

Ocean Data Tools

<https://www.oceandatatools.org>

RVTEC 2024 Tutorial

OpenRVDAS

A modular platform for developing custom data acquisition systems to support vessels or vehicles.

OpenVDM

A flexible vessel-wide data management system for organizing files from data acquisition systems

Sealog

A modular platform for building custom event-logging solutions to support vessels or vehicles.

OceanDataTools



- Introduction
- The Tools
- The Process
- Contributing
- Where to from here?

OceanDataTools



- **Introduction**
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OceanDataTools



- **What are they?**
- What's special about them?

A suite of open-source tools for collecting and managing data created aboard oceanographic research vessels.

- **OpenRVDAS** - Data Acquisition
- **OpenVDM** - Data Management
- **Sealog** - Event Logging

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- **What are they?**
- What's special about them?

Each tool is a stand-alone product that can be used independently of the other products.

But when configured together offers greater functionality.

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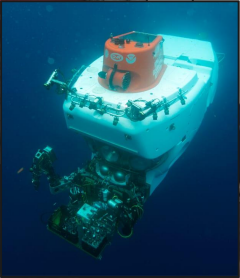


- What are they?
- **What's special about them?**

Each product has proven itself useful across multiple platforms and multiple operating models.

Excellent example of how correctly defined requirements result in solutions that benefit the entire community without requiring strict compliance to a single mode of operation.

OceanDataTools In Use



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Started in 2016

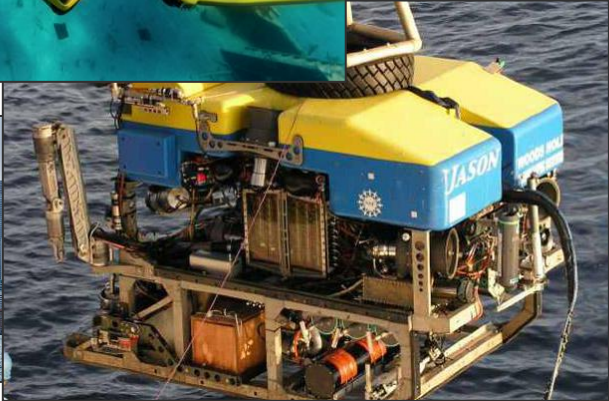
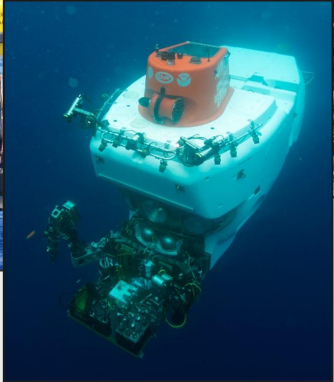
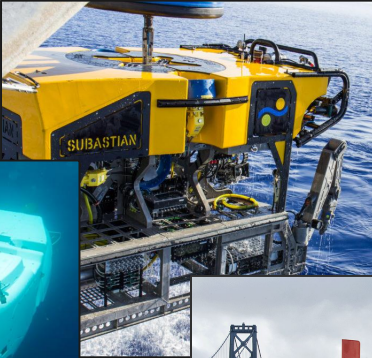
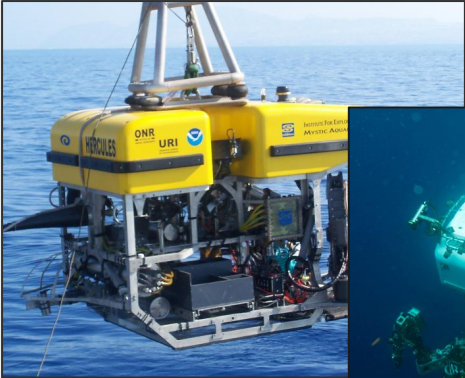
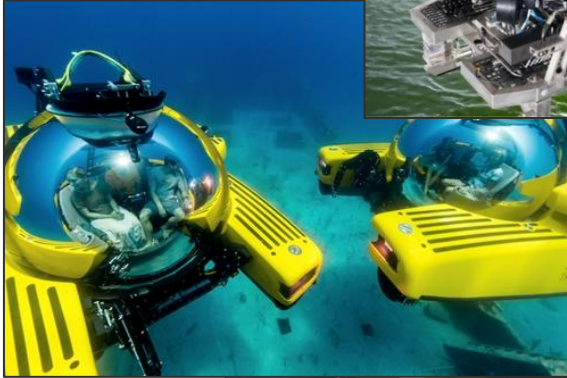
Currently deployed on 25% of vessels actively sending data to R2R and 6 (soon to be 8) additional vessels.

The screenshot displays the R2R website interface. At the top right, there is a "Contact Us" link. The main header features the R2R logo and the tagline "ROLLING DECK TO REPOSITORY", followed by navigation links: "SEARCH", "BROWSE VESSELS", "DATA TYPES & PRODUCTS", "COMMUNITY", and "ABOUT R2R". On the left side, there are three search input fields labeled "Search cruise...", "Search device...", and "Search keyword...", each with a magnifying glass icon. Below these are links for "QA Dashboard", "Operator Dashboard", "API", "Publications", and "Best Practices". The main content area is titled "Active" and contains a grid of 12 vessel cards. Each card includes a vessel name, a photograph of the vessel, and a "Select Cruise ID" dropdown menu. The vessels shown are: Atlantic Explorer, Atlantis, Blue Heron, Corwith Cramer, Endeavor, Falkor (too), F.G. Walton Smith, Healy, Hugh R. Sharp, Kilo Moana, Laurence M. Gould, and Marcus G. Langseth.

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Also supporting multiple
HOVs, ROVs and AUVs



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OpenRVDAS

The screenshot displays the 'NBP1406 Cruise Management' interface. At the top, it shows system information: 'now Tue Oct 01 2024 19:54:06', 'server Tue Oct 01 2024 19:54:06', and 'status Tue Oct 01 2024 19:54:06'. Below this, there are sections for 'cruise mode' (set to 'no_write+influx') and 'logger manager stderr' with log messages. A central table lists various net types, each with a green status indicator and a timestamp. The net types listed are: PCOD-net, cwnc-net, gp02-net, **gyr1-net**, adcp-net, eng1-net, svp1-net, twnc-net, mbdp-net, knud-net, grv1-net, mxw1-net, pco2-net, pguv-net, and s330-net. Overlaid on the right is a 'configuration' window for 'gyr1-net'. It shows a list of configurations: 'gyr1-off', 'gyr1-net [mode default]' (selected), and 'gyr1-net+file'. Below the list, it shows a JSON structure for 'readers' with a 'data_id' of 's330' and a list of fields including 'S330CourseTrue', 'S330EorW', 'S330GPDate', 'S330GPSTime', 'S330Latitude', and 'S330Longitude'. A 'Relative wind speed' plot is also visible, showing a line graph with values between 15 and 25 kn from 08:10 to 08:30.



OpenRVDAS

What is it?

Architecture that lets you snap together simple components to build a customized data acquisition system for your ship/station/chicken coop.

Intended function is to get data from sensors to file/database/network/graphics, with opportunity to process and/or mash it around into different formats on the way.

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OpenVDM

The screenshot displays the Open Vessel Data Management (OpenVDM) v2.9.6 - DEMO interface. The main dashboard includes a navigation menu on the left with options for Home, Data Dashboard, Configuration, and Links. The central area is divided into several panels:

- System Status:** Shows 'On' status for the system.
- Cruise ID:** Displays 'CS2001'.
- Cruise Size:** Shows '138.20 MB'.
- Free Space:** Shows '65.20 GB'.

Below these are sections for 'Incorrect Filenames Detected', 'Collection System Transfer Status', and 'Recent Shipboard Data Transfers'. The 'Recent Shipboard Data Transfers' section lists transfers for '2024-09-03 13:18:34 UTC' with various file names and statuses.

On the left, there are two sensor data visualizations:

- Metereological Sensor:** A line graph showing data from 01:00 to 03:00. The y-axis ranges from 0 to 30. A legend indicates 'Air Pressure (mbar)'.
- Wind Sensor:** A line graph showing data from 01:00 to 12:00. The y-axis ranges from 100 to 180. A legend indicates 'Wind Speed (m/s)' and 'Wind Direction (deg)'.

At the bottom left, there are file download links for 'met' and 'twind' sensors.

On the right, there is a 'Cruise Data Transfer Status' section with a list of transfer tasks, including 'Shoreline Data Warehouse', 'Cruise copy to anonymous SMB share', 'Cruise copy to authenticated SMB share', 'Cruise copy to rync server', 'Cruise copy to SSH server', and 'Cruise copy to local directory'. Below this is a map showing the vessel's track with a legend for 'gpr' and 'POSIMV_GGA'. The map shows a track along a coastline with various data points.

At the bottom right, there is a footer: 'OpenVDM is licensed under the MIT public license'.

OpenVDM

What is it?

Tool for retrieving files from across a vessel, organizing those files into a single directory structure and ***providing*** crew and clients with ***safe and immediate access to datasets.***

Identifies file naming issues to ***prevent problems from propagating.***

OpenVDM

What is it?

Provides ability to **setup bespoke data processing workflows** based on the arrival of files.

Updates data deliverables throughout cruise to **reduce end-of-cruise workload**.

Allows vessel operators to better **adhere to** their data management plan and **best practices of** archival facilities such as **R2R**.

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Sealog

The screenshot displays the Sealog software interface, which is used for managing vessel data and events. It is divided into several main sections:

- Map View (Top Left):** Shows a map of the Caribbean Sea region, including parts of the Bahamas, Jamaica, and the Dominican Republic. A blue location pin is placed near San Juan, Puerto Rico, with a green line indicating a vessel's path.
- Event List (Bottom Left):** A list of filtered events with columns for time, status, and free text. The events include:
 - 2023-03-03T17:00:00.000Z <mt> CRUISE -> status: "Start of Cruise"
 - 2023-03-03T17:00:00.000Z <mt> CRUISE -> status: "Departed Port/Dock", free_text: "Departing to Anchorage"
 - 2023-03-03T21:33:41.501Z <mt> CRUISE -> status: "Transiting", free_text: "Leaving Puerto Rico anchorage and heading toward MAR."
 - 2023-03-03T22:04:26.880Z <mt> SONAR -> status: "Sonar Started,Sonar Logging Enabled", system: "EM712"
 - 2023-03-04T01:30:43.595Z <mt> SONAR
- Event Configuration (Bottom Right):** A detailed view for configuring an event. It includes:
 - Event Filter:** Fields for "Full text" (with example "i.e. SAMPLE"), "Author" (with example "i.e. jsmith"), "Start Date/Time (UTC)", and "Stop Date/Time (UTC)".
 - Event Templates:** A table listing various event types and their associated actions.

Button Name	Event Value	Actions
Bird	OBSERVATION	[Icons]
CTD Problem	PROBLEM	[Icons]
CTD Winch Problem	PROBLEM	[Icons]
Debris	OBSERVATION	[Icons]
Mammal	OBSERVATION	[Icons]
Other Obs	OBSERVATION	[Icons]
SIS Restart	SONAR	[Icons]
Sonar	SONAR	[Icons]
 - Form Fields:** "Name" (required), "Status" (dropdown), "Type" (dropdown), and "Dropdown Options" (list of values like "Start of Cruise, Departed Port/Dock, Transiting, Arrived at working site, etc").
- Main Dashboard (Top Right):** Shows the "Sealog for Vessels v2.2.4 - DEMO" interface with tabs for CRUISE, CTD, EQUIPMENT, OBSERVATION, ROV, SCIENCE, SONAR, and SOUND SPEED. The "CRUISE" tab is active, showing a "Type new event" form with fields for "Vessel Realtime Nav Data" (Heading, Latitude, Longitude) and "Event Options" (Status). Below this is an "Event History" list of recent events and a "Hide ASNAP" toggle.

Sealog



What is it?

Sealog is a **general purpose event logging framework** built to support research vessels and underwater vehicles.

It provides vessel/vehicle operators with an event-logging solution that can be **customized to support** the operator's unique needs and provide a **science party** with a tool that allows them to design and **enforce standardized** documenting procedures and **vocabularies**.

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Use Case: SIO Fleet

In 2023-2024 the suite was installed on:

- R/V Revelle
- R/V Ride
- USCGC Healy
- R/V Sproul



The Process



- **Evaluation**

- Pre-planning
- Staging
- Installing/Configuration
- Commissioning
- Training
- Long-term support

- No two vessels work the same
- Important to fully understand the existing system before introducing change.
- Worked extensively with techs to understand the vessels systems, subtle nuances and various operating modes.

The Process



- Evaluation
- **Pre-planning**
- Staging
- Installing/Configuration
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- Iterated on a comprehensive data management plan.
- What sensors to integrate with OpenRVDAS?
- OpenRVDAS file names.
- What systems to integrate with OpenVDM?
- How to organize the files.
- Desired file naming conventions for other systems.

The Process



- Evaluation
- **Pre-planning**
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Documented custom integration tasks:

- Custom OpenRVDAS transforms (WicorTransform)
- OpenVDM plugins/parsers
- OpenVDM/OpenRVDAS integration
- Migration procedures from previous data management system to OpenVDM
- Grafana Dashboards

The Process



- Evaluation
 - Pre-planning
 - **Staging**
 - Installing/Configuration
 - Commissioning
 - Training
 - Long-term support
- Obtained dataset from a previous cruise.
 - Built a cloud-based staging environment for development, testing and evaluation.
 - Simulated a cruise using the staging environment.
 - Exported custom code from staging environment to code repo.

The Process



- Evaluation
 - Pre-planning
 - Staging
 - **Installing/Configuration**
 - Commissioning
 - Training
 - Long-term support
- Deployment to shipboard VMs
 - VMs setup by SIO
 - Base software installs
 - Applied customizations from staging environment
 - Setup remote access

The Process



- Evaluation
 - Pre-planning
 - Staging
 - Installing/Configuration
 - **Commissioning**
 - **Training**
 - Long-term support
- 4-day transit cruise to confirm system working as intended.
 - Training/System familiarization
 - Documentation

The Process

- Evaluation
- Pre-planning
- Staging
- Installing/Configuration
- Commissioning
- Training
- **Long-term support**

Long-term support via VPN connection to vessel.

Communication via email / Slack / Zoom

Support has included:

- Feature requests
- Additional training
- Bug fixes
- General assistance to shipboard personnel.

The Process



- Evaluation
- Pre-planning
- Staging
- Installing/Configuration
- Commissioning
- Training
- **Long-term support**

On-site installation done for Revelle, Healy and Ride

Sproul setup 100% remotely

Onsite setup is NOT required if there is sufficient remote access to shipboard systems

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Contributing to OceanDataTools

Because sharing is caring! ❤️

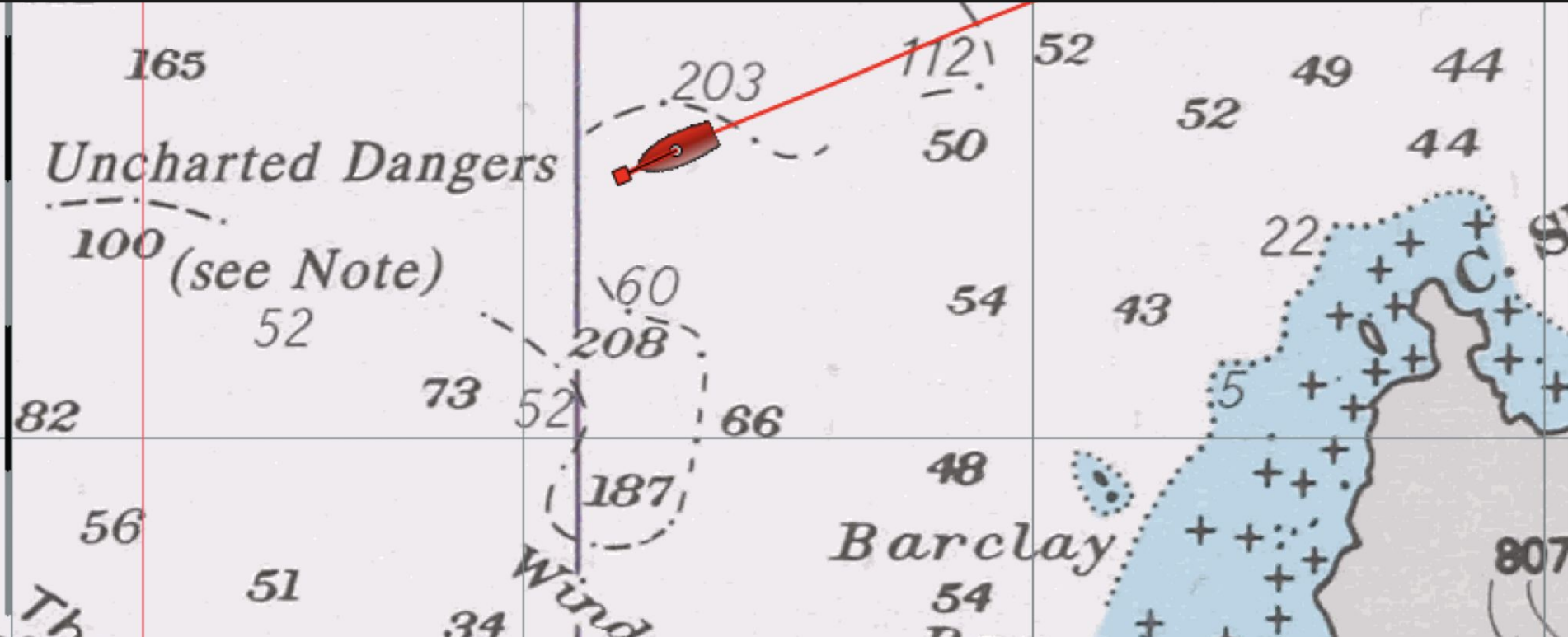
Bug reports/feature requests:

- <https://github.com/OceanDataTools/openvdm/issues>
- <https://github.com/OceanDataTools/openrvdas/issues>
- <https://github.com/OceanDataTools/sealog-server/issues>

Parallel repo for OpenRVDAS contributions:

- https://github.com/OceanDataTools/openrvdas_contrib

Where to from here?



Long Term Ocean Data Tools Support



- Current support comes from individual contracts (SIO, SOI, OceanX, InkFish, FIO, others)
- Improvements and ongoing maintenance are largely volunteer (*Thank you, NIWA, CSIRO and USAP!*)
- Does it make sense to get affiliated with or absorbed by an institution?