

Blue Insight Geomatics



KONGSBERG

Geomatics – powered by Blue Insight digital platform

Collect, catalogue, and distribute ocean data

In Geomatics, instrument dashboards provide a complete view of instrument performance while Ocean View allows for advanced data exploration both onboard vessel and from onshore.

Geomatics is designed to meet the increasing demand for accurate information from the oceans. It preserves and presents environmental, geospatial, and temporal data so that vessel operators can be assured their ocean data management requirements are met.

Simplified data management for vessel operators

- Manage bathymetric and water column data in one system
- One view across all observation platforms (AUV, USV, RV)
- Adhere to FAIR data management principles (Findable, Accessible, Interoperable and Reusable)
- Faster access to interesting data

KEY BENEFITS

Operational efficiency

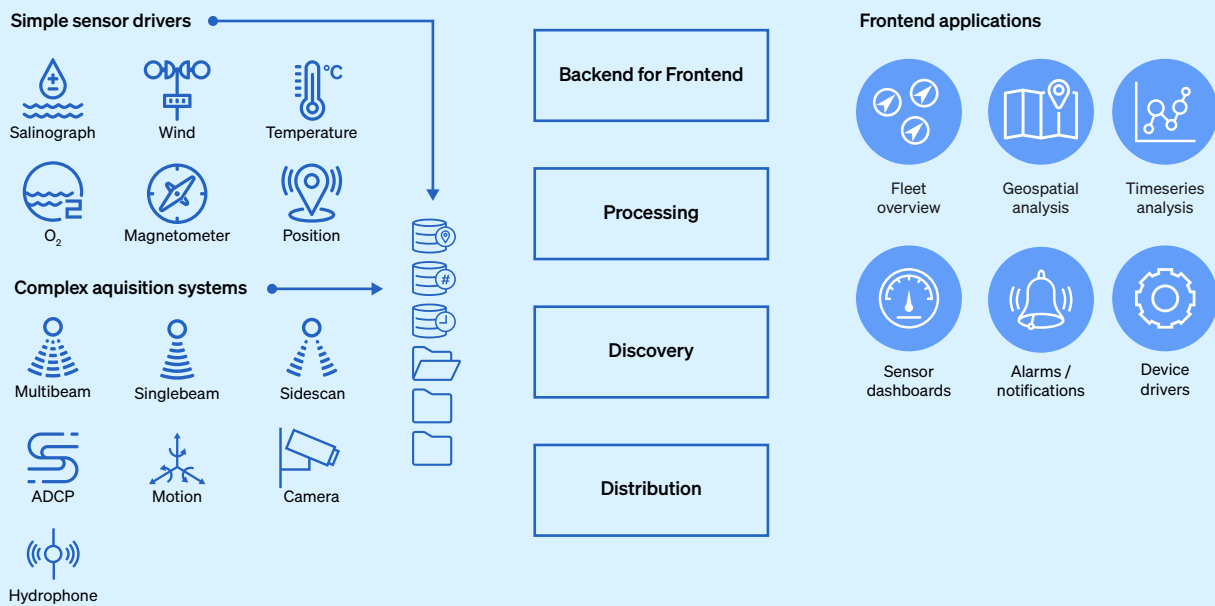
- Streamlined data collection: Automated data ingestion, reducing manual effort and time.
- Real-time instrument insights: Intuitive instrument dashboards, ensuring seamless performance monitoring.
- Global accessibility: Enables full access to data anytime, anywhere, whether onboard or via the cloud*

Scientific excellence

- Advanced exploration tools: Uncover valuable insights through a comprehensive toolset for in-depth data exploration.
- Metadata integrity: Complete control of metadata for chain-of-custody requirements, enhancing data reliability and traceability.
- Machine Learning (ML) integration: Automated ML-capabilities, facilitating advanced analytics and predictive modeling.

Geomatics overview:

From sensor to insight



Frontend Applications. The right side of the diagram shows various frontend applications that use the processed data:

Geomatics

The Geomatics system leverages a modern microservices and web-based architecture to support the seamless collection, processing, and analysis of ocean data. Designed for versatility and scalability, it accommodates a wide range of data sources and operational needs, ensuring accurate and actionable insights for ocean observation.

Sensor system

At its core, the system's data acquisition layer facilitates the integration of two types of sources: non-acoustic sensors and hydroacoustic sensors. Each type has its own specific components and data flows, tailored to handle different types of sensor data.

The non-acoustic sensor system handles environmental data such as temperature, pressure, or humidity measurements that are typically integrated via the NMEA protocol.

- A datalogger filters these data according to a configuration and publishes the data as a JSON payload via an MQTT broker.
- A time series database listens on the topic, receives the payload, and stores the data.
- A quality assurance system ensures further filtering, decimation, and down-sampling is completed.

- Scheduled exports of CSV or NetCDF files from the time series database can be configured.
- A third-party application, Grafana listens to MQTT topics as a live stream of data, bypassing the pre-processing to visualise time-sensitive sensor data.

Depending on the configuration, the system will sync the decimated time series data and exports to a cloud-side time series database and blob storage.

The acoustic sensor system is designed to handle data from acoustic sensors, such as echosounders and multi-beam systems. Hydroacoustic sensors are set up to write data to files. There are many formats, typically vendors provide their own proprietary formats. An indexer service parses new files, extracts metadata, and stores file indexes and events in a geospatial database.

The sensor manager ensures relationships between observing platforms, sensors, and metadata like location and time are captured. The syntax for acoustic metadata is based on AcMeta from ICES.

Discovery system

The Discovery system is designed for visualising and exploring time and geographically recorded data. This system enables researchers and operators to interact with the collected data, providing detailed analysis and insights.

To support the application layer with programmatic access to geospatial information, the system supports the OGC Feature API. This intermediary layer ensures that data is tailored and optimised for various user needs, delivering a smooth and intuitive experience for different use cases. By simplifying complex backend operations, it enhances the overall accessibility and usability of the system.

- The asset API provides access to geospatial asset data, including video files, CSV, images, and GeoTIFF map files.
- The survey API provides access to survey data. Together with the asset API, a user can get a complete catalogue of survey assets, all linked for convenience.
- The system monitoring service provides insights about systems, including sensor health metrics. The user can see compute, memory, and disk utilisation as well as acoustic pinging schedules and status.

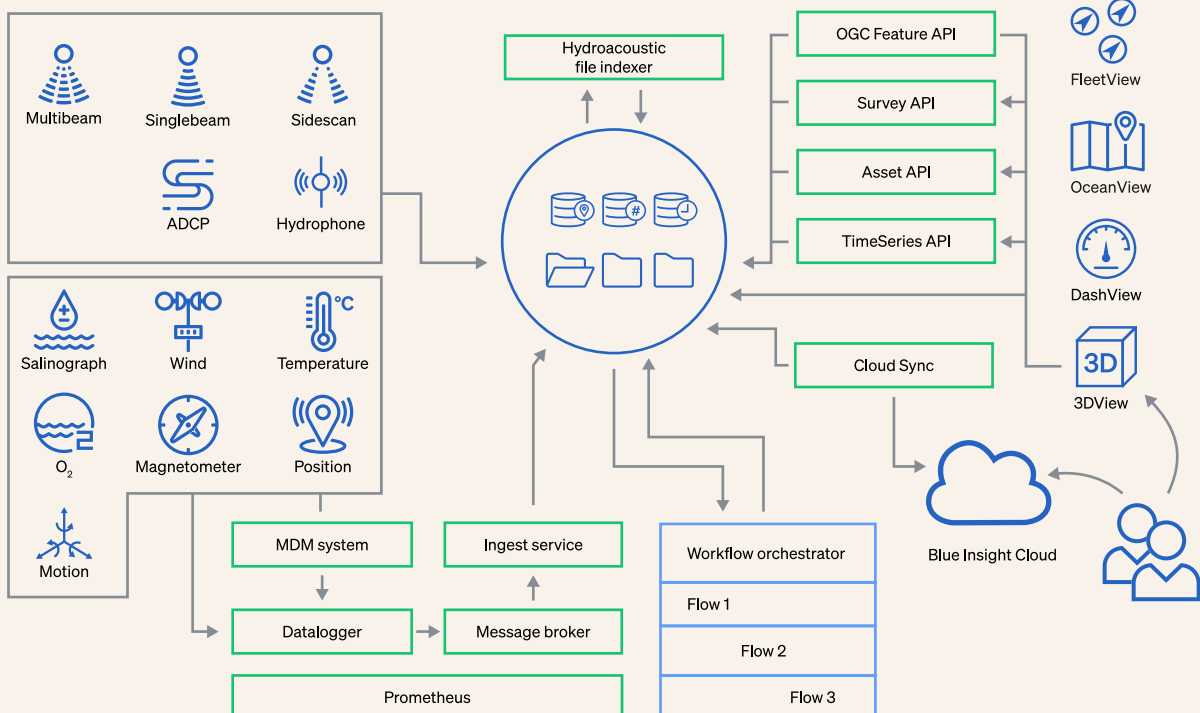
Geomatics enables users to interact directly with their data through several browser-based interfaces. It is

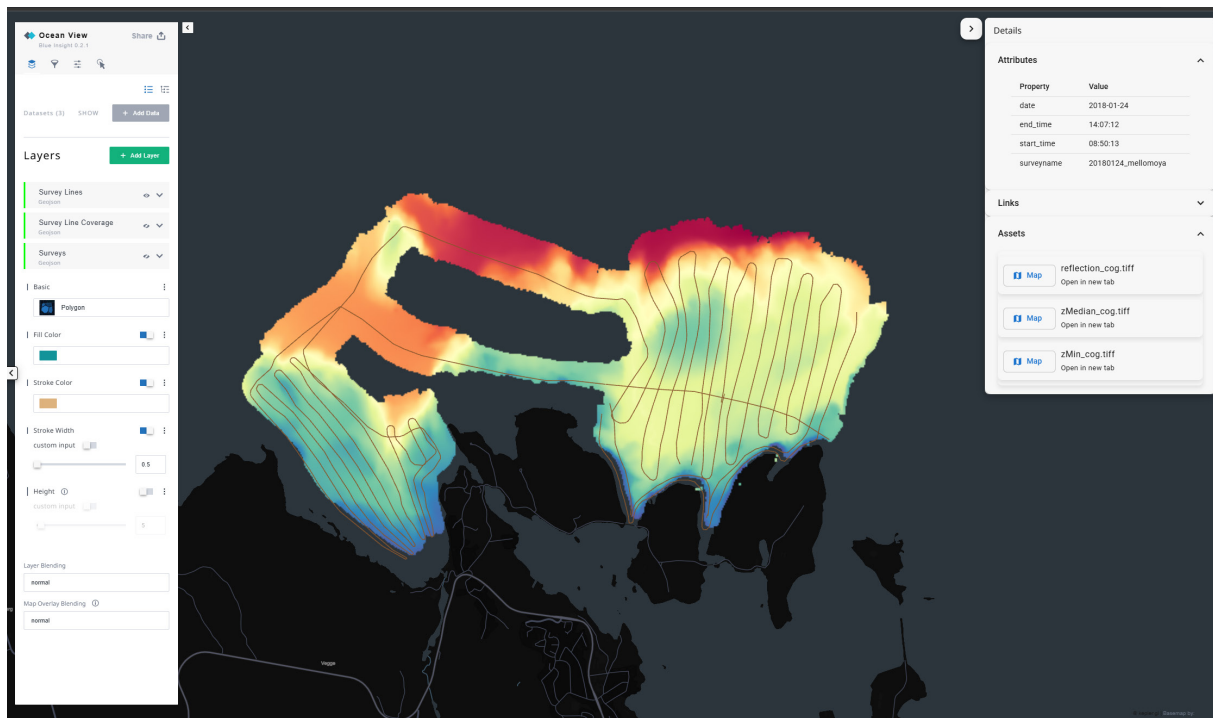
important to ensure the quality of data collected is of the highest standard.

Dashboards offer transparency into the structure, quality, and format of the data, which is vital during all stages of surveys. They also allow specialists to identify trends, patterns, and anomalies, providing the tools necessary to refine their understanding and develop meaningful research questions or operational strategies. The dashboards can be configured to bypass indexing and storage and listen directly to the data stream if low latency is needed, e.g. understanding winch operating status.

The OceanView application provides a map interface with options for both historic and near real-time views. Blending data provides situational awareness for ongoing survey operations. Users can simply point to different sources, from the local file system, local OGC API endpoints, or from cloud-based endpoints to add new data layers. The users can further apply multi-layered filters on the data to quickly zoom in on desired data.

Since the pre-processing performed in the sensor and discovery systems creates links between surveys, vessels, sensors, and data, it is possible to display survey lines on the map with associated assets. By selecting a survey line, metadata can be inspected for quality control, and assets can be displayed in a media carousel inline overlay.





3DView

The 3D application provides projection support and the ability to view data in a 3D-enabled environment, relative to other objects, such as man-made infrastructures.

Similarly to OceanView, the user can load multiple datasets, manipulate layers, and create multi-layered filters to find the relevant data.

Ocean data sharing

Geomatics ensures seamless data sharing through the OGC Feature API, database exports, OPeNDAP, and cloud synchronisation, providing standardised, flexible, and scalable access.

Supporting OGC API - Features, we enable programmatic access to geospatial data in GeoJSON, JSON, or XML, ensuring interoperability with GIS tools and mapping platforms.

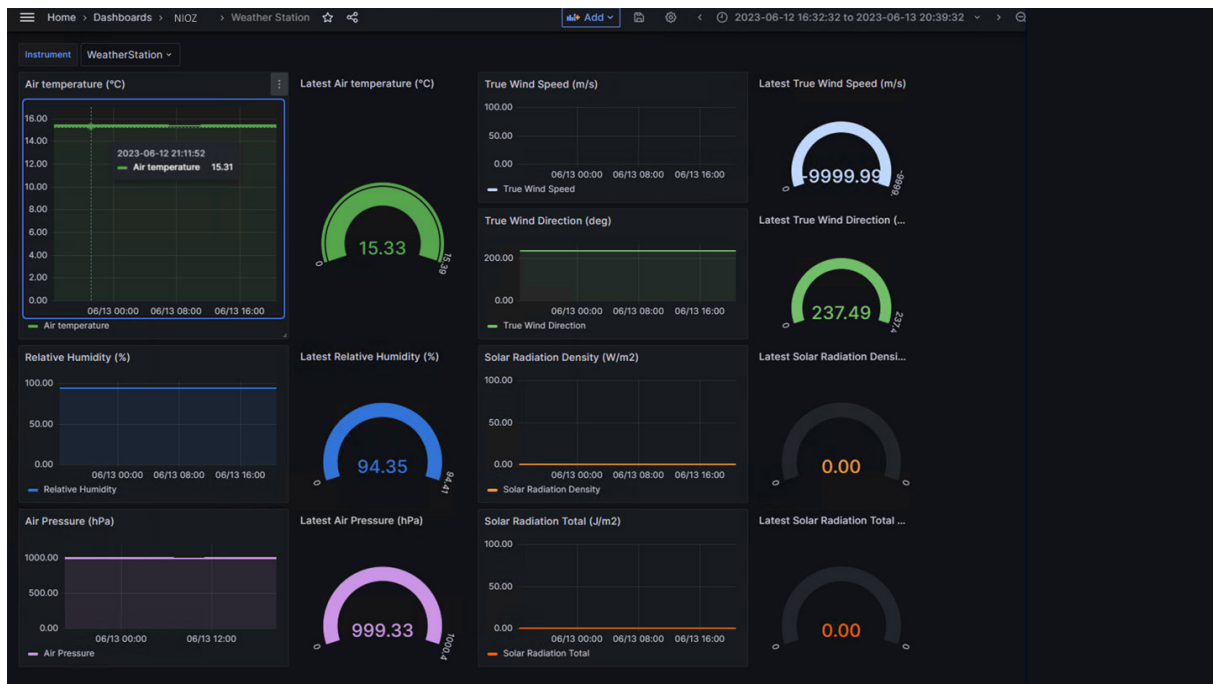
Direct database exports in CSV, NetCDF, and GeoTIFF allow researchers to conduct advanced analytics using Python, R, or MATLAB, ensuring structured, high-resolution data access.

With OPeNDAP, users can access and subset NetCDF and HDF datasets over HTTP, eliminating the need to download entire files, optimising bandwidth and storage efficiency.

Automated cloud synchronisation to Azure Blob Storage ensures real-time data availability, enhancing collaboration and analysis without infrastructure complexity.

The multi-channel approach ensures accessible, interoperable, and scalable ocean data sharing, whether via APIs, structured exports, remote access, or cloud solutions.

In summary, the Geomatics system delivers an end-to-end solution for ocean data management. By integrating diverse data sources, ensuring robust processing workflows, and offering intuitive user interfaces, it empowers users to gain accurate insights and maintain full control of their data at every stage of the observation process. This versatility makes it an essential tool for both operational and scientific applications.



Instrument dashboard

Geomatics ensures seamless collection, secure storage, and real-time visualization of data from all oceanographic sensors. The Instrument Dashboard, powered by Grafana, provides continuous monitoring and control, ensuring that all sensors and instruments function optimally.

Data accuracy & reliability

Continuous monitoring is essential for maintaining accurate and reliable data. Oceanographic sensors are exposed to harsh conditions, including saltwater corrosion, biofouling, extreme pressure, and temperature variations. The instrument dashboard helps detect anomalies early, minimising signal drift and instrument malfunctions.

Adaptation to environmental changes

The ocean is a dynamic environment. Geomatics allows for real-time monitoring and adjustment of sensors in response to shifting conditions such as temperature fluctuations, salinity variations, and changing currents — ensuring data consistency and quality.

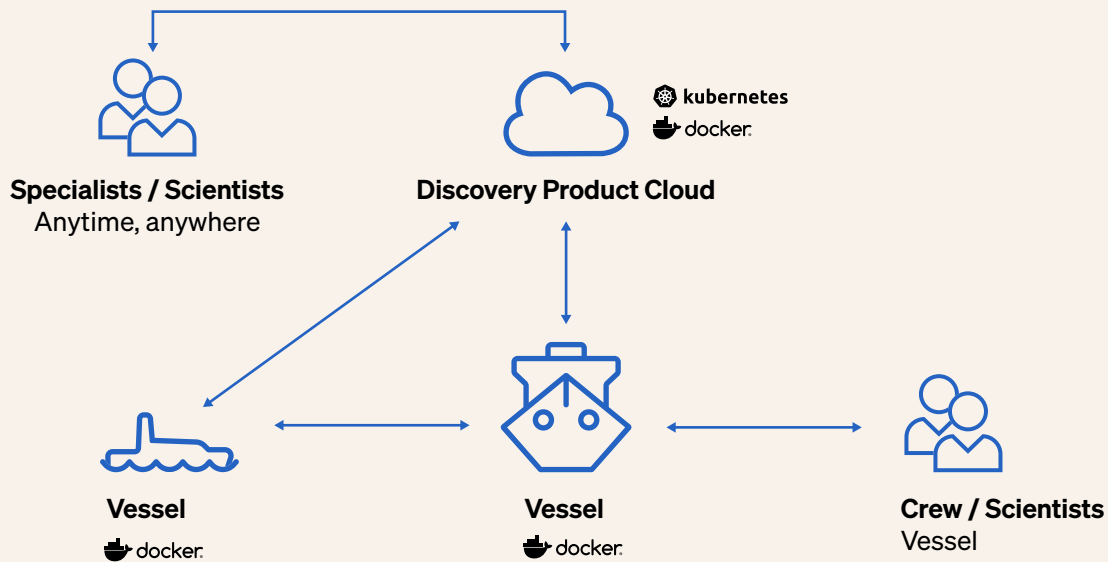
Long-term data trends & insights

For long-term studies, such as climate change research, sensor performance must remain consistent over extended periods. Geomatics supports proactive monitoring to enhance instrument longevity and ensure continuous data collection.

With Geomatics and its Grafana-powered dashboards, users can confidently monitor sensor health, ensure seamless data flow, and maintain smooth system operations.

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Simplified data management for survey operators

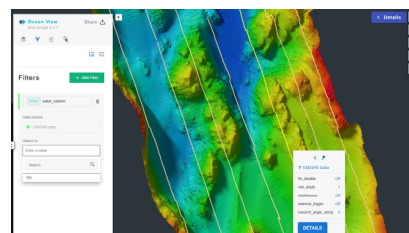


Data Exploration

Geomatics enables intuitive data exploration through OceanView and 3DView, allowing users to visualise, layer, and filter datasets for deeper understanding before applying advanced analysis. These tools provide an interactive way to uncover trends, validate findings, and gain new insights into oceanographic data.

Discovery of new insights

By blending external models with live measurements, OceanView and 3DView help reveal critical patterns in marine ecosystems, oceanic processes, and environmental changes. Users can explore phenomena such as marine species migration, ocean temperature variations, and the effects of human activity on marine life.



Fostering collaborative research

With robust access management and secure data sharing, Geomatics supports global collaboration. Scientists, policymakers, and environmental organisations can work together to tackle challenges like climate change, ensuring a more connected and informed scientific community.

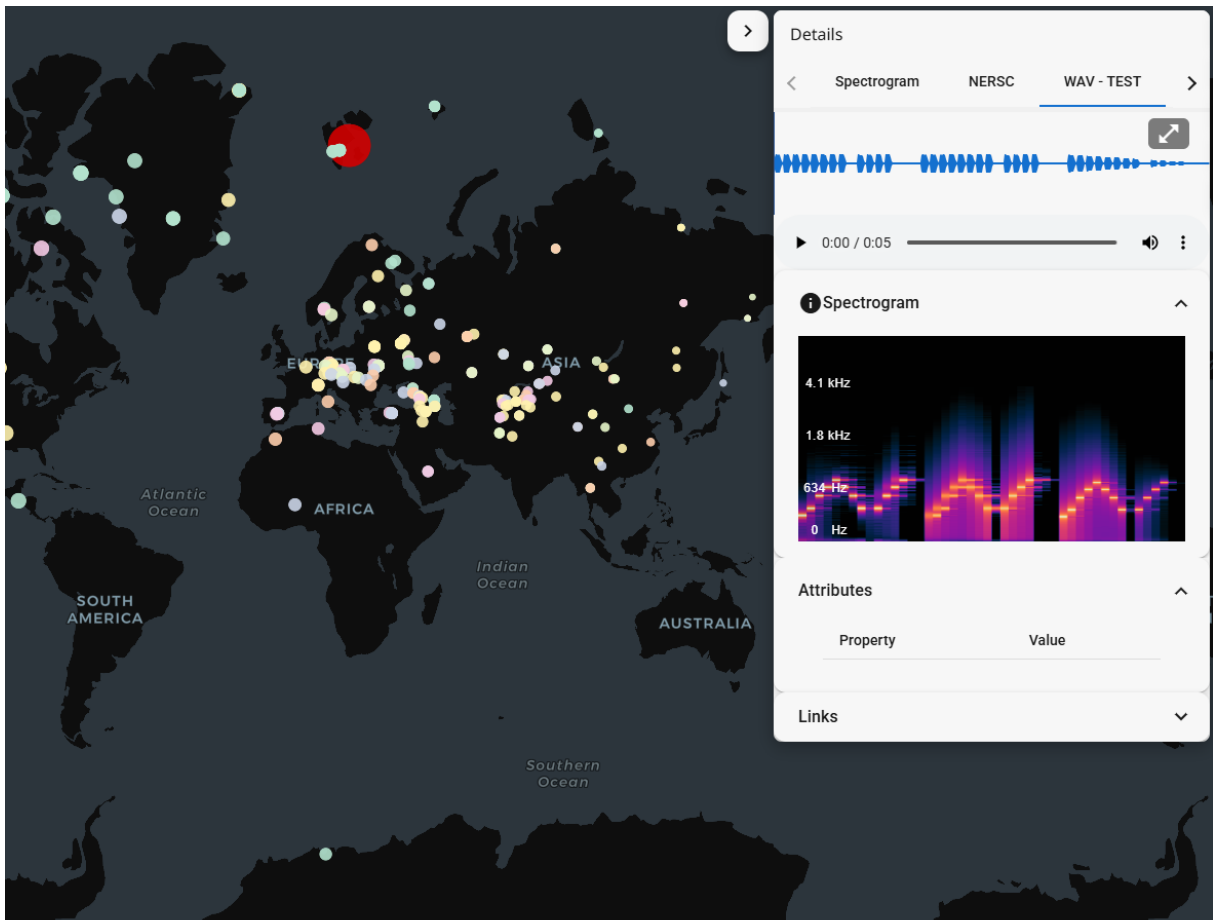
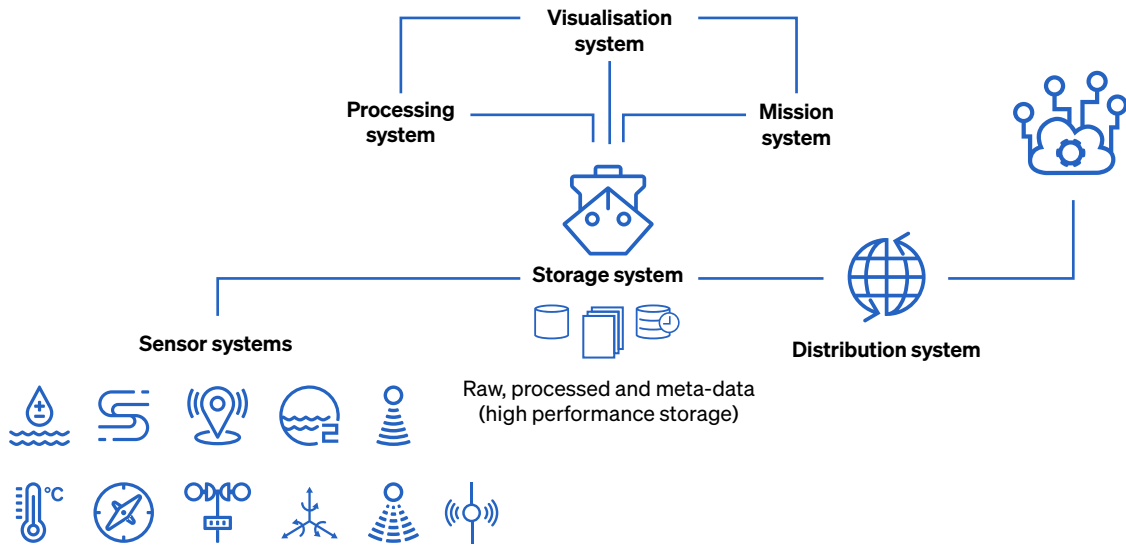
Enhancing scientific research

Data exploration plays a vital role in forming hypotheses, designing experiments, and validating scientific theories. For example, analysing datasets on ocean acidity levels can contribute to research on ocean acidification and its impact on marine biodiversity.

With OceanView and 3DView, users can seamlessly interact with oceanographic data, empowering them to uncover insights, collaborate effectively, and advance scientific discovery.

System overview

Onboard- and cloud side survey management



Analyze and present timeseries of data.

Sensors, data formats and protocols

Geomatics supports a large set of Kongsberg and third-party sensors

New instruments can be supported by adding custom parsing and ingestion handler

All geospatial, timeseries, mission and metadata available through Open Geospatial Consortium (OGC) APIs for support of FAIR principles (Fair, Accessible, Interoperable, Reusable)

Type of data	File formats
Water column data, incl ADCP	.raw, .netcdf, Zarr, .hdf5
Bathymetry data	.xyz, .las, .laz, .kml/all
Sidescan / SAS Sub-Bottom Profiler data	.xtf, .geotiff
3D models of objects from e.g., underwater laser scanner, photogrammetry	.gltf, .stl, .fbx, .obj
Videos incl. metadata	.mp4 + .geojson / companion file (lat long)
Photos / images, e.g. georeferenced	.jpg + .geojson / companion file (lat long)
Projected photos from e.g. Aerial drones, satellites	.geotiff
CTD & Sound Velocity data	.csv, json, txt, .netcdf, .svp
Hydrophone	UDP datagram, .wav

Protocol	Description
NMEA	ASCII over serial or UDP. Geomatics implements a Generic Driver for NMEA-like output from Instruments and some proprietary drivers for GPS, AIS & WeatherPak
MQTT	Publish/Subscribe interface to ingest and distribute datagrams locally on ship or to cloud
RS232/RS432	Sensors connected using a serial-to-ethernet converter to translate serial messages to UDP or TCP
Ethernet	Geomatics support sensors connected to the local network over UDP or TCP
Modbus	Application layer messaging used for sensors and automation systems

Hardware

- Requires a Hydrographic Workstation (HWS) ship-side.
- Integrates to onboard Network Attached Storage (NAS).

HWS

- Only 1U high
- 19" rack mount
- Only 3.6 kilos
- VESA mounts behind display and under-the-desk
- Supports four displays SSD or NVMe data disks IntelCore I7-8700T
- 32 GB RAM upgradable
- 115/230 VAC
- Max 170W, 65W typical, Windows® 10
- Maritime certification

Optional services

- NAS infrastructure incl HW can be provided upon request.
- Cloud access can be provided upon request.