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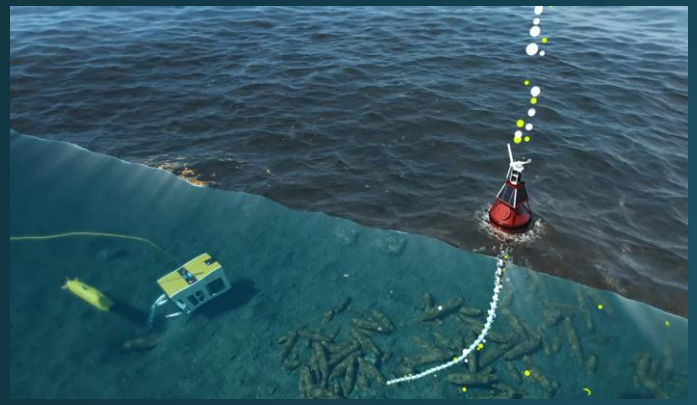
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From Ocean Big Data to Ocean Services

Ocean Tech 2026 I Korea

Speaker, Role (tbd)

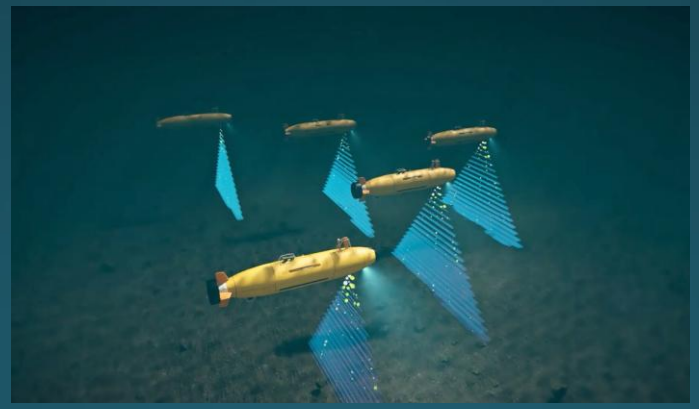


Megatrends in Ocean Data



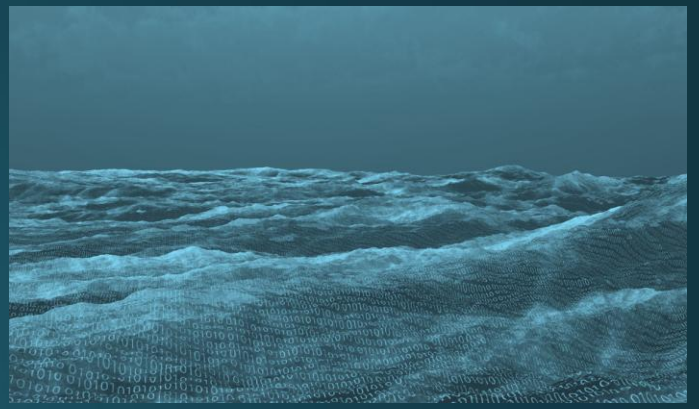
Connectivity

Connectivity and bandwidth is increasing, enabling smarter data workflows



Autonomy

Autonomous systems and next-gen sensors are redefining data collection at sea



Big Data & AI

Ocean data is growing fast in volume, variety, and velocity — massive potential for Big Data & AI

Data Variety

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Sound Velocity Profiler

Common Data Formats:
csv, xls, txt, ascii

Processed Data:
- Sound Velocity Profile
- CTD Profiles

Multi-beam Echo Sonar

Data Formats:
gsf, xtf, s7k, all, kmall, til, raw , qpd, wbm

Processed Data:
- Pointclouds
- Bathymetry
- Backscatter

Sidescan Sonar

Data Formats:
xtf, jsf, sdf, mst, s7k, sds, til, son, fau, hsx, imx,

Processed Data:
- Backscatter
- Contact List

Magnetometer Electromagnetics

Data Formats:
csv, xls, txt, ascii

Processed Data:
- Anomaly Maps
- Contact List

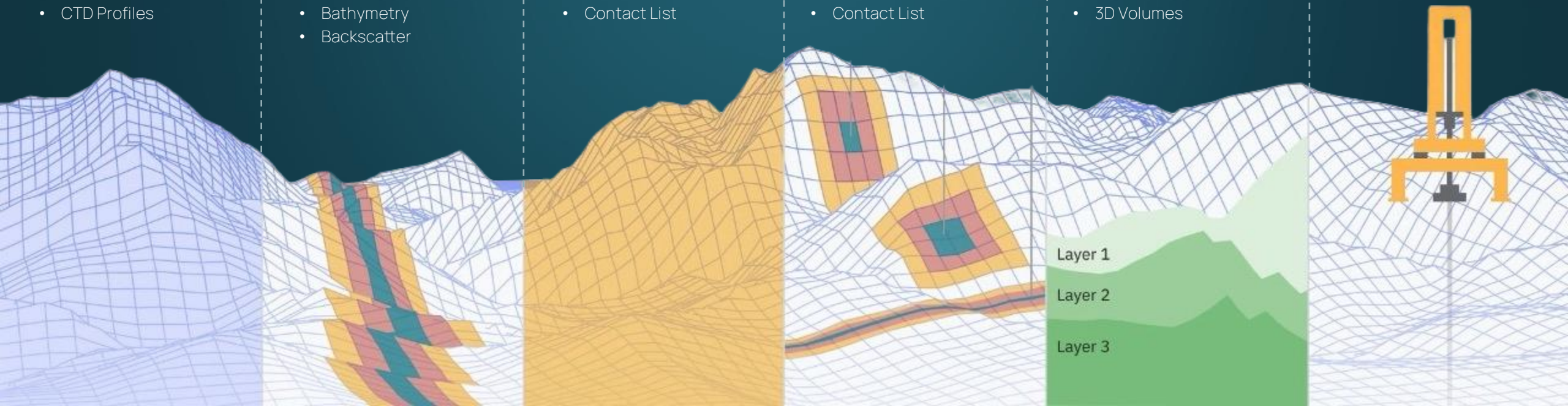
Sub Bottom Profiler

Data Formats:
segy, seg-d, ses, eBoss

Processed Data:
- Subsurface Profiles
- 3D Volumes

Other Sensor Types

Data Types:
- Satellite
- Radar
- Lidar
- Timeseries



Data Growth

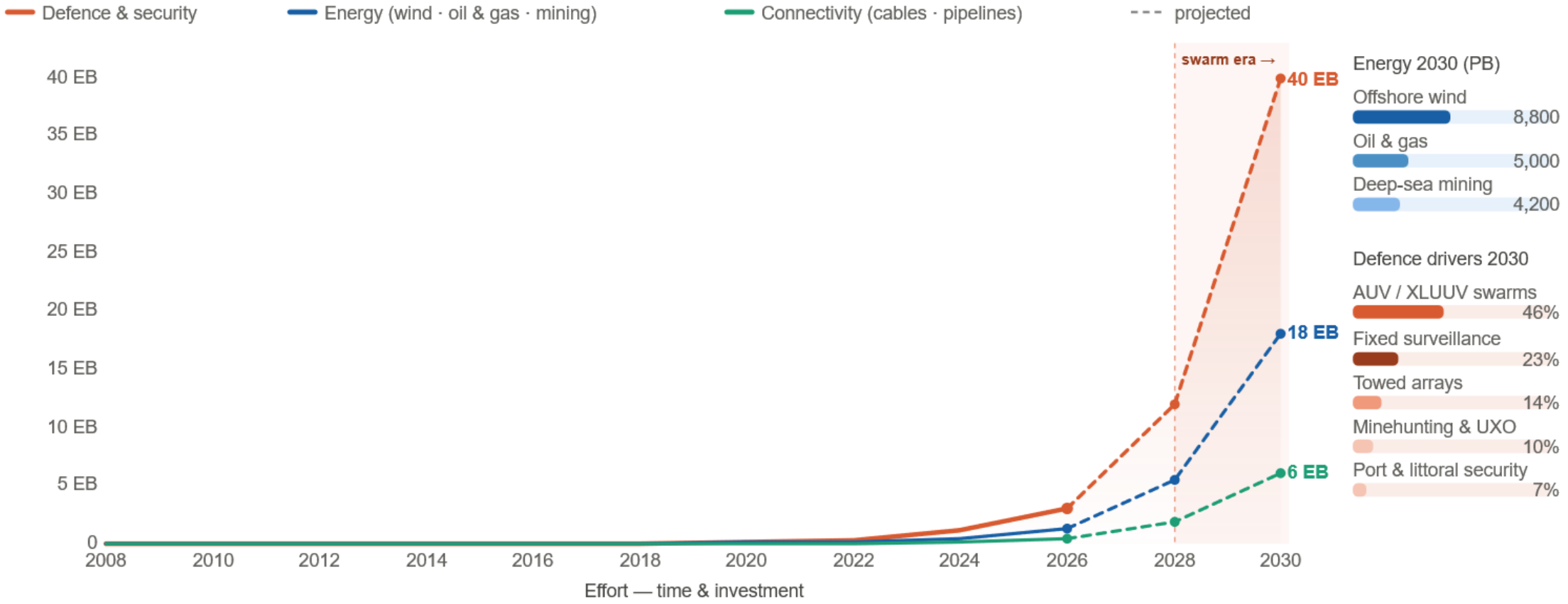
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Annual data volume by strategic driver · 2008–2030 · petabytes

DEFENCE & SECURITY 2030
40 EB / yr XLUUV swarms · SAS

ENERGY 2030
18 EB / yr wind · O&G · mining

CONNECTIVITY 2030
6 EB / yr cables · pipelines



Sources: NATO CMRE, NOAA, Kongsberg, Teledyne, ISA, ONR, DARPA. EB = exabyte (10^{18} B). Defence projections based on open-source procurement and published UUV programmes. 2008–2026 flatness is not a data error — it reflects true exponential growth before the swarm-era inflection in 2028.

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From ocean data to shared value – five steps

01
Introduction to north.io

02
Ocean data platform & key technologies

03
Experience & lessons from Marispace-X and other projects

04
Transforming ocean data into services

05
Potential areas of cooperation with Korea



Introduction to north.io

north.io

A Leading Specialist in Ocean Big Data

- Founded in 2019
- Cloud-, Big Data and AI technologies
- 50+ Employees
- Kiel, Germany

GEO AWESOME

GLOBAL TOP 100 GEOSPATIAL COMPANIES IN 2025

Reference Customers

north.io

Offshore Wind

FLOTATION ENERGY

JAN DE NUL

Construction

Research

GEOMAR

amprion
verbindet

Transmission

Marine

Defence



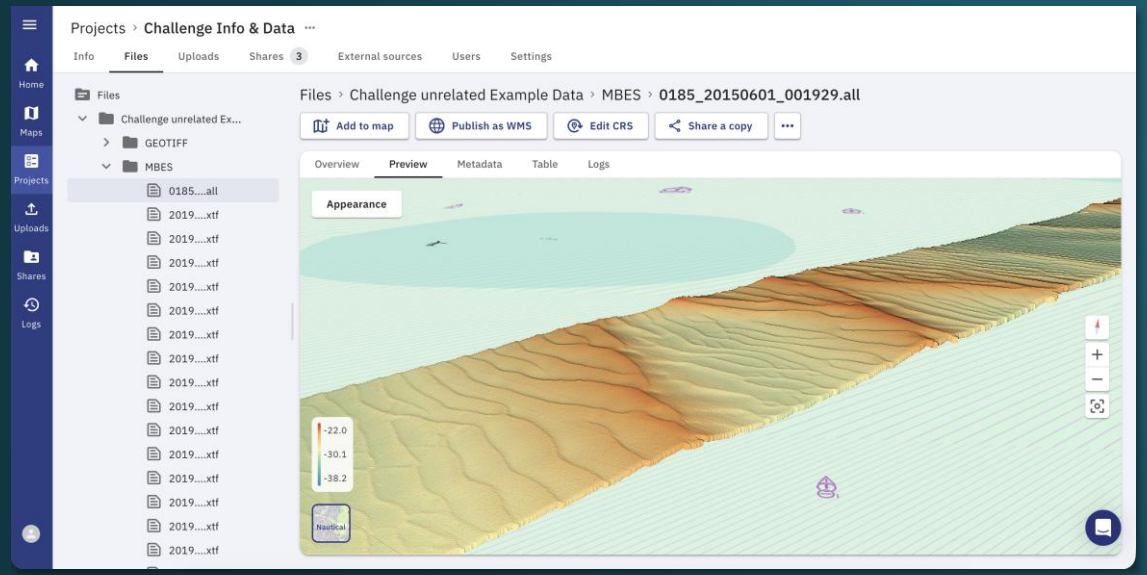
Ocean Data Platform & Key Technologies

Our Technologies

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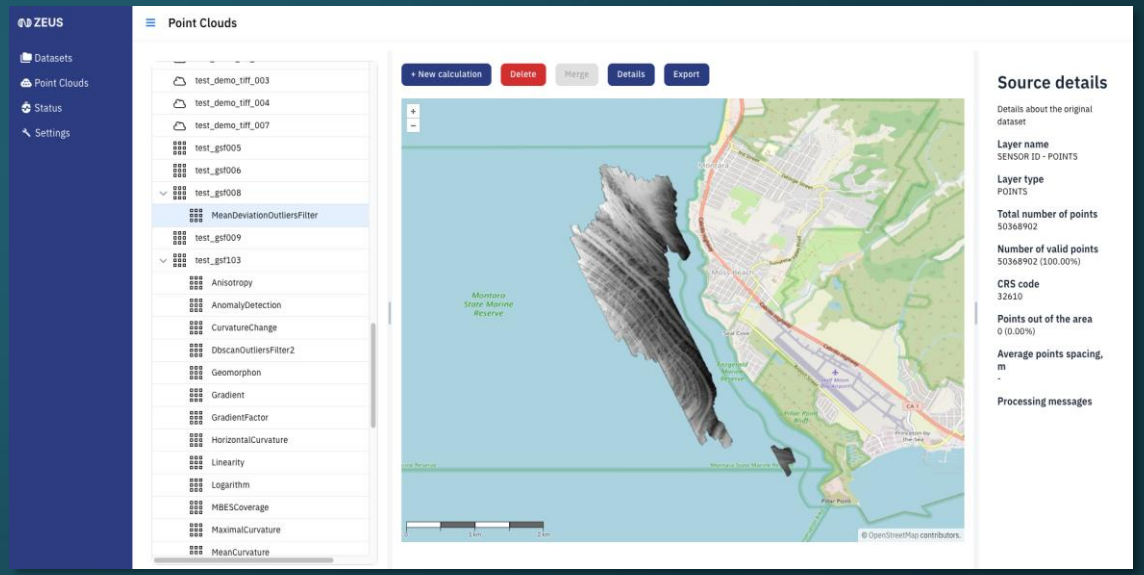
Ocean Data Platform (ODP)

Secure underwater sensor data management, sharing, and exploration



Ocean Data Processing Engine (ODPE)

Cloud-scale processing and analytics - directly on raw sensor data.



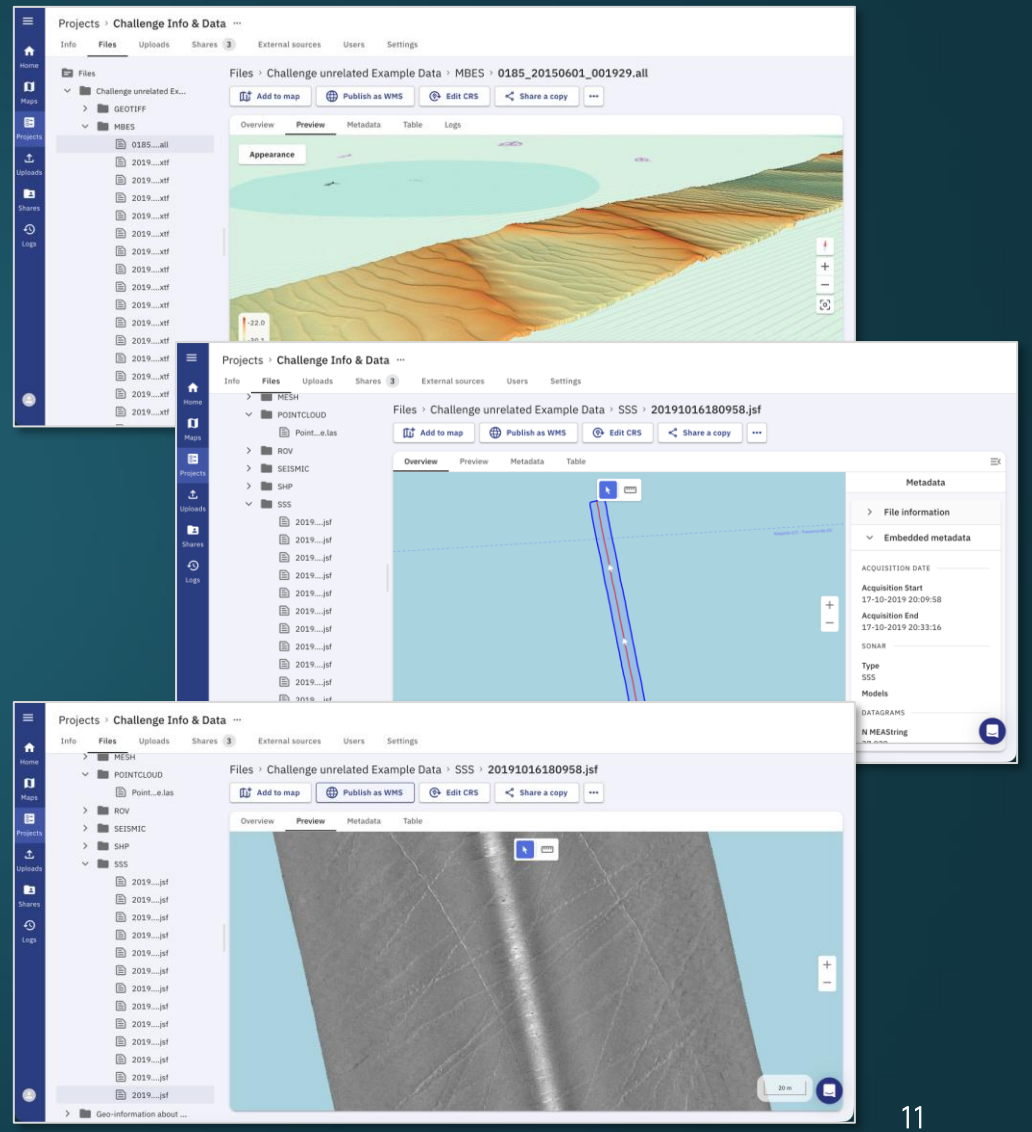
Turn raw ocean sensor data into a shared, scalable data warehouse.

Ocean Data Platform (ODP)

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AI-driven platform technology for Ocean Big Data

- Central, secure ocean data platform for petabytes of underwater sensor data
- Controlled access and permissions for complex multi-agency environments
- Instant data exploration without specialist tools or knowledge (155+ data formats)
- Geospatial Intelligence powered by AI-assisted data processing

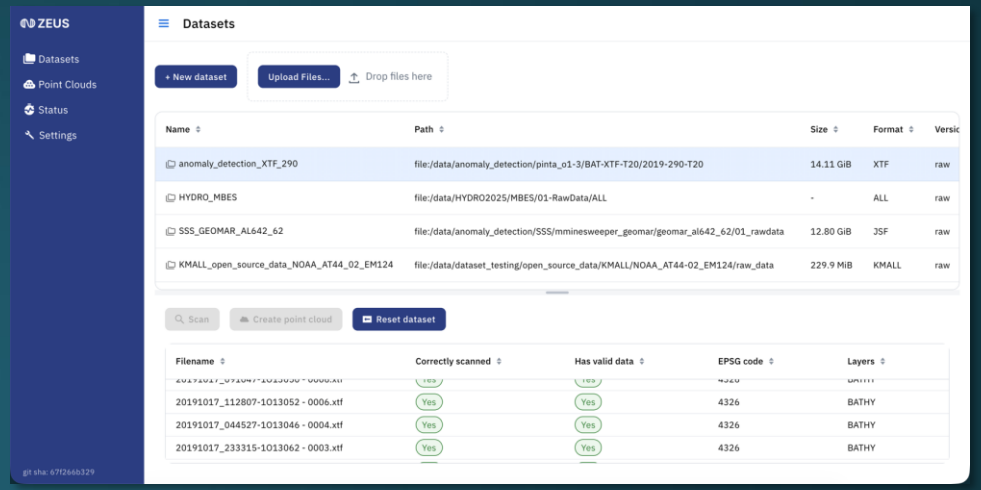


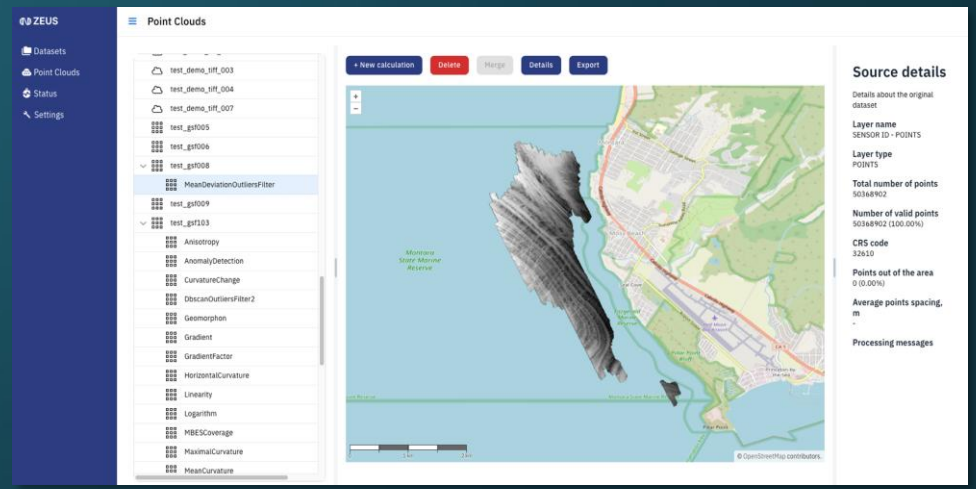
Ocean Data Processing Engine (ODPE)

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Distributed big data computing for Ocean Big Data

- Distributed, cloud-scale processing engine for high-volume sensor data
- Automated pipelines for QC & preprocessing to save time and cost
- Process raw underwater datasets while preserving full detail and resolution
- Scale reliably in production with orchestration (Spark + Kubernetes)





Decentralisation

Our technology enables sovereign data hubs

- Deployable everywhere
- National sovereignty
- Interoperability standards
- Operational Resilience



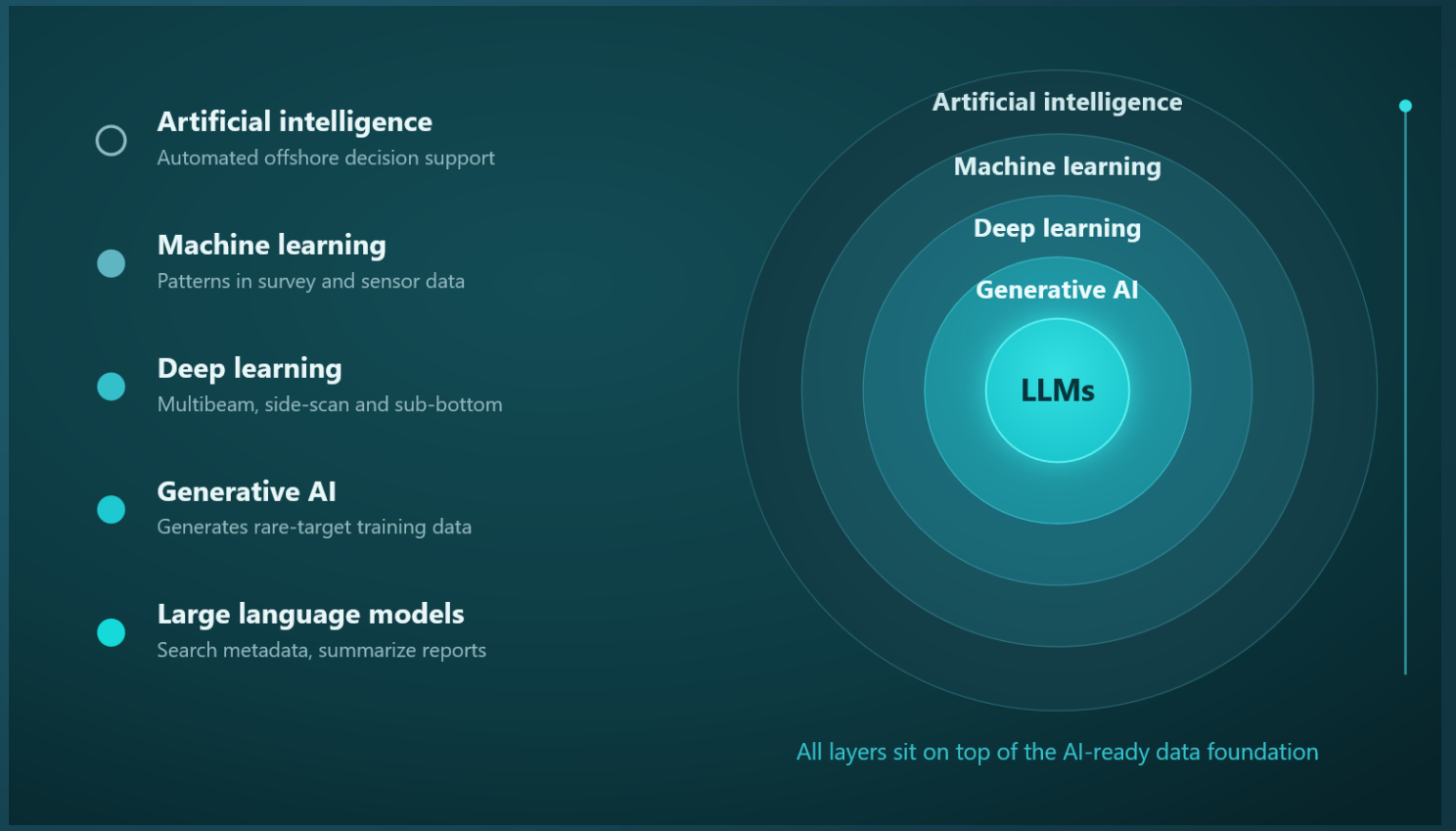
AI in the Ocean Domain

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AI is a stack of capabilities — from machine learning to generative AI and large language models. And everything depends on data!

Strategic implication

- Every AI capability in offshore operations depends on trusted, standardised and AI-ready ocean data.
- The more advanced the AI capability, the more important the underlying data foundation becomes.

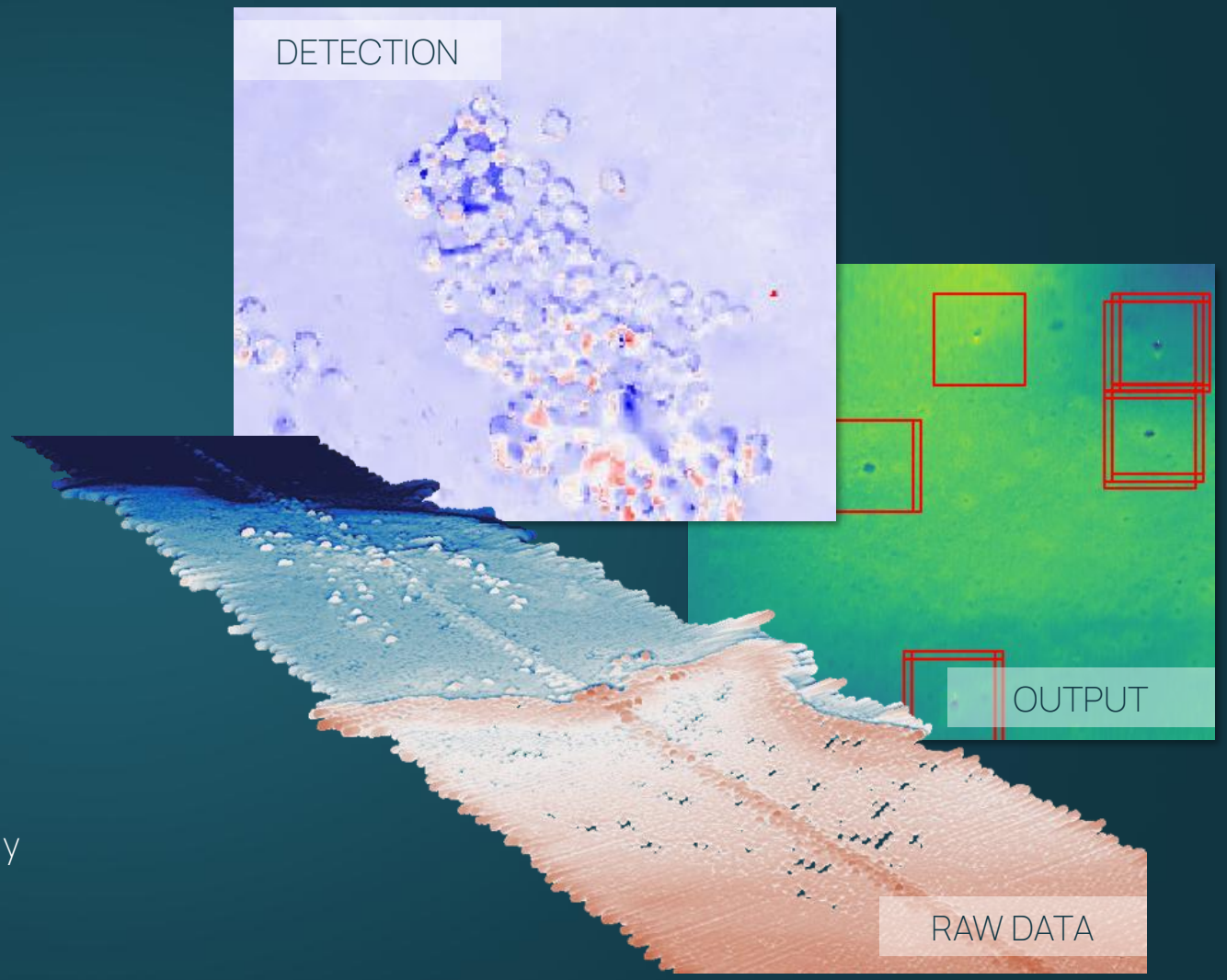


AI-Enabled Seabed Intelligence

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AI: from raw sensor data to relevant insights

- Adaptive data processing
- Change detection
- Detect & classify objects



Sovereign by design • interoperable by standards • mission-ready



Experience & Lessons from Marispace-X

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Starting point of Marispace-X: ocean data is hard to find, move and share

Availability

- Collected ad hoc, project by project
- Stored on hard drives without metadata

Volume

- Hydroacoustic data reaches tera- to petabytes
- Spatio-temporal analysis needs big-data computing

Storage & Processing

- Enormous volumes need intelligent storage
- Cloud & AI for efficient processing

Security

- Subsea infrastructure is security-relevant
- High-resolution data needs controlled access

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GAIA-X
The Concept

Gaia-X represents the next generation of data infrastructure ecosystem: an open, transparent, and secure digital ecosystem, where data and services can be made available, collated and shared in an environment of trust.

The architecture of Gaia-X is based on the principle of decentralisation. Gaia-X is the result of many individual data owners (users) and technology players (providers) – all adopting a common standard of rules and control mechanisms – the Gaia-X standard.



Vision

Mission

Together we create an open, and secure federated digital ecosystem, where data and services respond to common rules and can be freely and securely built, collated, and shared

Vision

Digital platforms are becoming the digital twin of physical environmental, economic, political, and societal ecosystems. Our ability to ensure their respect of fundamental principles of freedom, transparency, and sovereignty, will determine the future of Europe ad any civil society

marispace·x

gaia-x

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Data sharing works today – but it is inefficient

How would you ship a large amount of goods from Seoul to Northern Germany?

- Before the container, every shipment was packed individually – in crates built by a craftsman
- Different packages, different sizes
- Loading and unloading a ship took several days
- It worked – but it was inefficient









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One container – two standards in one

Technological standard

- Built exactly the same in every country – in Germany as in South Korea
- Same ships, same cranes, same trained operators

Standard of trust

- Accepted and used throughout the world
- Trusted as a secure and efficient way to ship goods

Whatever is inside – the medium is always the same. A simple idea that revolutionised shipping.

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Data spaces are the shipping container for data

Today: FTP servers | HTTP transfers | Cloud data exports | Local servers

every transfer is different

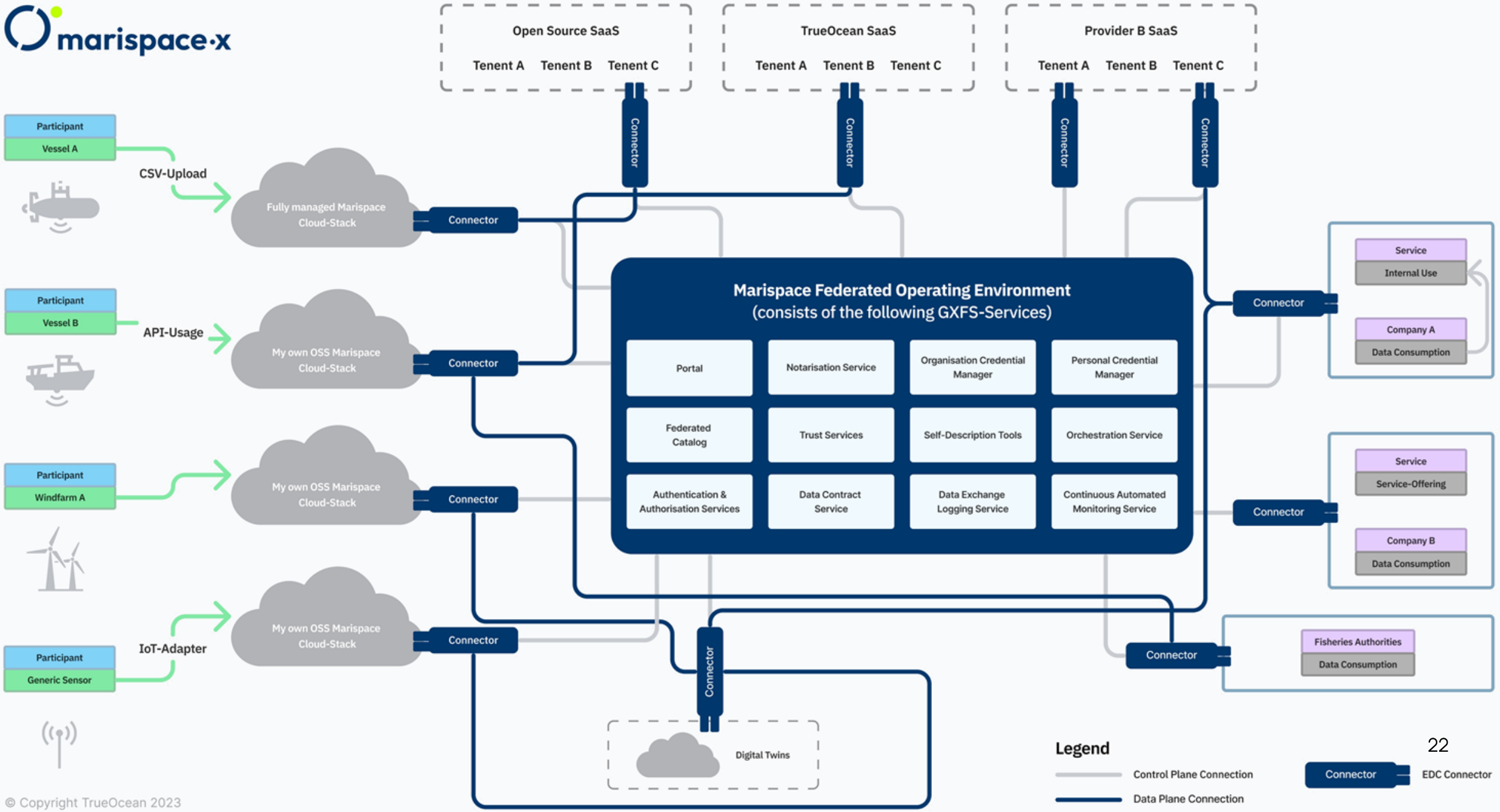
Technological standard

- Standardised components, e.g. catalogue – no one builds alone
- Usable everywhere in the world

Standard of trust

- Contracts and metadata descriptions
- Your data stays your data – trusted like a container

Gaia-X defines both standards – Marispace-X applies them to ocean data

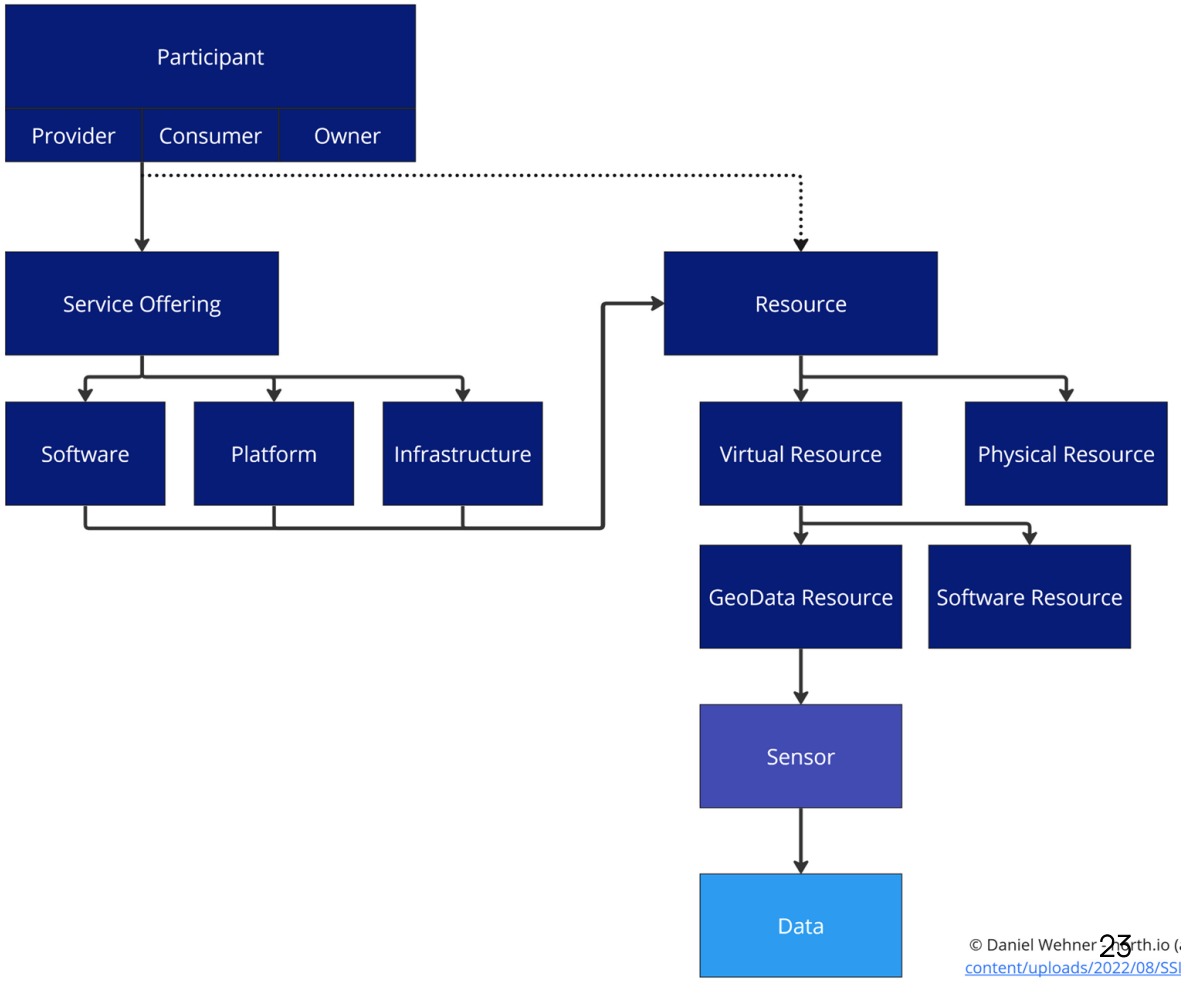


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Self-Descriptions

Participants in a Gaia-X ecosystem talk to each other in the language of Self-Descriptions. :

- Metadata records that describe providers, resources, service offerings and datasets
- Human-readable by using the JSON-LD format
- Geospatially compliant with ISO 19115, Gaia-X, DCAT and other highly specific standards (e.g. iFDO for images)
- Sensor types: Multibeam, Side Scan Sonar, Subbottom Profiler, Magnetometer, Sound Velocity Profiler, CTD, CPT, Sediment Grab Sampler, Seismic, Hydrophones, Hydrophones, ADCP, LiDAR, Images, Videos and many more
- Available under https://github.com/marispace-x/selfdescriptions



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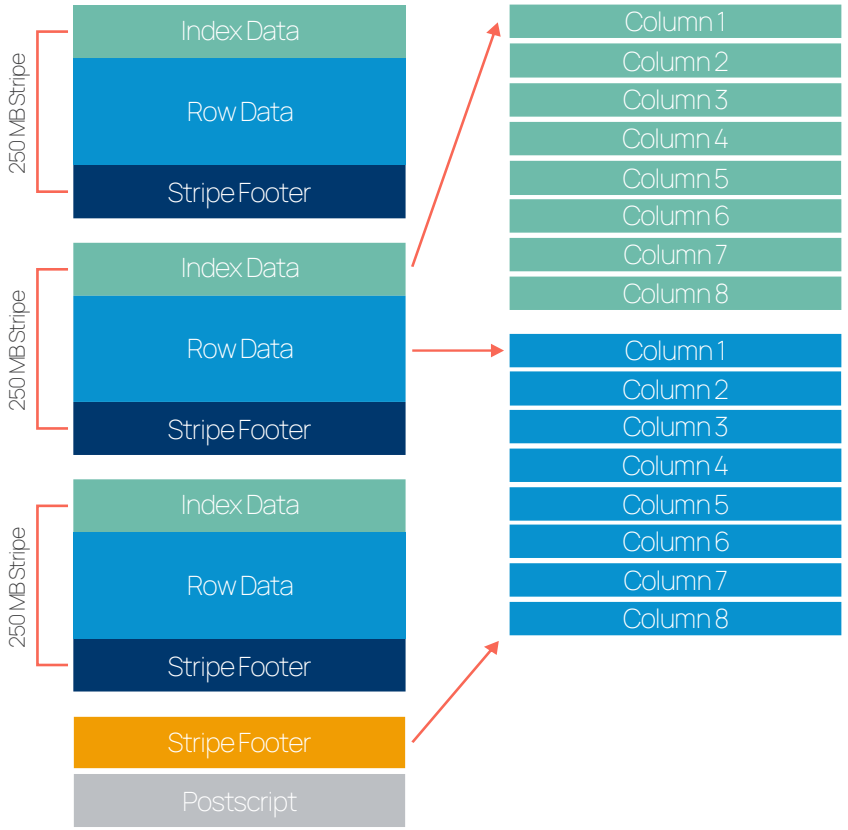
Cloud-native data format

Development of a maritime cloud native data format:

- Scalable: approaches for cloud based maritime data analytics need new ways of data handling
- Industry-driven: together with specialists from our associated partners and their specific needs
- Open: the format specifications and the development process will be openly accessible

- MariParquet based on the Parquet/GeoParquet

ORC file scructure





Proven in Operations: Defence & Security

REPMUS 2025

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REPMUS 2026

north.io powered the Data Fusion Cell of MCM—turning underwater mass data into COP-ready insights.

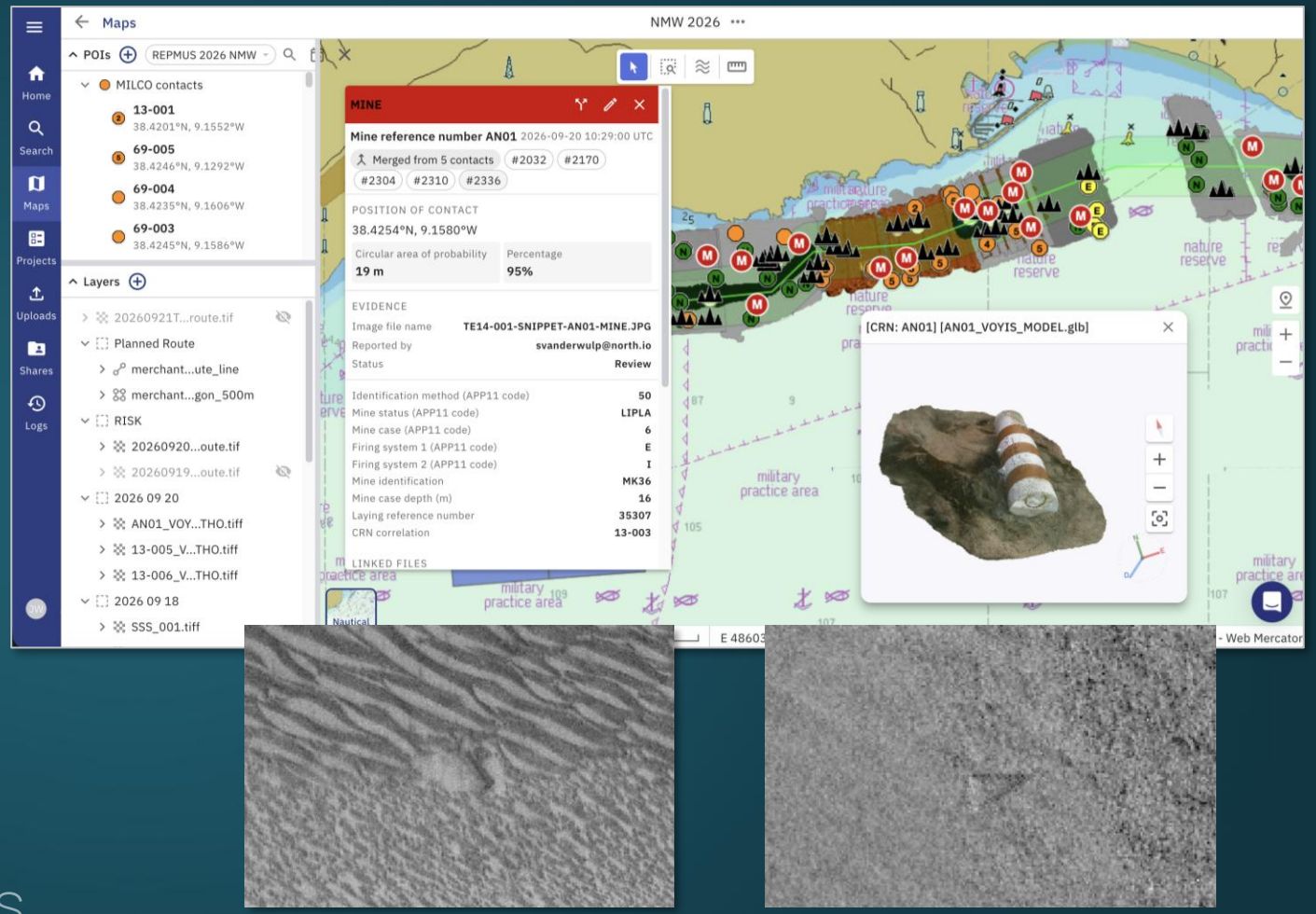
- 5+ Terabyte fused into the common operational picture under dynamic exercise conditions
- Time-sensitive delivery: underwater sensor data processed and streamed in minutes
- Sensor agnostic data integration (20 navies + 15 industry) under one data model
- Underwater big data processing with highly scalable architecture and computing
- Proven deployability for highly secure and air-gapped environments

REPMUS 2025

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REPMUS 2026

north.io powered the Data Fusion Cell of MCM—turning underwater mass data into COP-ready insights.



COP view with fused underwater layers (SSS/SAS) + detections

SeaSEC 2026



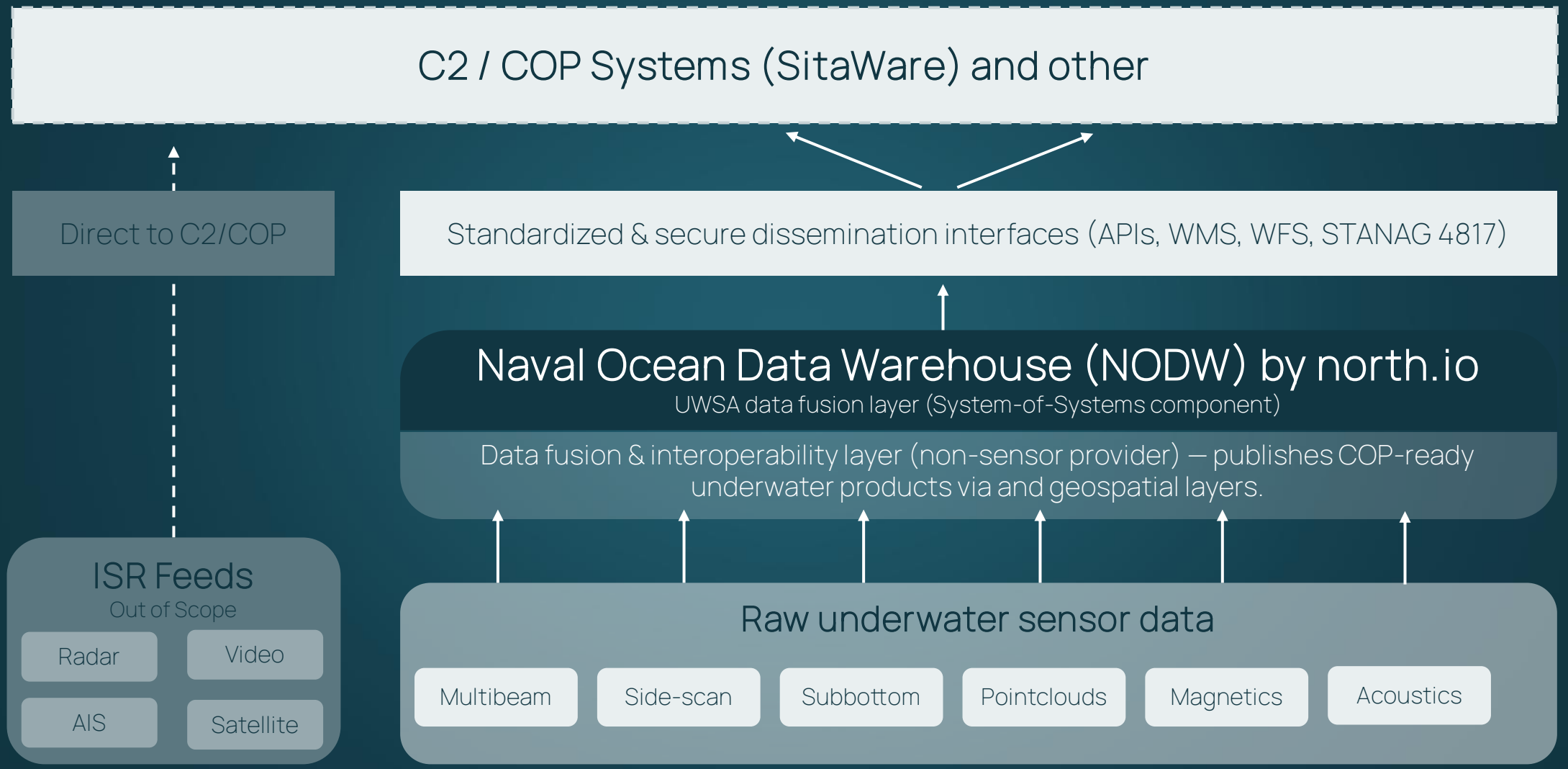
SeaSEC 2026

north.io powered the Data Fusion Cell of the whole SeaSEC Data2Sea exercise

- north.io was tasked by the NNCC (Northern Naval Capability Command) to be power the data fusion cell of all underwater data
- north.io was explicitly not part of the actual challenges but deeply integrated into the exercise architecture (Blue Cell)
- > 250 simultaneous users;
- > 550 GB data ingested and processed;
- > 3000 data uploads an shares;
- > 50 information layers pushed to the COP (here: SitaWare)

Architecture Overview

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Defence & Security Edition

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For high-security environments, distributed teams, and massive data volumes

- **HQ-to-field scalability**: large-scale installations at headquarters, command centers, as well as portable systems for ships and platforms
- **High-performance processing**: technology for extremely large, high-resolution data volumes
- **Air-gapped & offline-ready**: for the highest security requirements and challenging environments



Naval Ocean Data Warehouse (NODW)

From research data space to operational platform

Standards before AI

- Metadata, self-descriptions and common formats make data findable and AI-ready

Trust enables sharing

- Sovereignty, access control and clear usage rules decide whether partners share data

Cloud-native beats hard drives

- Process data where it lives – at petabyte scale

Federate, don't centralise

- Interconnected, sovereign data hubs instead of one central repository

Marispace-X proved the concept – REPMUS & SeaSEC proved it in operations



From Ocean Data to Services

Why this matters

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A key challenge for global subsea and offshore operations

- Offshore and subsea projects generate massive volumes of heterogeneous sensor data.
- Data is often fragmented across vessels, projects, contractors, tools, and formats.
- AI and automation only scale when the underlying data is standardized, governed, and reusable.

north.io provides the data foundation to turn raw ocean data into operational intelligence at scale.

Blue Economy

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Science



Infrastructure



Resources



Coastal protection



Tourism



Shipping



Fishery



Biotechnology



Blue Economy

marispace·x

north.io

Examples: how raw sensor data becomes a recurring service

Offshore Wind & Cables

- Data: repeated multibeam & side-scan surveys
- Service: automated seabed change detection & asset monitoring
- Value: earlier risk detection, less manual processing

Critical Subsea Infrastructure

- Data: hydrophones, fibre-optic sensing (DAS), surveys
- Service: event detection & alerting
- Value: continuous protection of cables & pipelines

Survey Data Management

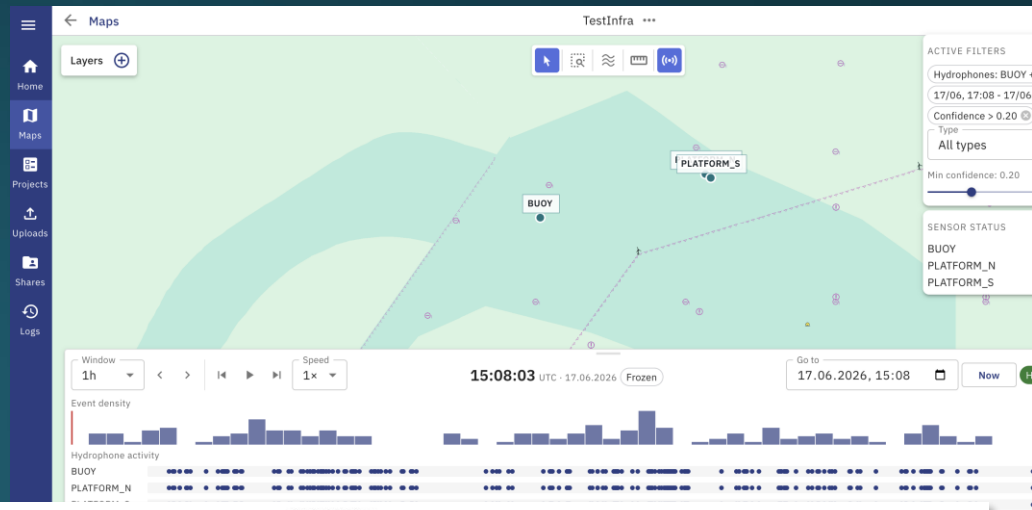
- Data: multi-vendor survey data in 155+ formats
- Service: shared data hub from HQ to project to ship
- Value: reusable data, faster delivery to clients

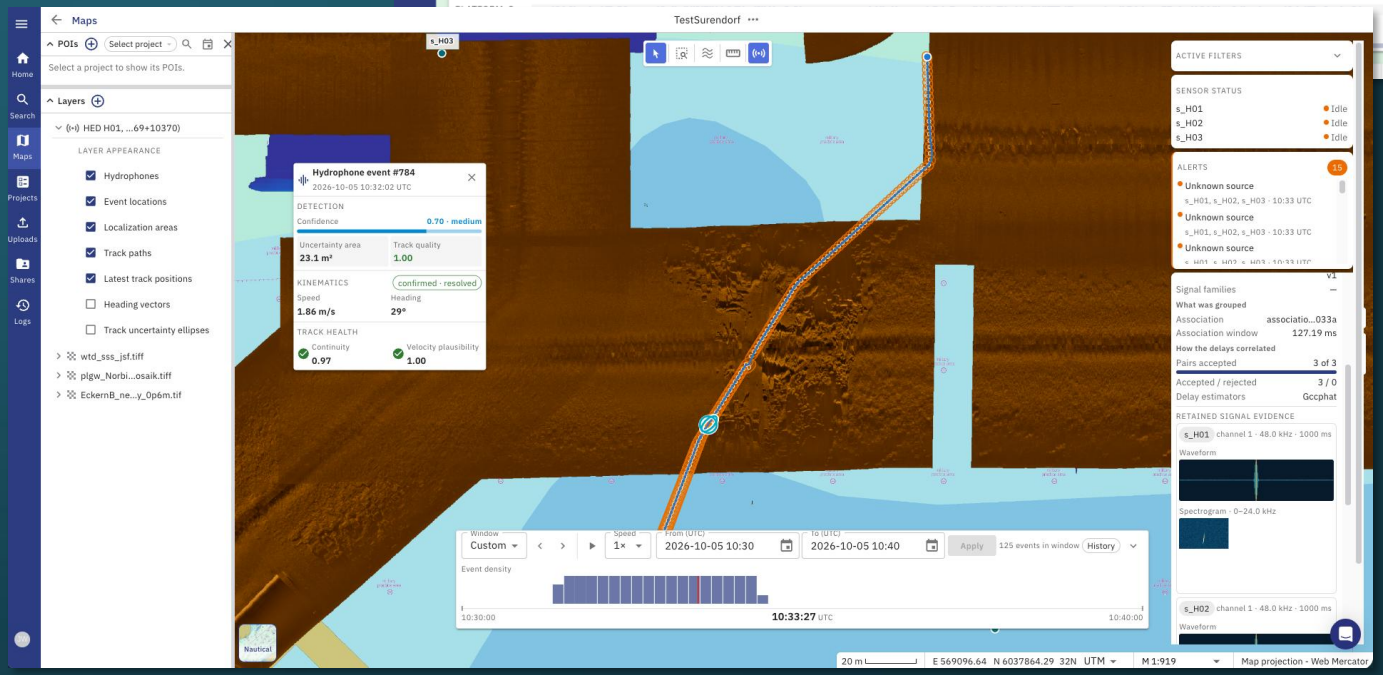
Underwater Situational Picture

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Automated event detection system

- We are building a flexible plug-in system into the Ocean Data Platform for passive sensor based event detection
- Hydrophone-based together with multiple vendors
- Fiberchannel-based (DAS) together with the German Aerospace Center (DLR)







Cooperation with South Korea

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Where north.io and Korean partners can create value together

Offshore Wind Expansion

- Data platform for site surveys, construction and O&M monitoring

Subsea Infrastructure Protection

- Monitoring and event detection for cables & pipelines

Maritime Security (dual-use)

- Underwater situational awareness – subject to export regulations

Joint R&D on AI & Data

- AI-ready ocean data, cloud-native formats, German-Korean programmes

Standards & Interoperability

- Joint work on e.g. IHO S-100, OGC and open self-descriptions

Thank you!

Contact

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