OTT Offshore Operations Data Management

IOOS DMAC Annual Meeting 2025

Kelly Knee, Riley Young Morse, Alex Kerney

NERACOOS

MARACOOS
Ocean Information for a Changing World

Gulf of Maine Research Institute

TETRA TECH

Agenda

1	Project Overview
2	Data Sources
3	Technical Approach & Draft Architecture
4	Discussion / Q&A

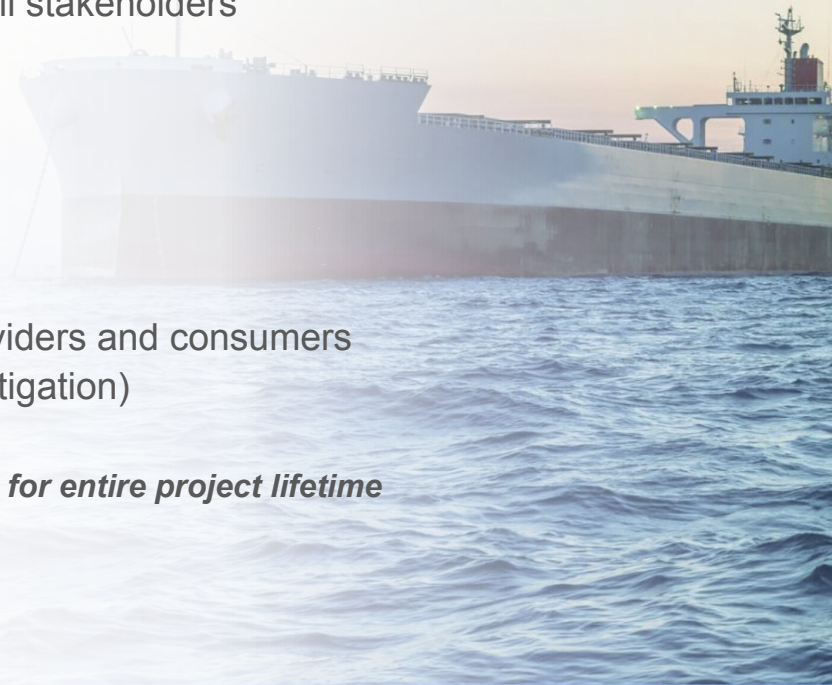
Offshore Operations DAC

Goal

- Ensure that meteorological and oceanographic (metocean) data collected in support of offshore operations are effectively managed and available to all stakeholders

Why Now?

- Multiple organizations deploying MetOcean sensors
- Data discovery, access, interoperability inconsistent
- Valuable data is siloed and possibly lost
- Many stakeholders not benefitting from data
- Pan-regional approach streamlines workflows for providers and consumers
- Support WTRIM (Wind Turbine Radar Interference Mitigation)
  - data availability to IOOS
  - Required to mitigate turbine interference on HF Radar data ***for entire project lifetime***



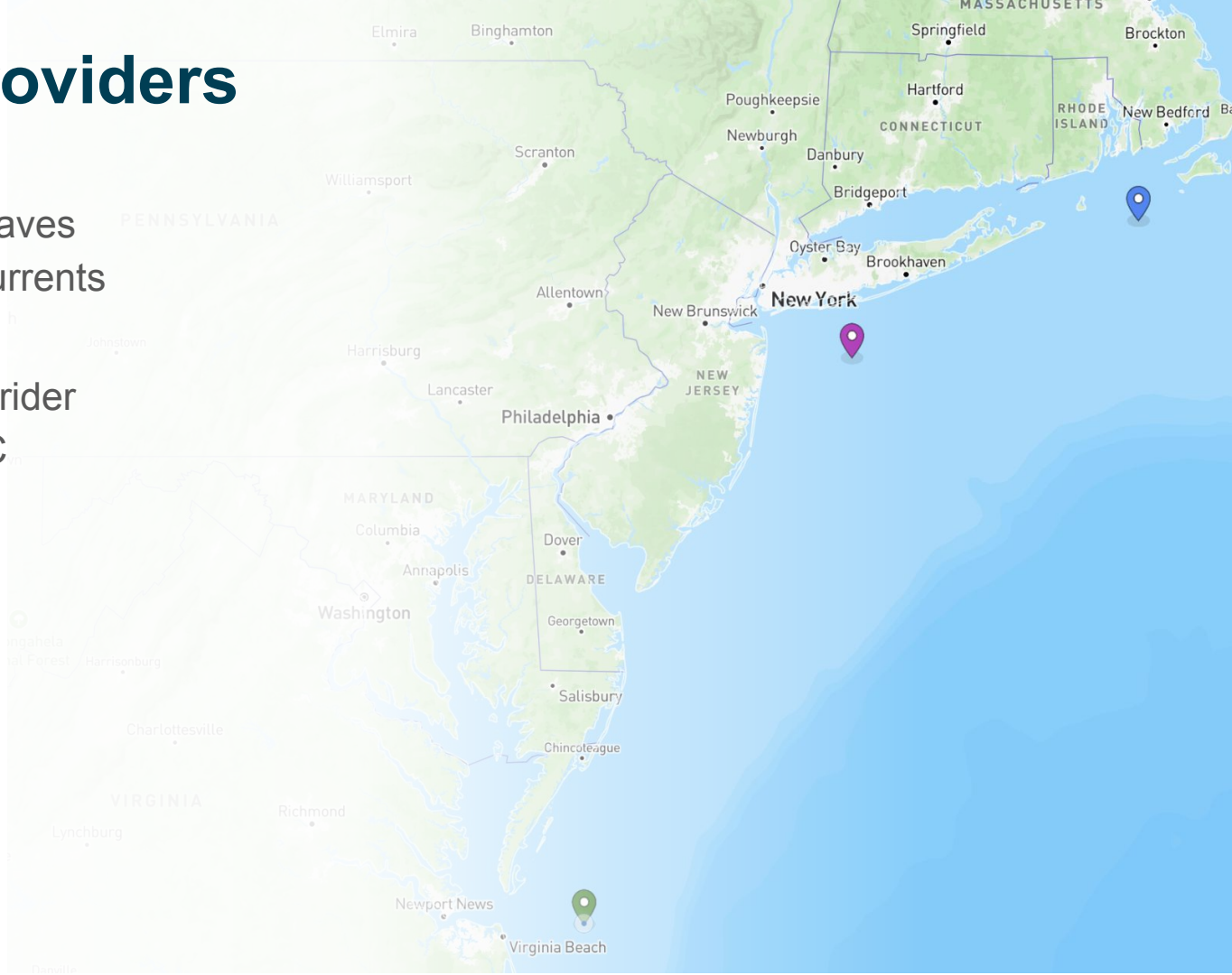
Offshore Operations DAC

Objectives

1. Engagement:
    - Communicate project purpose and benefits
    - Understand data provider needs and expectations
    - Understand data consumer needs
2. Develop platform for ingesting, transforming, storing, and accessing metocean data collected in support of offshore operations
3. Automate ingest workflows
4. Publish data to external systems and data products
5. Provide efficient access to data via Portals and APIs
6. Develop technical documentation, training materials, and approaches for reuse/scalability
7. Develop transition plan for long term operation of metocean cyberinfrastructure (**MetOcean CI)**

Early Data Providers

- Orsted
  - South Fork waves
  - South Fork currents
- Dominion
  - CVOW wave rider
  - CVOW RADC
- Equinor
  - Empire wave



Technical Approach

Develop and deploy a leading-edge cyberinfrastructure platform for ingesting, transforming, storing, and accessing metocean data collected in support of offshore operations

- Define acceptable file formats (CSV, XML, netCDF) to minimize data processing burden on data providers prior to submission
- Integrate data from data providers in the Northeast and Mid-Atlantic regions & plan for national scale
- Publish data to external systems and data products through data APIs (OceansMap, NDBC, Mariners' Dashboard, NCEI)
- Develop technical documentation, training materials and share source code and libraries through IOOS GitHub repository for reuse and scalability
- Develop a transition plan for long term operation of MetOcean CI

Core Capabilities: Ingest | Store | Access

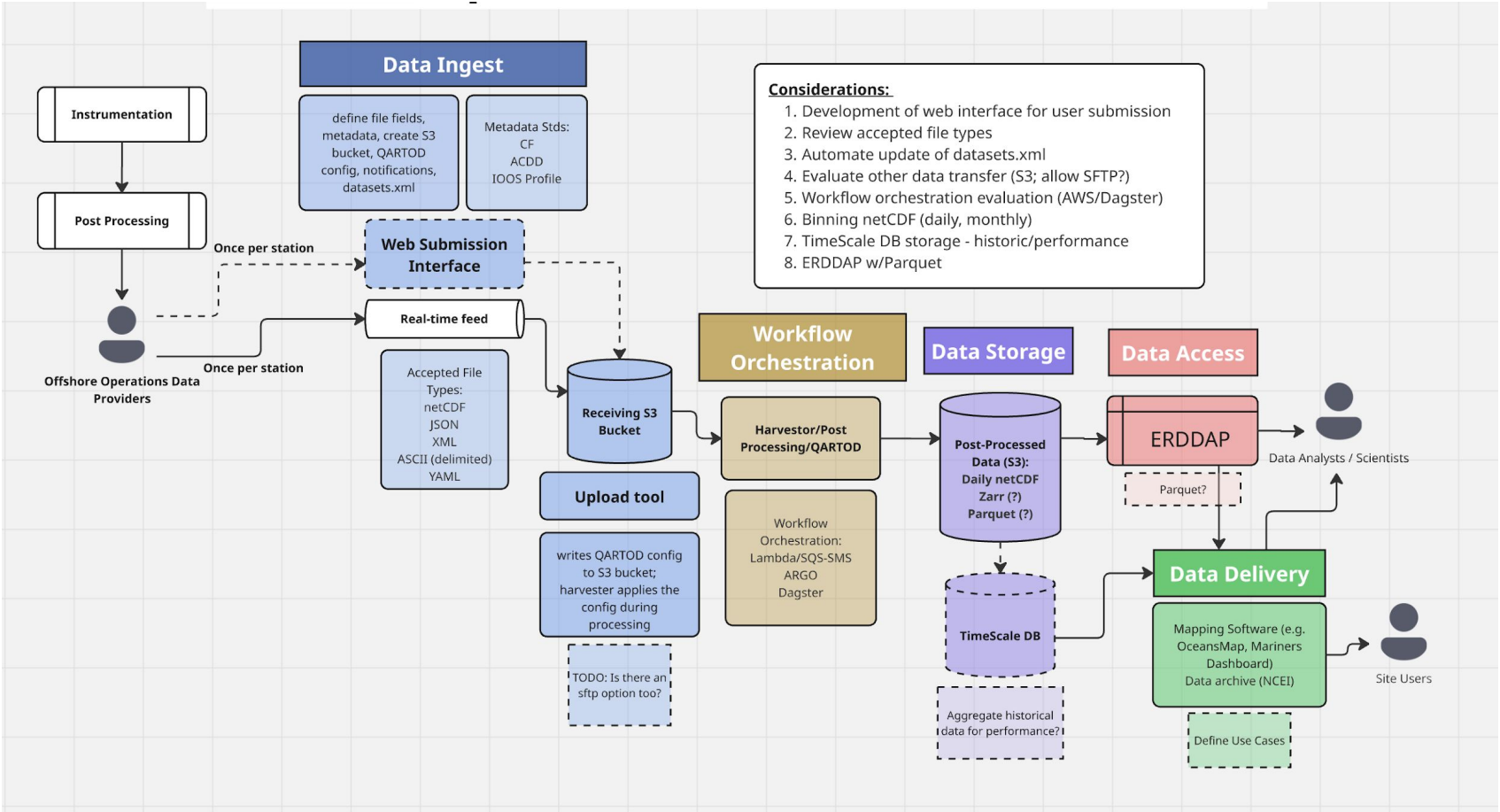
Ingest & Store

- Push/pull of datasets to cloud storage (S3)
- Object storage (S3) for performance and scalability
- Compliant metadata creation
- Convert to netCDF
- QARTOD application
- Aggregation with Kerchunk
- Automate, event driven, update of datasets.xml

Discoverability & Access

- Native ERDDAP services (supports NDBC harvest)
- Modern APIs and packages (Buoy Barn, xArray/xPublish)

System Architecture



Parallel Approach: Cloud-Native Workflow

- Building from RFC, use cloud-based workflows to support scale, extensibility, evolution
- Project team will vet and prototype options for workflow integration
- Run in parallel with standard ERDDAP data access
- E.g. Parquet and Xpublish to optimize data storage and retrieval.
    - Parquet format directly accessed via Xpublish & accessible by data science tools
    - ERDDAP Compatibility >> Xpublish plugin to for federation protocol
    - QARTOD Compatibility >> initial conversion to netCDF

Stay Tuned….

More information for engaging forthcoming!

Stakeholder Engagement

Organizations

- Developers and contractors
- State and federal agencies
- Academic institutions
- Private companies
- NGOs
- Science collaboratives
- Impacted end users

Roles

- Funders and regulators
- Data providers
- Data system partners
- Data end users

Stakeholder Engagement Outcomes

- Increase awareness, understanding of the project and its benefits
- Increase our understanding of offshore industry and their data processes
- Gather input on the CI from from various users
- Enable funders and regulators to recommend or require submission
- Increase data provider participation
- Improve data accessibility for all stakeholders