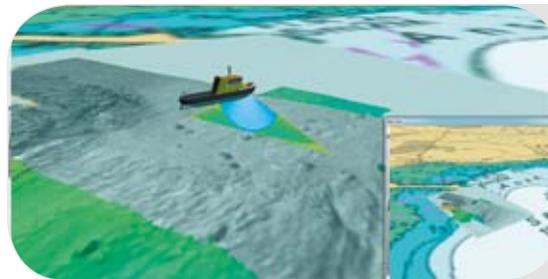
Fledermaus is the industry leading interactive 4D geo-spatial processing and analysis tool. With the release of Version 7 we have moved this to the next dimension: the addition of a fully integrated time reference allowing users to work in a true 4D space and time environment.

Qastor is a precise marine navigation, piloting and vessel docking software, primarily designed as an ECS for marine piloting operations. Qastor has also proven to be a useful navigation tool in several other fields including Ship Trials, Oil Rig Positioning, Inland River Barges, SPM Approaches, Ferry Operations, Oil and Gas Tanker Approaches and Docking, Patrol Vessels and Tugboat Operations.

YEARS QINSy · 1997-2017

Quality Integrated Navigation System (QINSy)

QINSy SURVEY is the complete version of QINSy and supports multiple objects and interfacing of many survey sensors. QINSy Survey is intended for more complex survey operations involving multiple vessels/vehicles and where backup sensors are widely used.

As multiple objects can be defined, QINSy Survey can be used for all types of offshore activities like anchor handling with tug management, pipe and cable lay operations, and of course ROV/AUV/Crawler operations. QINSy Survey comes with data acquisition, full survey planning, data cleaning and valida-tion, data exchange and mapping. This version of QINSy can be customized with add-on modules like the MBES and SSS addons, plus Remote Display Control.

Accurate timing is critical in complex surveys and as part of its core design QINSy has always been able to use a timing routine based on the 1PPS option from GNSS receivers. For less time critical operations, it is able to utilize NTP time synchronization methods, or NMEA messages.

# One product, many applications

QINSy not only allows multiple vessels (each with their own absolute or relative positioning system), but also allows Linked Objects attached to a vessel, and so is capable of complex posi-tioning and visualization tasks required on modern offshore and engineering projects.


QINSy INSHORE is the entry level license that is an easy to operate hydrographic survey package. It allows the user to interface one GNSS, one heading and one singlebeam echosounder (dual frequency) device. With relevant displays and functionality, QINSy Inshore can be used for data acquisition, survey planning, cleaning and validation, data exchange and mapping.

Image courtesy Deep bv

QINSy LITE, like Inshore, is limited to one object and then one of each type of device (GPS, Motion, Echosounder), but unlike Inshore has all the display options of Survey. This version can be used for data acquisition, survey planning, cleaning and validation, data exchange and mapping. Lite can be customized with add-on modules like the MBES and SSS add-on making it ideal for harbor or coastal survey operations.
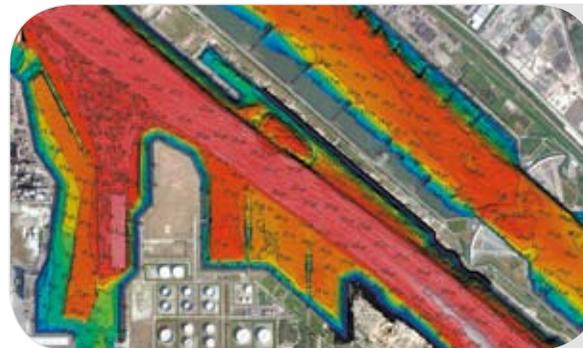
QINSy OFFICE is the offline license and is meant for planning or processing activities. Data that is recorded with one of the QINSy acquisition licenses can be analyzed, replayed, validated, visualized, and mapped or exported. For processing MBES or SSS data QINSy Survey Office can easily be customized with the same add-on modules available to QINSy Survey.

Survey sensor manufacturer independent

The following sensor types are among those presently supported by QINSy, and can be exchanged via RS232 or LAN:

• Surface and underwater positioning, including Inertial units.

• Heading, motion and integrated attitude and layback systems

• SBES, MCES, MBES echosounder, laser scanner, and SV, SVP and Tide systems

• SideScanSonar and Magnetometer systems

• ADCP and SubBottomProfiler systems

• Generic (user defined) Input/Output systems

• Eventing, Closure output and Output systems

• AIS and ARPA systems

• Dredge management/status systems

Inertial navigation and attitude systems are able to provide data at 100Hz and QINSy is quite capable of utilising such data streams at their full data rate
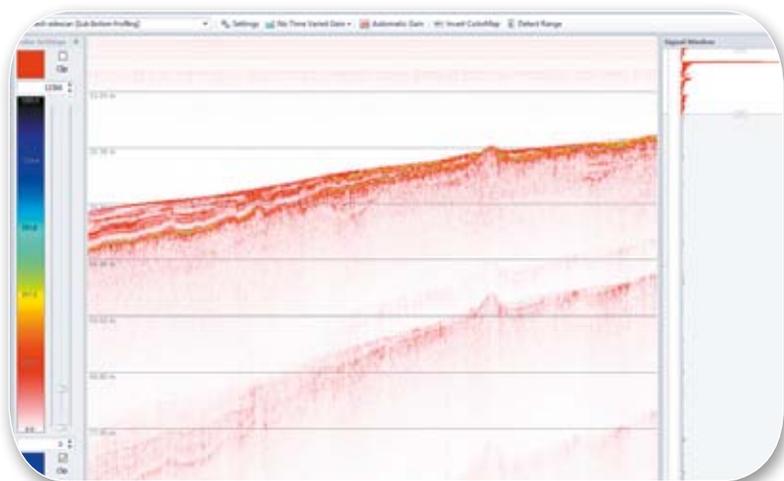
Units, Geodesy and map projections

QINSy includes distance units other than Meters. Plenty of ellipsoids and local survey datums, plus a wide variety of map projection methods, and the more popular "pre-defined" coordinate systems, mean QINSy is well suited to projects around the globe.
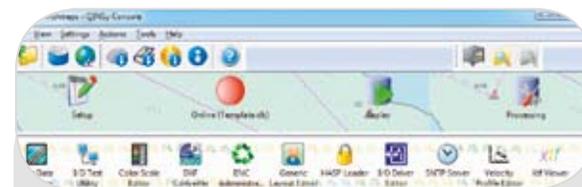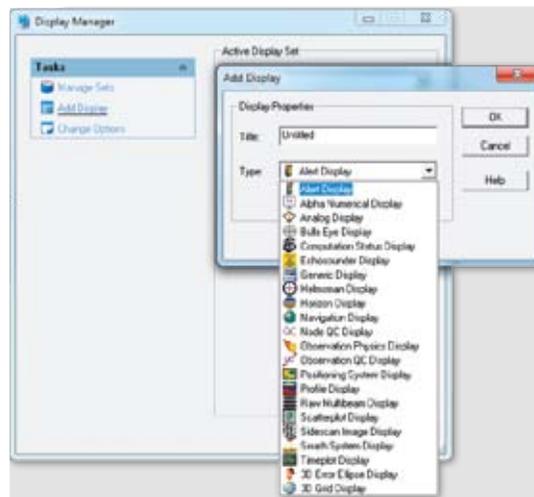
Project data are neatly separated and stored in a group of folders on the storage media. QINSy relies on a template database file, that maintains the project geodesy, objects and survey sensors. At any given time, one nominated template file is the active settings for all QINSy operations, but multiple templates can be created for easier change-over between different survey operations.

The "support folders" are there to avoid unnecessary duplication of often used background or support files.

DISPLAYS: QINSy offers an excellent selection of display types and each display is highly configurable. When QINSy is operated on a modern workstation with powerful graphics capability, then any number of the same display type can be simultaneously opened and used. Some QINSy displays are generic to many project types, whilst others are very specific to certain sensors.

With Remote Display enabled on the main Survey license, any number of remote clients can connect and use the shared data. The remote client has the flexibility to configure their own displays, and even take remote control of data storage.

DATA FILES AND DATA EXCHANGE: All interfaced sensor data is captured to the QINSy Database (*.Db) file, that is QPS proprietary format, and highly optimized for the storage of fast updating sensors and the wide variety of supported sensor types. Utilities are available to import and export data to/from popular exchange files formats.

## Simultaneously survey with MBES, laser scanner and camera

QINSy can simultaneously collect and process data from MBES and Laser Scanner (mobile mapping topographic scanners sensors, or underwater laser units), plus Digital Cameras can be interfaced and geoTagged images collected.

MBES and Laser units from all major manufacturers can be interfaced to QINSy, as single-head or multi-head systems. QINSy also includes Controller options, so avoiding the need for separate software to control the MBES or Laser sensor. All modalities (bathymetry, backscatter and water column) of MBES data are collected.
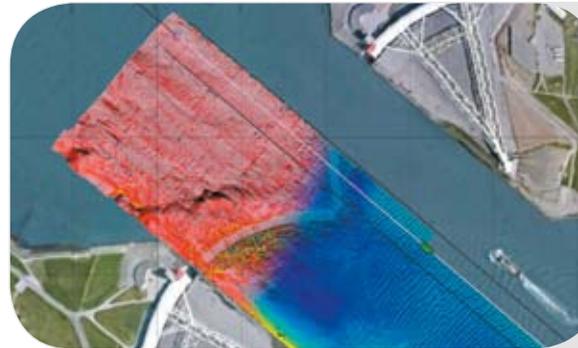
QINSy promotes IHO S-44 5th Edition that provides "Standards for Hydrographic Surveys", by computing Total Horizontal/Vertical Uncertainty (THU/TVU) values.
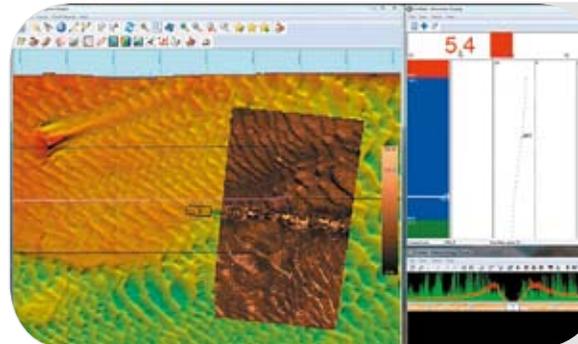
The Side Scan Sonar tools in QINSy provide realtime waterfall display, normalized mosaic and contact reporting functions. SSS towfish can be positioned by USBL or layback. In processing, the mosaic can be exported to geoTIF, along with a comprehensive contacts report.

Multibeam bathymetry, backscatter and water column data

A key objective for QINSy is to save time in processing and the possible need for re-survey. By providing tools for real-time QA/QC and on-the-fly correction for sensor offsets, attitude, sound velocity refraction, data flagging and tide/height, DTM points are derived as the survey proceeds.

The multi-layered sounding grid data shown in the Navigation display is populated with corrected DTM points on-the-fly, giving the operator a complete view of what has been surveyed. Advanced rendering and Sounding Grid cell attributes like the "95% confidence level" and "hit count" are the tools that promote real-time QA/QC of collected data. A design DTM and/or previous survey allows real-time monitoring of DTM differences.

QINSy provides a semi-automated MBES/Scanner calibration (patch test or boresight) module.

Dredging and rockdumping

Dredging vessels come in all shapes and sizes, and utilize several different methods of dredging, from suction to backhoe. Functionality in QINSy provides a full range of support for dredging vessels and excavators, from the smallest excavators to the largest cutter suction and trailing suction hopper dredgers.

QINSy interfaces to, and communicate directly with, the dredging computer systems on-board the dredger, receiving all vital information needed to determine where the dredging tool(s) is in reference to the vessel. QINSy uses data from density and velocity sensors to compute the production of the vessel and signals from dredge status sensors for process automation.

An advanced algorithm to connect all moving parts is used to calculate the position of the dredge tool(s) from measured angles and distances, regardless of the movement of the dredge vessel itself.

The Eventing utility uses simple "hot" keys to record dredging actions as instantaneous, or periodic, events, and production reports are available for export and printing.

Image courtesy Jan De Nul Group

Configure, monitor, visualize and report

Visualization of the dredging process is very important and for this QINSy includes various displays to view the dredger, the dredge tools, the excavated DTM and the design DTM in 2D (plan and profile views) and in 3D. A range of QA/QC tools ensure a smooth operation and provide audio and visual alarms.
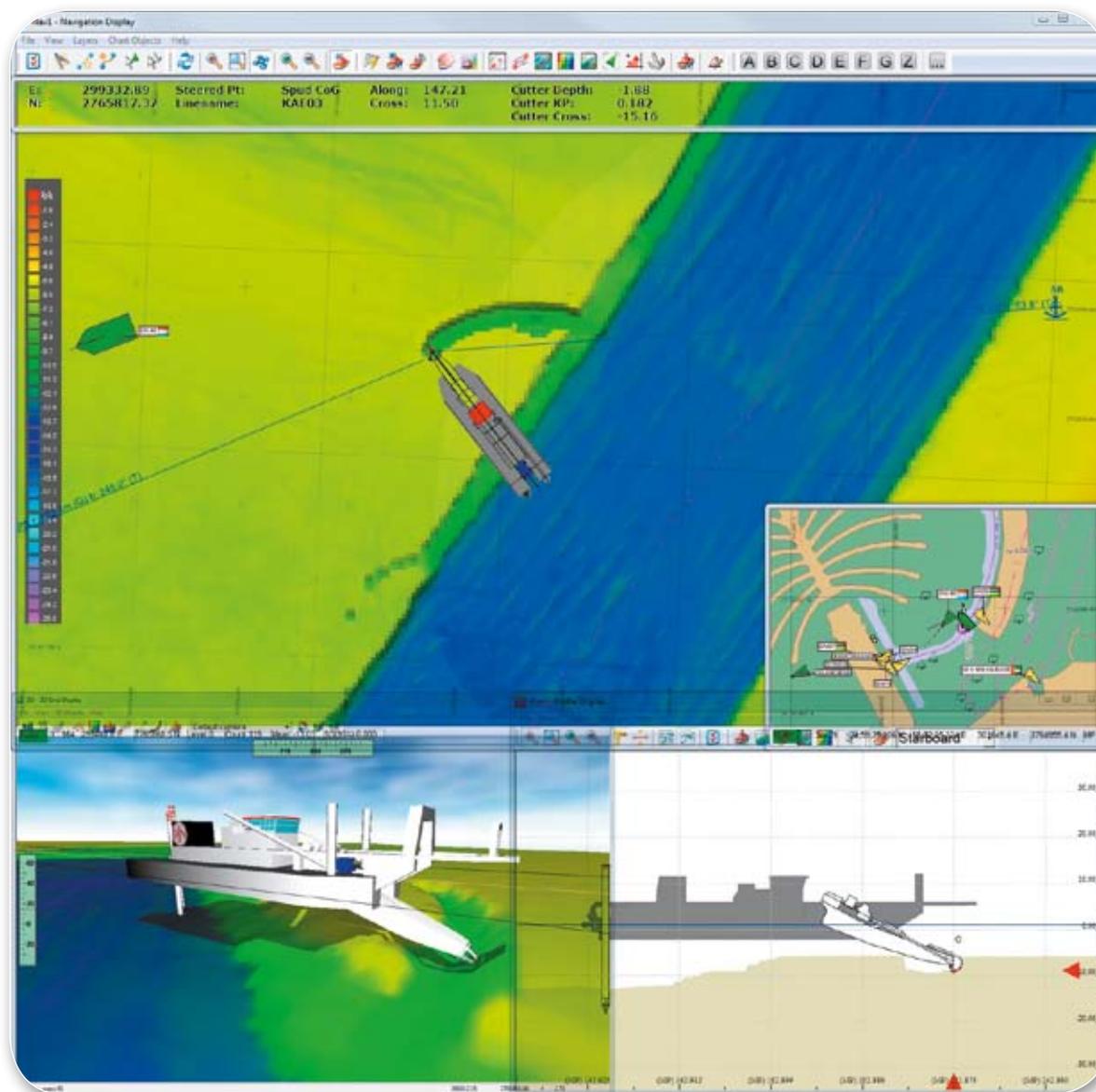
Offshore construction

QINSy includes the Remote Display Client which allows any data to be shared with remote QINSy installation via LAN. Any number of remote clients can connect and use the shared survey data, and the remote client has the flexibility to completely configure their own displays, and even take remote control. This is an ideal way of sharing survey data with the Wheelhouse, Client, ROV operator, support vessel, etc.

Drilling rigs have to be moved from one place to another and locating the rig over the intended location in the specified orientation is a job QINSy handles expertly. Specially developed anchor handling options are available to assist in the anchor handling operation and bi-directional data telemetry to exchange the necessary information between the rig and the attendant tugs.

Pipes and cables on the seabed need to be protected from anchors, trawlers and other risks. Specialist vessels are used to place protective materials, sometimes in very large water depths, in precisely the correct location and this requires a reliable integrated solution such as the one offered by QINSy.

Trusted solutions

The advanced core technologies of QINSy are the trusted solution for often highly complex, route and time critical, offshore construction projects such as rig moves or pipe/cable lay and bundle towout.
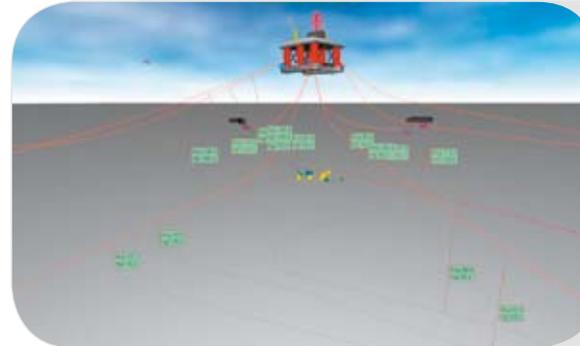
Real time advanced catenary tools to compute the tow cables & anchor chains involved in a rig move using a rig and one or more anchor handling tugs. During each computation cycle the location of the anchor plus the catenary of both the tow wire and the anchor chain are computed after which they are displayed in 2D and 3D.
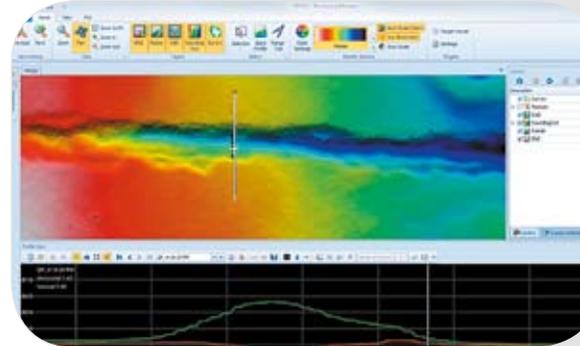
To minimize operational downtime, QINSy incorporates sophisticated Kalman filter algorithm to smooth positioning data and create a steady track of the vessel and fall pipe ROV.

During pipe and cable lay operations, the proposed route is shown on the navigation display, and used by QINSy to calculate the barge track, which is different than the proposed route itself, and dependent on the offset from the vessel's reference point to the "touch-down point".

Supervised and unmanned surveys

Remotely Operated Vehicles (ROV) and Autonomous Underwater Vehicles (AUV) are in fact diving robots for carrying out operations like survey, inspection, observation and connectivity. These electric or hydraulic motorized vehicles are well equipped with a multitude of sensors which allow researchers to explore the hidden and mysterious subsea world and let engineers from oil and gas companies inspect and manage seabed assets.

Autonomous Surface Vehicles (ASV) have for some time been used by defence organizations as target drones or for surveillance. Recently, thanks to improved endurance abilities, they have been adapted for marine survey purposes.

Subsea technologies are expected to see the strongest investment in coming years, to support exploration into new or challenging environments. This indicates that many view the development of deepwater reserves as a principal means of replacing depleting traditional reserves, and so remote platforms are expected to play an even greater role.
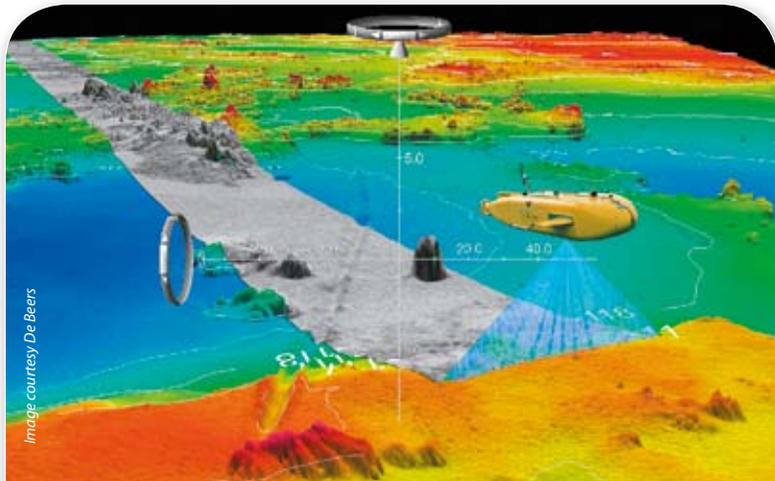
Image courtesy De Beers

To tether, or not to tether.. that is the question

The hybrid AUV/ROV bridges the gap and delivers a complete hydrographic data acquisition, navigation and processing package that is fully integrated.

The Seaeye Leopard is designed to offer an exceptionally powerful electric work class ROV in a compact chassis. With Seaeye's iCON™ intelligent control system, this ROV provides many benefits and is ideally suited to work tasks including drill support, pipeline survey, exploration, salvage, cleaning and deep water IRM.

Without the need of a ship on station or anchoring, the multi-role USV is designed to conduct unmanned surveying and environmental monitoring projects. It is well suited to have QINSy onboard and complete data collection and provide provisional results quickly using Qimera processing. Courtesy SeaRobotics Corp.

As offshore operators go deeper and into more difficult to access areas, the Saab-Seaeye Sabertooth Hybrid AUV/ROV concept is attracting interest from those looking for a reliable and versatile underwater vehicle that can accommodate a wide range of data acquisition systems and tooling onto a single platform.

Management, Presentation, Exchange

The Processing Manager is the hub for many of the actions related to data exchange and mapping.

Soundings and or Contours from entire survey areas or selected regions can be generated. Choose the sounding grid layer (and so the level of resolution) the contour interval and range to quickly generate contours. For sounding selection, use either selected grid cells method or the within search radius method.

Volumes computation from the entire survey areas, or selected regions are possible, and further options are available for volume values between different layers within one sounding grid file or against design models, and either using a triangulation or grid cells method. The volume computation report is saved in HTML format, and includes the full details of the used files as well as the area selected, not forgetting values with respect to upper and lower tolerance thresholds.

The Processing Manager also includes the Line Planning utility that is used to prepare the survey run-lines. Having the electronic chart, or GIS/CAD, or geoTIFF files in the background makes planning easy. This utility also includes an up-to date library for data exchange in CAD and GIS formats, both import and export.
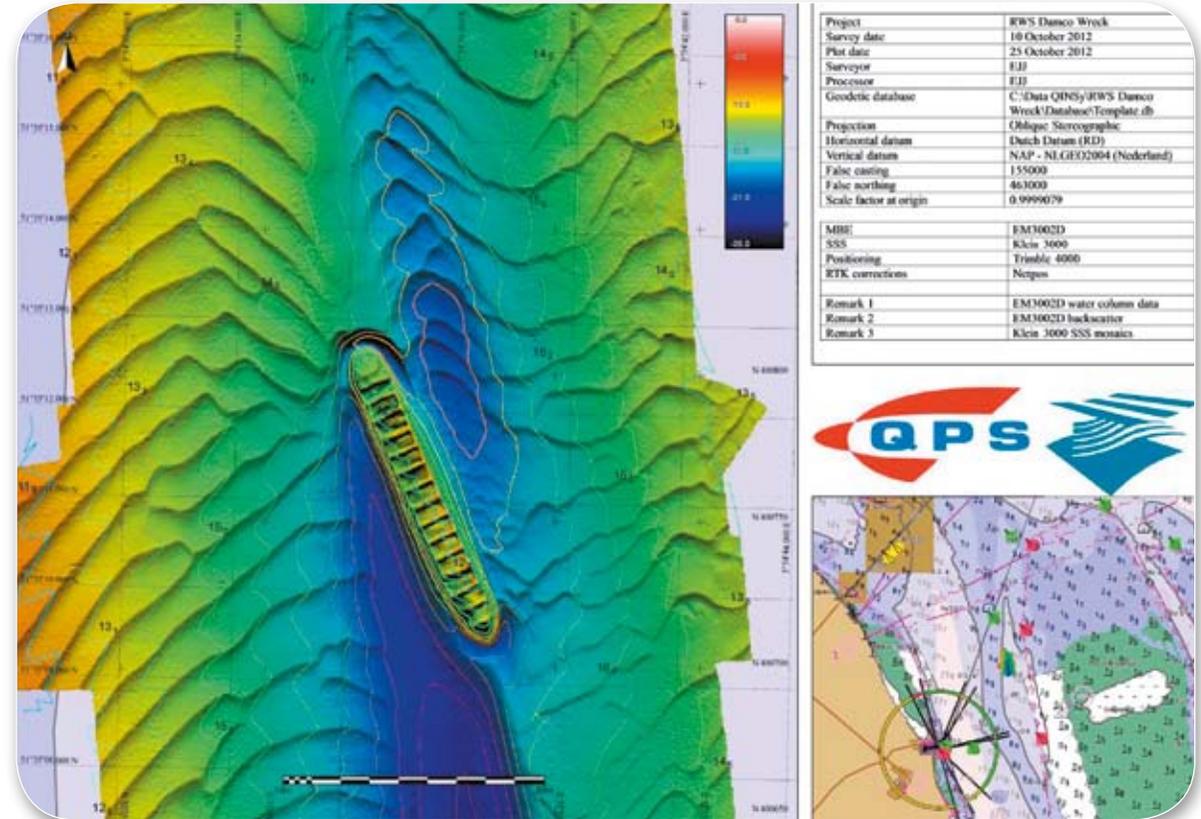
Post-processed trajectory

An increasing number of coastal surveys, and also ROV/AUV surveys are using post processing navigation tools to reprocess the real-time navigation solution to improve its accuracy and perhaps resolve installation issues. Then the post processed navigation solution is merged with the bathymetry data. In Processing Manager, it is possible to import a variety of trajectory formats, without losing work already done to edit/validate the DTM points.

Hydrographic Processing Evolved

We've taken the core technologies of QINSy and Fledermaus and joined them together in a new platform…

Qimera is an easy to use yet most powerful sonar data processing application. Built using core QPS technologies, Qimera supports the major raw sonar file formats and by working with a Dynamic Workflow it revolutionizes the way data is handled.

Qimera intelligently guides you through the data processing stages, simplifying what traditionally has been a convoluted process. Multi-day, multi-vessel, multi-sonar datasets are handled with ease.

Operating on the latest computing technology, it is 64bit and the unique IO Balanced Multi-Core engine is specifically designed to process sonar data as rapidly as possible. Qimera also contains a number of advanced tools for troubleshooting common equipment installation issues.
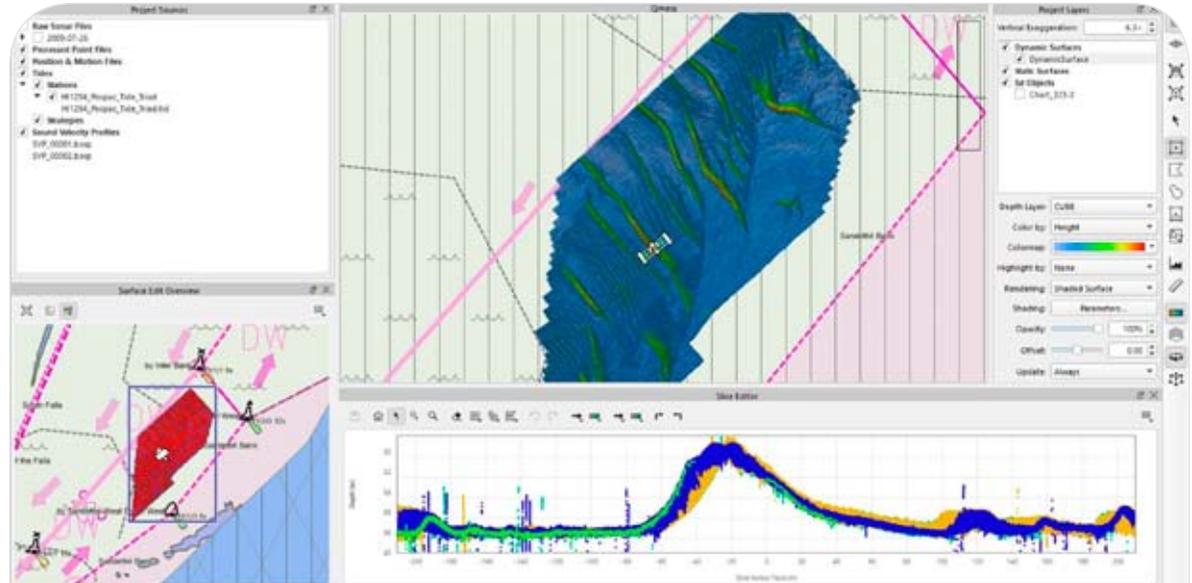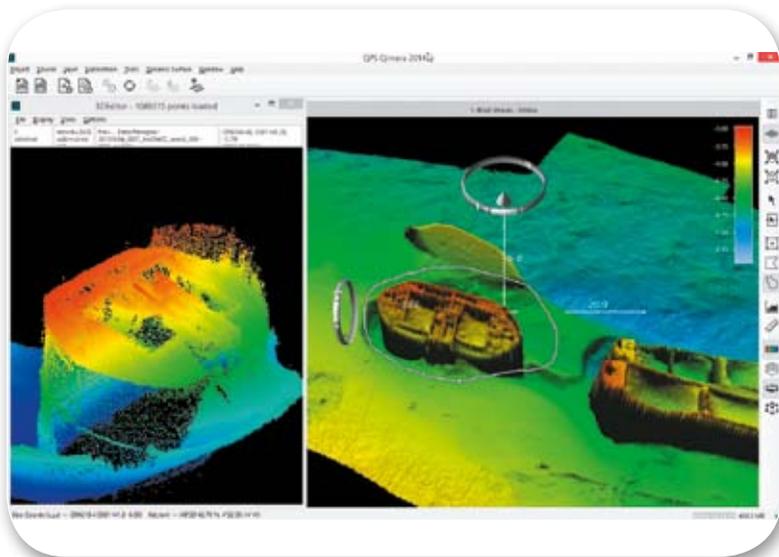
Acquire – Process – Visualize – Share

| Survey Management	Acquisition, Dynamic Ops	Production Processing	Interactive Analysis	Authoring & Distribution

Qimera is a completely new product, coded from the ground up..

• is intended to be sold either as stand-alone or sold in a suite.

• has the flexibility to sell into many markets with a variety of workflows.

• is feature rich, fast, accurate and easy to use: an excellent value proposition.

• is built to be localized for regional flexibility.

• the architecture allows for more timeline updates and feature releases.

State of the art functionality for hydrographic processing
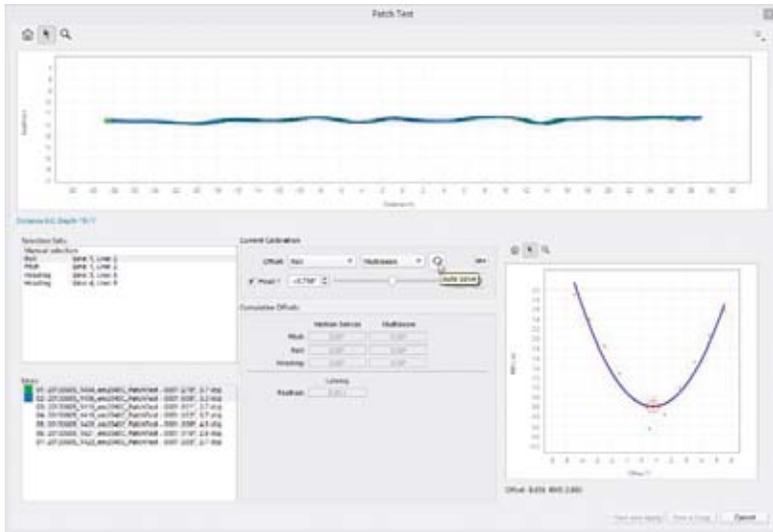
2D/3D/4D Supervised Sonar Processing

Patch Test

SVP processor

Inside Qimera

New User Experience Design

New Interactive Tools

Timeline Data Management | Dynamic Workflow

I/O Balanced Multi-Core Engine

Dynamic Surface | QINSy Multibeamer | PIO | Fledermaus Visualization
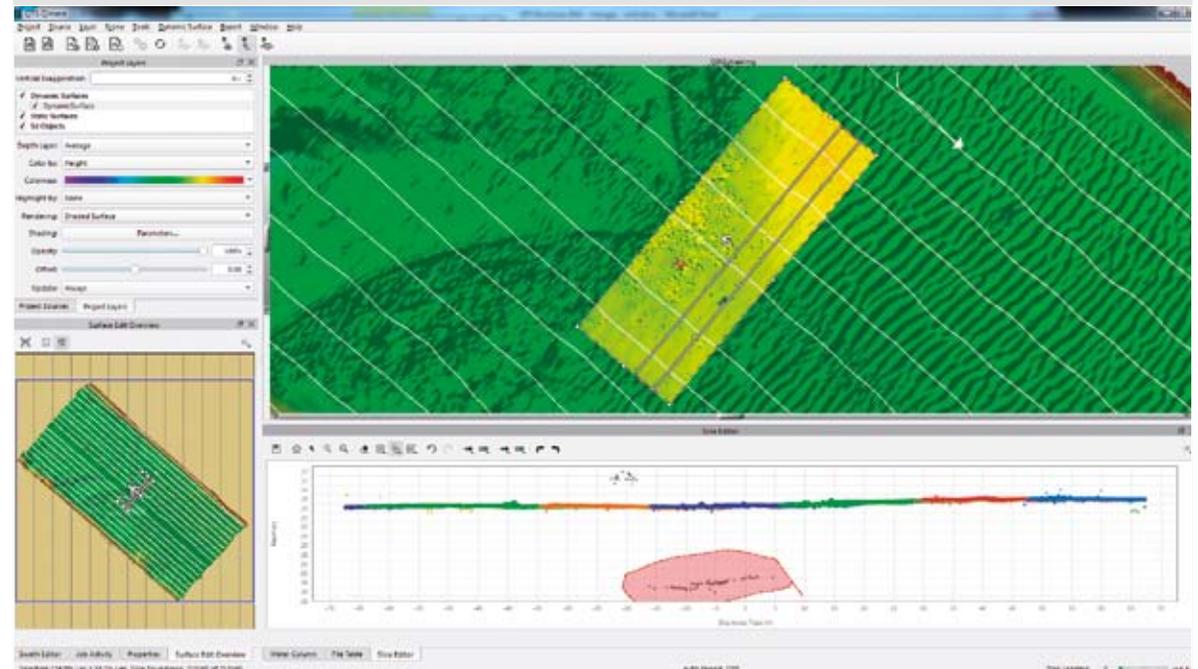
A toolkit for very fast processing

Qimera Live: Qimera Live is near real-time loading of data into a Qimera project. The raw data folder is monitored and when the file is closed it is loaded into Qimera with the filtering and vertical settings as set in the raw file. The new data is added to a dynamic surface. Qimera Live helps minimise the time to start processing.

Patch Test Auto Solve: The Patch Test Tool now has an auto solve button and a graph showing the parabola of errors, the calculated offset and the RMS values.

Multibeam and motion sensor yaw misalignment correction: The Wobble Tool can now solve a yaw misalignment between the multibeam sonar and the motion sensor which created a roll/pitch cross-talk artefact in the data.

Time Series Multiplot: A correlated time series plot is now available to show multiple sensors in relation to time on a single plot. It is also possible to calculate and display differences between two sensors. The Time Series multiplot is very useful for working out latencies in an ROV setup by displaying the roll with the results of computing an outer beam. Any phase difference between the two can be applied as a latency to the motion data.

Tidal Correction Processing enhancements: Applying tides to data in Qimera has been significantly enhanced to be able to apply tides from either single, two station line interpolation or a multiple station distance interpolation. It is also possible to apply time offsets and scale factors for full tide control.
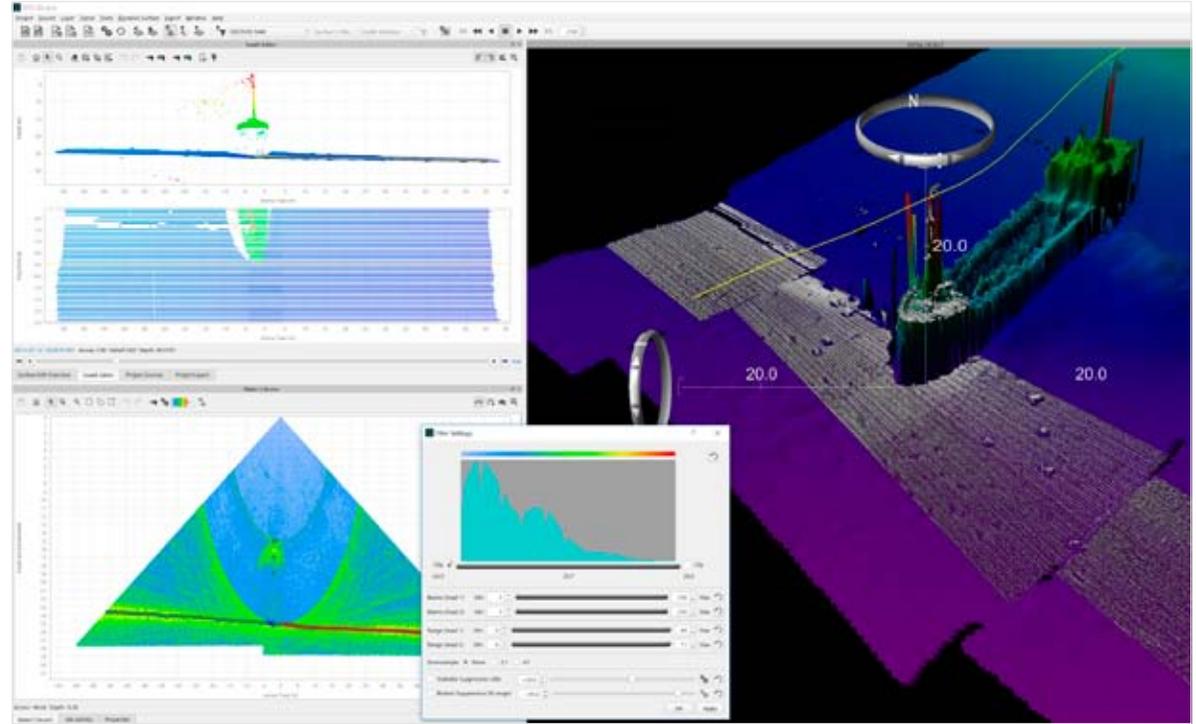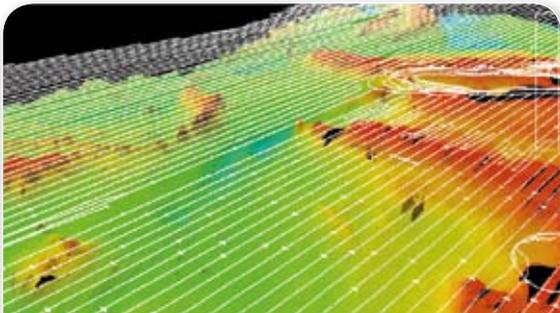
Support for Kongsberg "Extra Detection" and Teledyne-Reson "Multi-Detect" data

Now offered by some MBES the capability to choose more than one bottom detection for each beam is supported in Qimera. The additional detections are handled separately to the normal detections and are visible in the Editor views and Water Column view to give as much information as possible to aid processing of them

More than just a picture

Fledermaus is the industry leading interactive true 4D geospatial processing and analysis tool.

Commercial, academic and government organizations use Fledermaus to interact with massive geographical datasets of numerous data types for ocean mapping and land-based projects.

The intuitive 4D environment allows users to rapidly gain insight and extract more information from their underlying data. This provides added value in data processing efficiency, quality control accuracy, data analysis completeness, and project integration, that promotes clear communication. 4D Fledermaus scenes can be distributed and viewed using the freely available viewer, iView4D.

Instead of sharing the Fledermaus scene, impressive fly-throughs can be created and distributed as WMV or MPEG movie files. Or, data can be exported to KMZ for viewing in Google Earth. Fledermaus also provides image creation tools, allowing you to generate high-resolution perspective images, profile images, and sun-illuminated georeferenced images for posters, presentations, and publication.

*Image courtesy of GEOMAR*
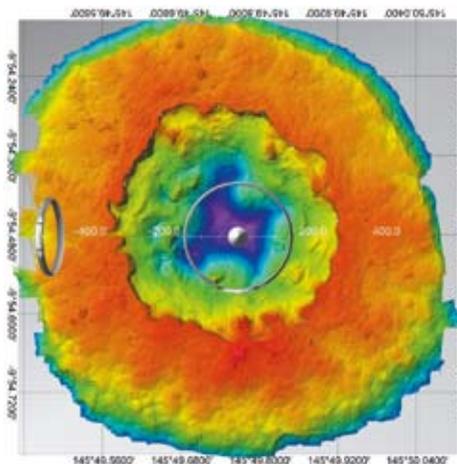
True space and time 4d environment

A wide variety of industry standard formats are supported for direct import of data to the 3D scene. The extensive functionality of Fledermaus allows its use across many phases of a project from the planning, processing and QC, through to analysis and production of images, plots and animations.
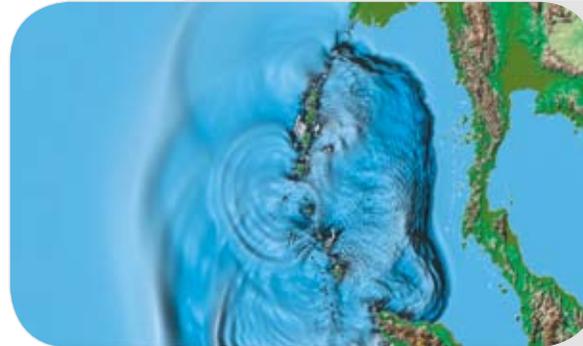
Planning for weather events and studying sea level rise are just some of the examples of environmental monitoring and planning. Others include establishing or observing marine protected areas, monitoring coastal erosion and beach migration, developing fisheries management plans, planning for dredging or beach nourishment operations, and dealing with waste disposal or monitoring old dump sites.

Additional grids, draped imagery, nautical charts, contours, Electronic Nautical Charts, and other information can be added to support your processing. Once data is refined to a clean sounding or point set, Fledermaus has the tools you need to produce your survey report and products.
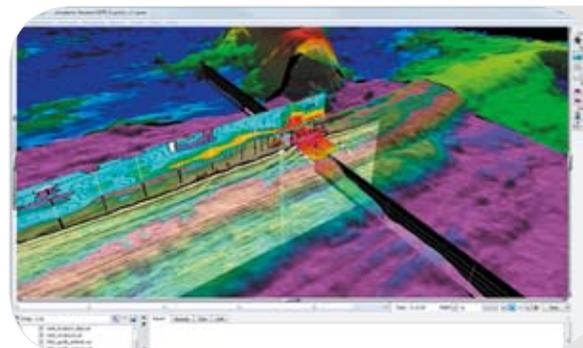
Sounding-selection for charting or shoal-biased thinning can quickly be performed on the data using approved filters and algorithms; as you compile your feature reports, you can consult the multibeam water column data over wrecks and hazards to be sure the least-depths were detected. Bathymetric Attributed Grids (BAG) with proper metadata, survey area poly-gons, and Sounding Density Surfaces can be gener-ated to show coverage and for quality assurance.

The integrated marine habitat toolbox

FMGT is designed to visualize and analyze backscatter data from MBES and to a lesser degree SSS sensors. In processing the source files into mosaics, it is designed to perform as many corrections as possible to maximize the information content within the backscatter signal.

The software can read multiple files of backscatter data, apply corrections, and then create a 2D representation of the ocean floor called a backscatter mosaic. Once the mosaic has been generated, various statistics can be calculated and exported in a number of formats, along with the mosaic backscatter value. Angle range analysis (ARA) can also be performed to attempt to classify the seabed types. All of the processing pipelines of FMGT are multi-core aware to maximize throughput of data and mini- mize any required reprocessing due to changes in desired output mosaic resolution or alteration in the number of data files.

Integration of new data to update interpretations of seabed sediments

Bathymetry

Rugosity

BGS 1:250,000 Sea-bed sediment mapping — New sediment interpretation – 1:50,000

Courtesy of the MCA Civil Hydrography Programme

A multi-disciplinary undertaking

Marine habitat mapping is all about creating a complete picture of the seafloor – the morphology, sedimentology, and biology – and interpreting the results to create thematic maps of distinct habitats that can guide marine policy, management, and resource utilization.

Offshore Engineering tools

Interactive Pipeline Object: new functionality for analysing, visualizing and reporting on pipelines and cables within a Fledermaus scene. This is a dynamic object that can be created by digitizing points on the surface or importing an existing pipe or cable route.

The new object works with any Dynamic Surface, either created directly in Fledermaus or imported from QINSy or Qimera. This version also introduces many complimentary new objects, controls, and displays that work alongside the pipeline object.

Dynamic Surface: Previously Fledermaus allowed dynamic surfaces to be brought into Fledermaus by opening a QINSy or Qimera project. Now you can directly create a Dynamic Surface from a set of input data. A dynamic surface object provides significant advantages over working with a standard static SD grid, including the ability to handle much larger area surfaces. There is also the ability to work directly with your source point data, allowing functionality such as the Dynamic Point Cloud (point cloud data read directly from linked QPD files).

Image Collection and Video Objects: Is a new way to interact with large sets of 2D geo-referenced images. After creating a spatial index of all images in a folder, within the Fledermaus scene, the nearest image to the current active pick point will be displayed. Whilst the new Video object can be used to display time synchronized video in an external viewer.

# iVIEW4D – free Fledermaus scene viewer

Our iView4D free viewer has been enhanced to provide additional functionality to support interactive analysis of FM scene files. The new features are: - Interactive Profiling – hold and drag the right mouse button to create a profile - GeoPicking – interactively pick points and export them for use elsewhere
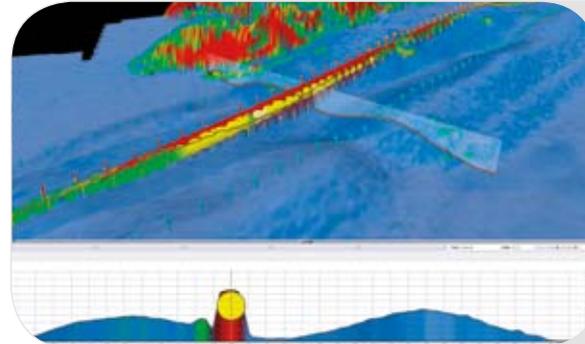
The pipeline object can create a profile object directly from the current path of the pipeline. This profile has all the capability of the standard profile object and also displays the pipe as part of the cross profile display.
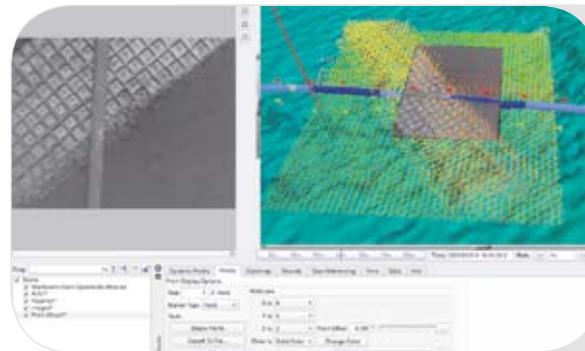
As well as including the image in the scene, there is a new 2D image display that will show the same active image but in a separate 2D window which also allows to zoom/pan in for more details in the image.
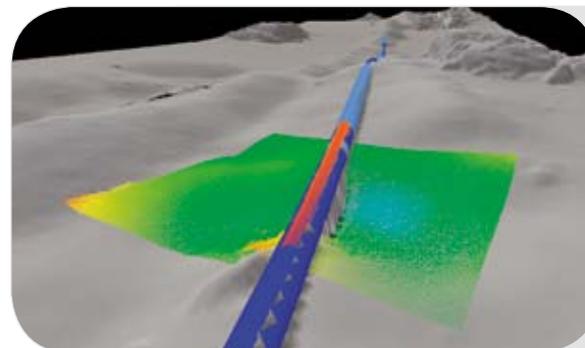
Any dynamic surface in Fledermaus can now create a child object that dynamically displays the QPD data for a set area around the currently active pick point (a manually picked point, or vessel or AUV/ROV track).

Water column analysis tools

FMMidwater rapidly extracts relevant water column features from a range of sonar file formats. Raw sonar files are first converted to a Generic Water Column format (GWC) for use in further processing and visualization. A simple graphical user interface is used to perform threshold filtering on a number of key parameters to help with feature extraction. FMMidwater also provides multiple views of the water column features and finally allows for easy export to a variety of Fledermaus visualization objects and exchange files.

Being able to show echosounder bathymetry and water column data, interactively in the same Fledermaus 4D scene, has aided interpretation of seabed survey results during hydrographic surveys for charting purposes.

Identifying the shoalest depth has often proved tricky to achieve, with a Bar Sweep typically being the preferred methodology. In recent years, results derived from water column data has been accepted as an alternative, and far more cost efficient and safe, way of determining the shoalest depth.
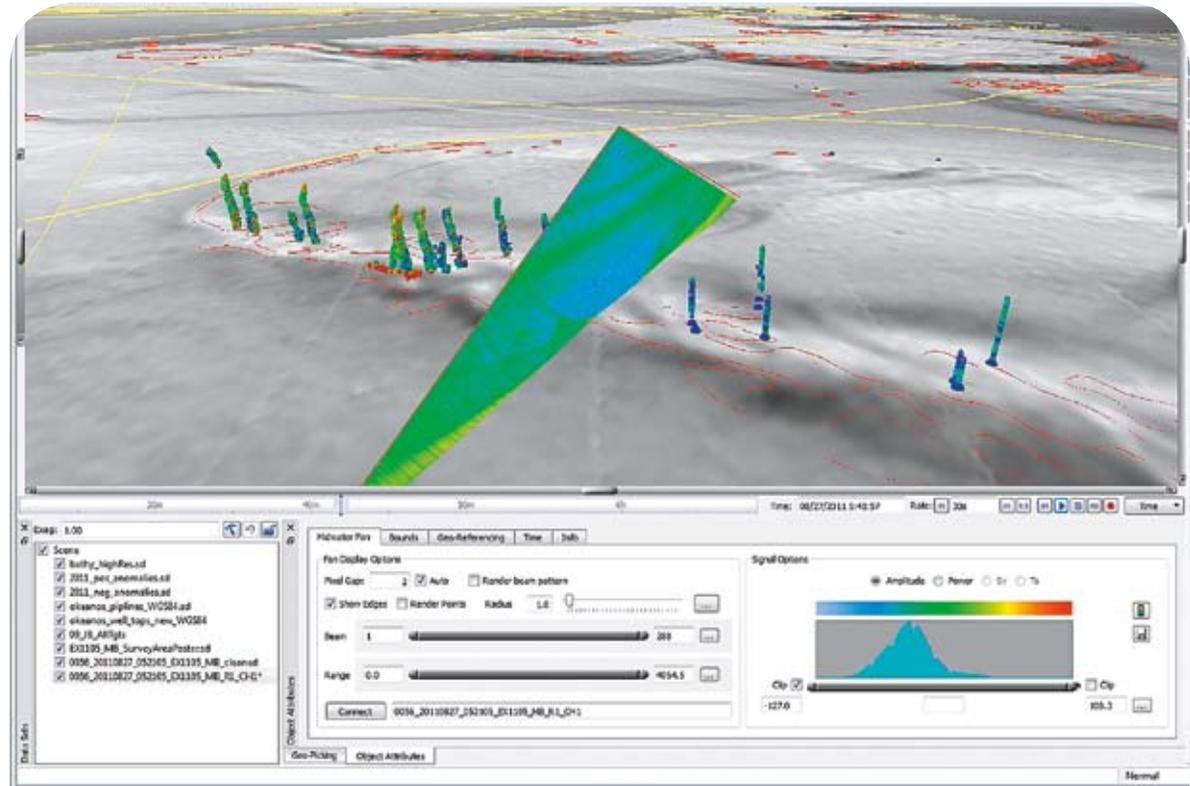
Oil and Gas seep detection

The most recent developments for the Midwater utility have been in the field of semi-automated Seep detection (Dr. Tom Weber CCOM UNH), for Oil and Gas projects.
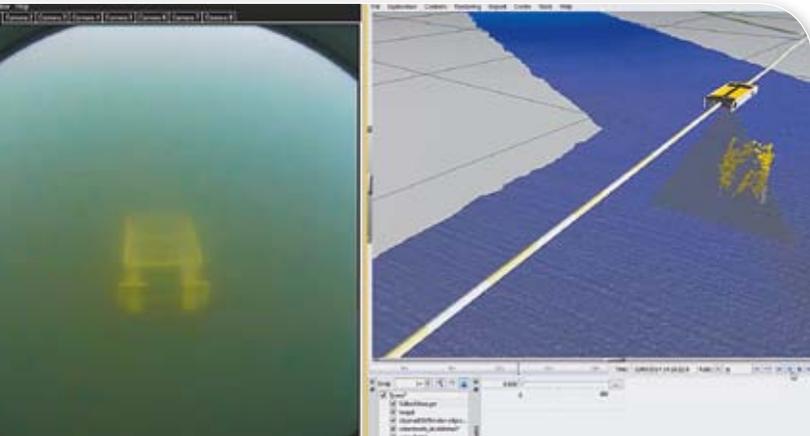
Fledermaus extensions

In computing, a plugin is a set of software components that adds specific abilities to a larger software application. Plugins enable customizing the functionality of an application. As such, Fledermaus is a "Platform" rather than a "Product". Why Plugins? Quite simply, they enable 3rd party developers to extend the platform capabilities, which leads to new markets and increased user base.

It's as easy as; close the host application, then copy a new plug-in into the application "plugins" folder, then restart the application; Voila! new cool functionality is available.

Fledermaus allows direct connectivity to an ESRI® ArcGIS workspace through the SD ArcWorkspace object type. Having this SD object in your scene allows you to browse an ArcGIS workspace for Fledermaus compatible objects and load them directly into your scene. Conversely, you can take ArcGIS Aware SD objects from your scene and transfer them directly to any connected ArcGIS workspace. Fledermaus allows your scene to have multiple connections so that you can move data to and from any number or type of ArcGIS workspace objects.
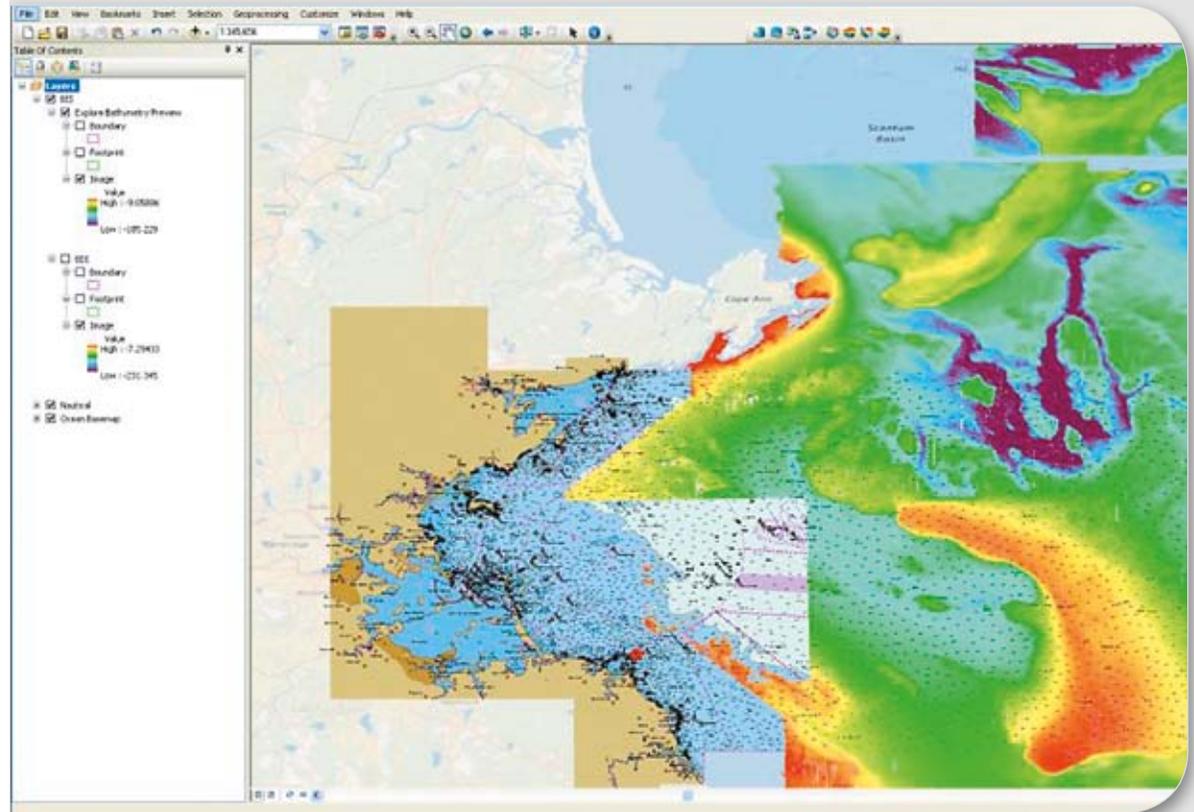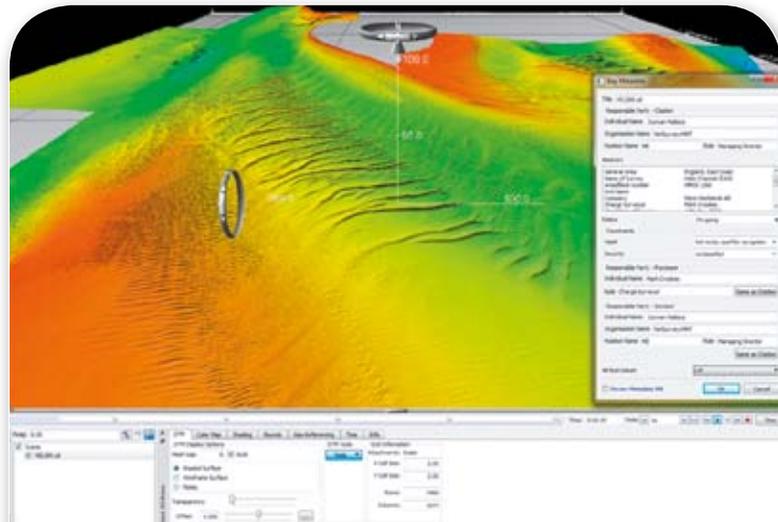
Link with Esri ArcGIS

ArcGIS for Maritime: Bathymetry is an extension to ArcGIS for Desktop that supports a "produce once, use many" capability to allow you to easily serve and use your bathymetric data for a variety of needs, regardless of its source or where it is stored. With ArcGIS for Maritime: Bathymetry you can create a single composite bathymetric surface on the fly to visualize multiple surfaces in one frame of reference. The solution also helps you control your hydrographic survey footprints to identify data holdings and see gaps quickly.

ArcGIS for Maritime: Charting helps national hydrographic offices, charting agencies, and subcontractors significantly increase the speed and flexibility of their production operations. The solution provides a true GIS-based platform to improve, standardize, and expedite data and workflow management. This enables efficient chart product creation and data sharing within your organization and with other agencies for flexible and efficient interoperability.
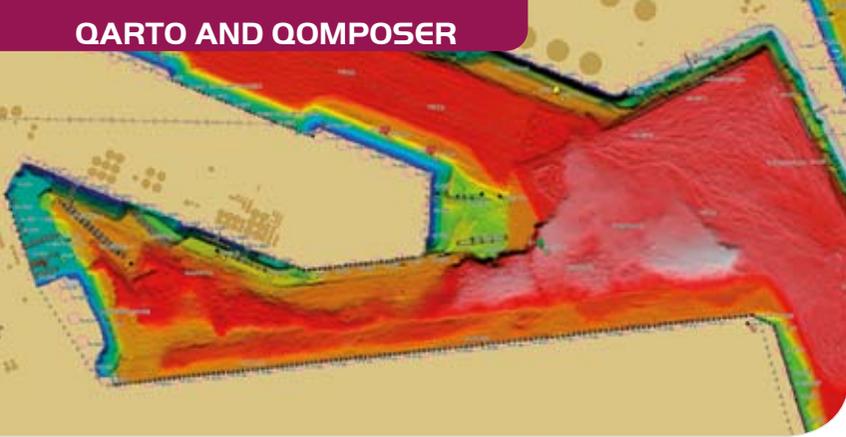
Qarto as part of your ENC production

Why Qarto? The strength of Qarto is the very fast and auto-mated ENC production. Qarto makes possible the short turn-around times from survey to chart that are necessary for the safe operation of the busy waterways e.g. in the Westerschelde and the Port of Rotterdam.

Qarto can be part of your ENC Production suite that is built on ArcGIS - the system consists of three primary pieces: the Bathymetric Information System (BIS), the Nautical Information System (NIS), and the Maritime Chart Server (MCS).

Or Qarto can operate standalone, using the QPS gridded data file to store the bathymetry data (each cell has many attributes including Date) and ENC base cells made available by 3rd party tools.

Qarto is bundled with Qomposer, the QPS tool for ENC edits. Qomposer can import source files like CAD and imagery files, or the current S-57 and then be used to export a new S-57 after changes have been made.

ENC production in just a few steps!

In late 2014, QPS reached agreement with Rijkswaterstaat (RWS), The Netherlands, to provide a new software suite (Qarto vn3) to replace the existing Qarto vn1 as used by a number of regional RWS offices. Key to Qarto3 vn3 was the tight integration with an Esri ArcGIS For Maritime solution being implemented by RWS.

Stage 1 in the ENC production workflow is to arrange the base ENC – one that is complete in accordance the IHO requirements except for the bathymetry data layers.
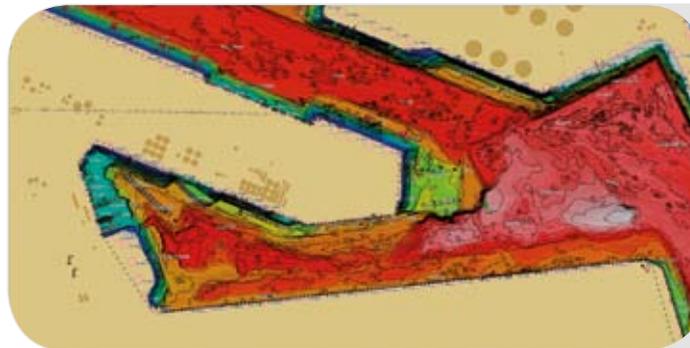
Then stage 2 of the ENC production workflow is to contour the bathymetry dataset and to derive the shoal soundings.

Finally, stage 3 in the workflow is to merge the base ENC cell with the contours and shoal soundings, and deliver a new ENC set.

Innovative Approach
To Hydrography - PortMaps

A leading global port and by far the largest seaport in Europe, the Port of Rotterdam is a key entry point to the European market. For the port, understanding the depths throughout the 40km of the Port's waterways is a critical piece of information for the day-to-day work. Some years ago, because the Dutch Hydrographic Office only produced harbor usage electronic navigation charts (ENCs), the Port investigated the possibility of producing "berthing" ENCs containing high density depth data to support decision-making within the Port. That ENC system is now dated so in 2013 the Port partnered with Esri to implement PortMaps.

PortMaps, built using the ArcGIS platform, it is not only an asset management system, but also provides the framework for hydrographic production at the Port. PortMaps went live in 2015, and now harbor masters, asset managers, and marine pilots have access to the data they need via the MCS. MCS serves the most current ENCs available for the Port, including some created by the Port with depth information surveyed that day.

To keep the Port open all year and safe for navigation, the Port operates a fleet of dredgers and also three survey vessels equipped with the latest multibeam echosounder systems, and it is not uncommon for three surveys per day to be conducted.

MS Vale Rio de Janeiro" visiting Port of Rotterdam, marginal underkeel clearance!

When an ENC update is required, the base ENCs can be exported easily from the NIS using the Nautical S-57 tools which use an ENC cell coverage layer to select and batch export ENC cells that need to be updated. The complete port area can be exported as ENCs in under an hour. At this stage of production, the exported ENCs do not include bathymetric information and to complete the S-57 ENC, Qarto is used. From the seamless surface of the BIS, Qarto automatically derives an irregular DTM of shoalest soundings, as well as features from the NIS, to create the depth contours at 10cm interval (for water depths less than 25m), areas and also spot soundings. In other words, a new ENC set is produced, populated with the most up to date nautical information and also the latest hydrographic data. Once the ENCs have been made available, they are published for a wide variety of different uses in the Port of Rotterdam.

Total control

Qastor, fed with reliable and accurate position and orientation data, offers the mariner a tool that can greatly improve his situational awareness, thereby easing the navigation task. In addition to basic information such as speed, heading, course over ground (COG), and rate of turn (ROT) that is shown in the Qastor side panel, probably the most important aspect for navigation is the background electronic chart.

Qastor displays all the popular electronic chart systems like S-57, Primar, C-MAP, ARCS and DENC. Typically all charts show depth contours. Knowing the ship's draft, the required safety margin for under-keel clearance (UKC), and the real-time tide value, Qastor will distinguish between safe and unsafe waters, and can do so simply by displaying depth areas in different colours. Of course the quality of the chart and the density of its contours dictate how accurately safe waters can be shown. To facilitate this, some authorities produce and use "high-density" charts with contour intervals as frequent as 10cm.

The Qastor Move app will connect to Qastor and receive the values normally shown in the Qastor instrument panels, allowing the mariner to move even more freely around the bridge, whilst keeping track of the most important navigational information.

Qastor - ECS software for marine professionals

Vessel-to-vessel operations at sea are typically very difficult and dangerous to execute. Operational safety is hugely enhanced if the relative positions of both vessels can be accurately visualized.
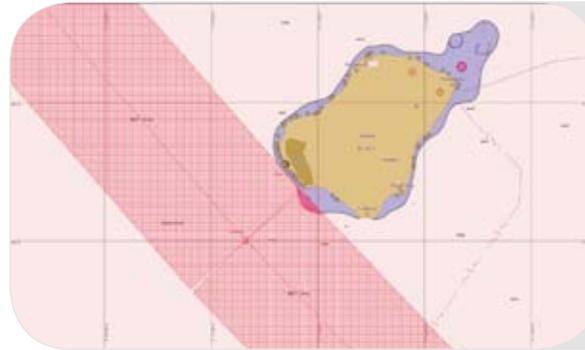
Route planning is fully supported in Qastor, from simple passages from A to B, to creation of an entire route network with multiple different end destinations. As well as distance to the next waypoint, off-track distance, wheel over line, and much more, by entering all the relevant UKC param-eters, Qastor will verify the viability of passage, highlighting on the chart all the sections of the route where it is not safe to navigate the vessel.

Taking speed, COG and heading into account, Qastor will predict the vessels path for a user-defined period of time. The accuracy of prediction depends on the quality of the positioning and navigation sensors feeding data to Qastor. When the pilot carries a high-end PPU, path prediction can be extremely accurate. Path prediction is used in combination with the "guard zone" to extend identification of potential hazards further forward of the vessel.

The mariner should of course be able to see the traffic around him. AIS integration is a standard feature of Qastor. All targets within VHF range are displayed in Qastor along with all the available information for each AIS target. With a route selected, Qastor computes "closest point of approach (CPA)" for multiple targets thereby giving the mariner an opportunity to adjust own vessel speed to dictate appropriate "meeting points".

Precision navigation

Using wired or wireless methods, Qastor interfaces to most devices outputting NMEA data strings to AIS transponders/receivers and to the QPS Connect Server, which is currently supplying meteorological data to Qastor users, but also capable of distributing other types of information (like VTS)."

Docking at an oil terminal or entering a lock is a very critical moment. Those involved must have a clear and complete picture of the situation during ship manoeuvres, including approach distances, speed and direction, as well as precise rate of turn. In particular, the bow and stern speed are vitally important values.

A RTK GNSS PPU system that communicates with Qastor via standard wireless technology, makes an ideal lightweight system for transportation and operation under various conditions. The system has been designed in accordance with the POADSS concept (Portable Operational Approach and Docking Support System), which was developed under the European Marnis project.

## Docking, lock approach, FPSO and SPM are all critical maneuvers

The accuracy and reliability of the manoeuvring data provided by the RTK GNSS PPU system are of a much higher level compared to the shipborne systems and shore based laser docking systems.

Image courtesy of BG Group
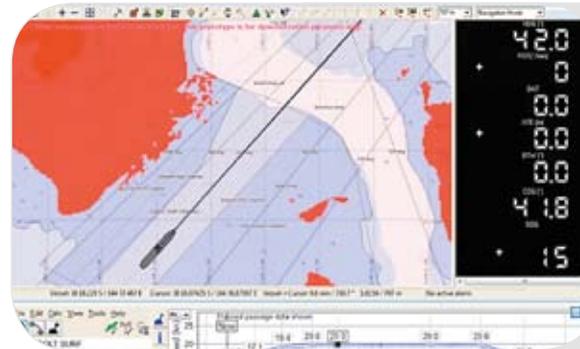
Qastor integrates OMC International's Dynamic Under Keel Clearance and is the only tool in the world providing marine pilots with real-time UKC management advice through vessel speed optimisation. Together they determine the optimum sailing speed prior to, and during a transit, ensuring frequent under keel clearance advice and the information required to cope with variations in vessel capabilities, met-ocean conditions and vessel traffic congestion.
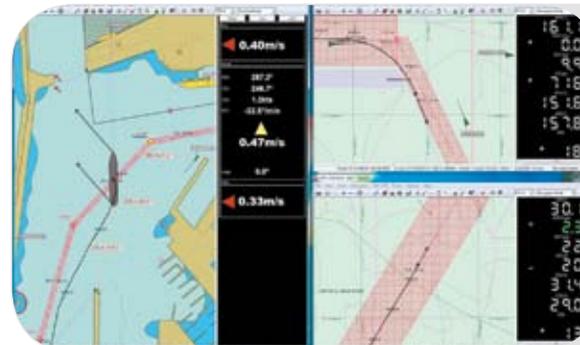

To support Traffic Centre use of Qastor, recently we added Qastor Multi-Instance. This means that on one computer, multiple instances of Qastor can be operated simultaneously, and by using a video wall with multiple monitors, several vessel can be tracked in fine detail, whether they are docking or on a passage between ports of call.

Situational awareness

Not every vessel carries an AIS transponder, and it is the port Vessel Traffic System (VTS), augmenting AIS with radar targets, that maintains a complete validated traffic image which, when made available to the Connect Server, can be distributed to Connect Clients. AIS is already a standard feature in Qastor, able to display all AIS targets within VHF range of own vessel, so receiving the complete validated traffic image from the Connect Server means radar tracked targets are also displayed in Qastor.

The Connect Server can be used to synchronize files between a server and any number of clients. The server will also distribute dynamic or live information, for example weather, sea state and tide. The configuration of access to all data sources is done one time only on the server and thereafter Connect Client simply has to select the relevant data and make use of it.

Real-time hydro and meteorological data can be distributed via the Connect Server, giving the Client real-time information about current, wave height, wind speed and direction, and various other associated information that is shared.
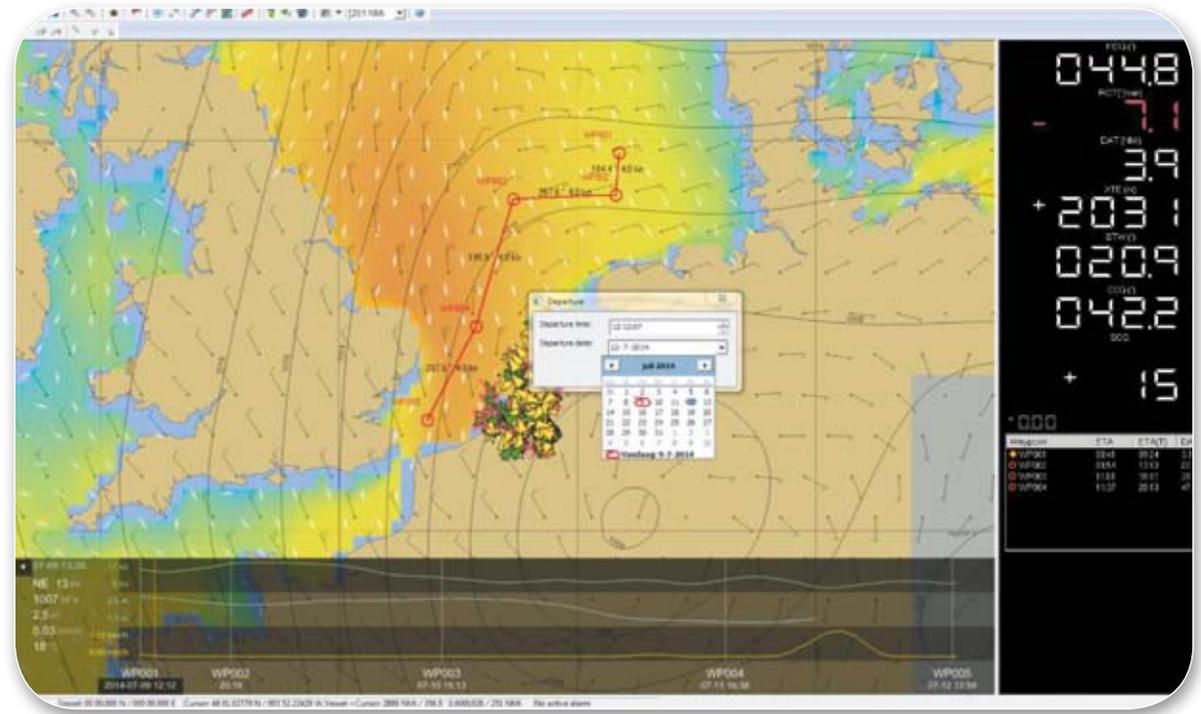
Hassle free ENC update mechanism

Keeping ENCs updated on the computers of all users has proven to be a hassle. The Connect Server allows authorities to share their ENC portfolio with their users. Qastor employs an automated chart updating mechanism that communicates with the Connect Server to ensure the mariner's chart portfolio is kept up to date. The Connect Server is smart enough to only update the local portfolio with enc files requiring an update. It also keeps a history of enc file updates, so the user can revert to previous chart updates if necessary.

It's not just mariners on vessels using Qastor, a number of harbour masters and most recently fleet operation managers use Qastor and the Connect Server for round the clock monitoring and alerting.

Voyage monitoring and alerting

The most recent implementation of Qastor and the Connect Server has been for a cruise liner company, whereby QPS have delivered a route monitoring and alert system.

Using real-time vessel and AIS data, in case a cruise vessel is too fast or too slow when compared against its predefined route, or enters a "no-go area", an automated alarm (email and SMS) is broadcast to the shore based company offices. Alarms are triggered within seconds of the event, allowing the officer of the watch to take prompt corrective action if required and assist the vessel back on its planned route.

A dedicated website is available to key maritime staff which provides a complete real-time overview of the location of each vessel, with up-to-date ENC as background. In addition to the vessel track history, the active route is also available to provide an up-to-date and accurate overview.

Since the grounding of Costa Concordia in January 2012, reassuring cruise passengers that the cruise industry is on top of route planning has become a priority.

"This state-of-the-art technology complements our onboard crew's vast knowledge and experience," says Emilio La Scala, general manager of MSC Cruises' technical department.
"By providing this additional information system, we are sure that each cruise vessel is fully supported at all times."
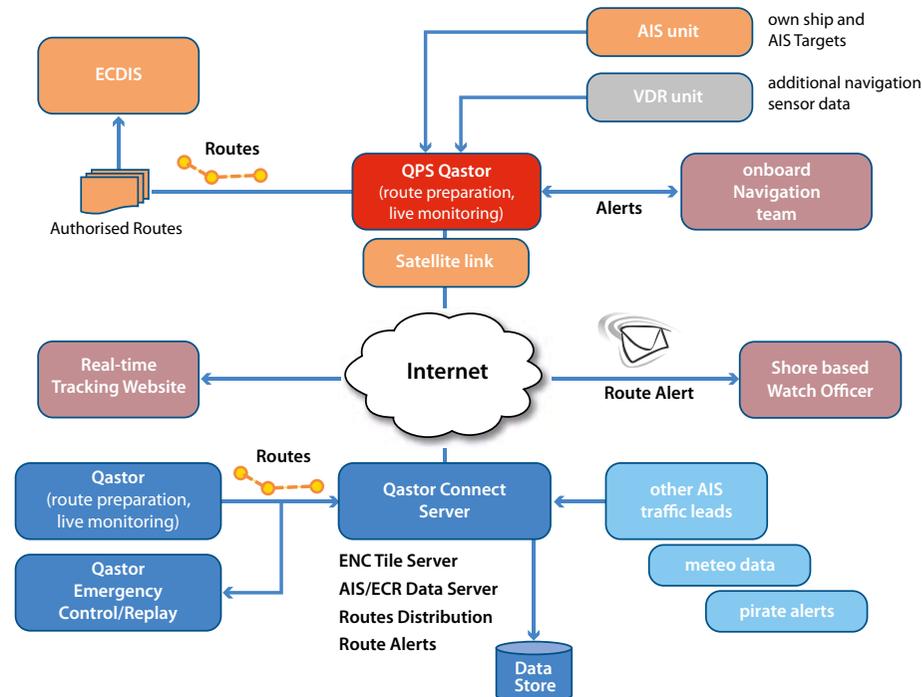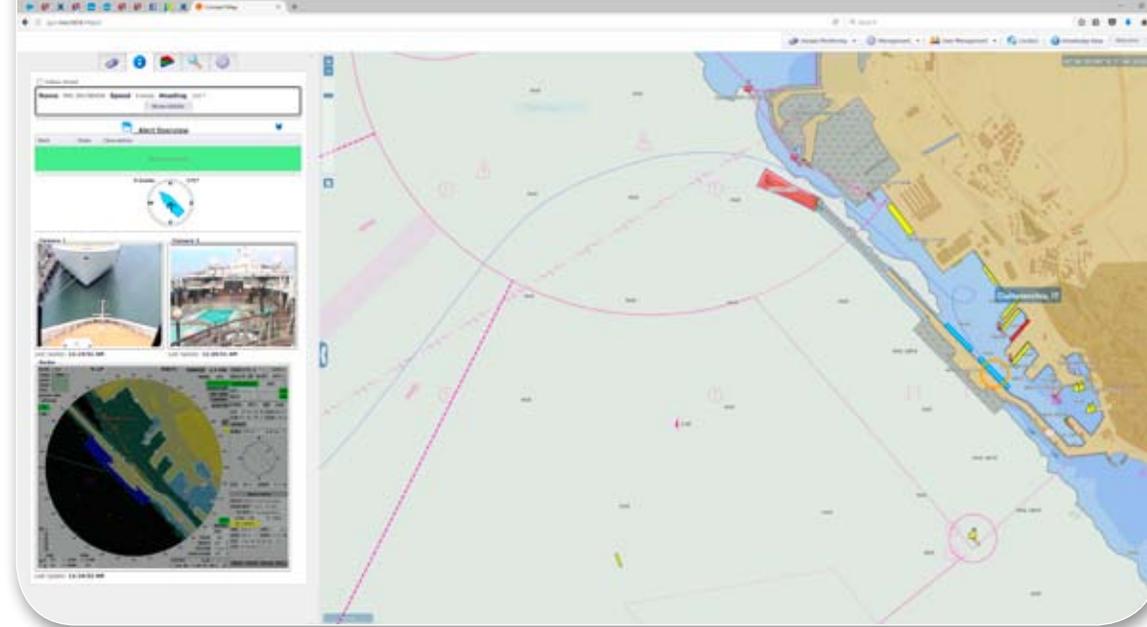
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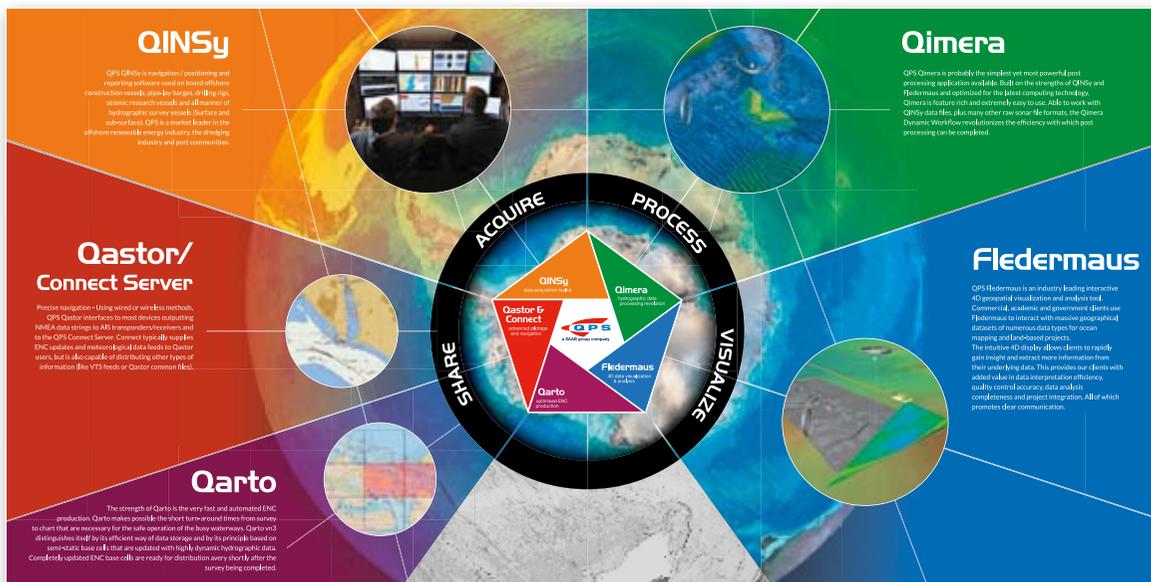
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4D data visualization
& analysis

Qarto
optimised ENC production
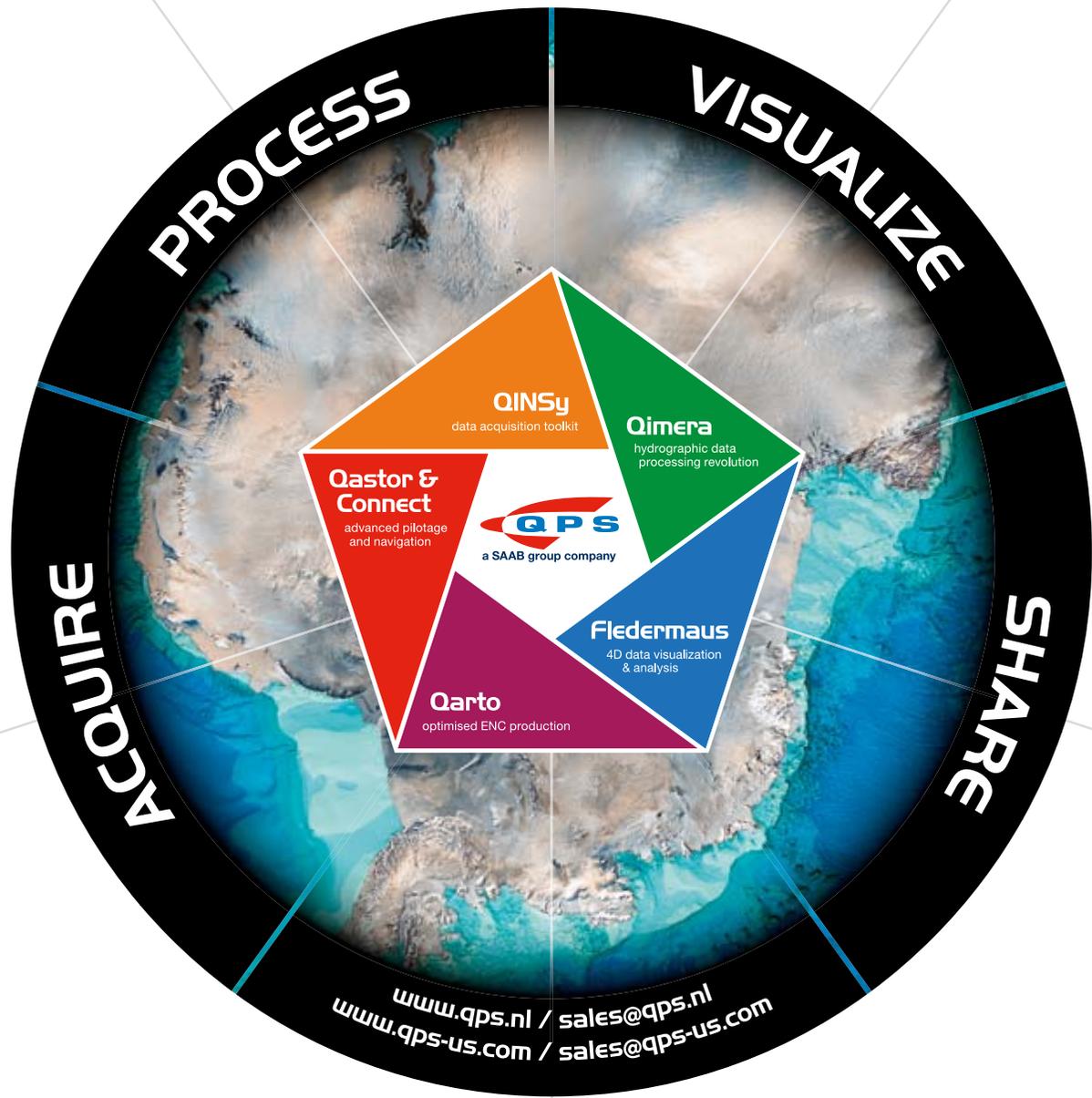
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