



From experiment to archival storage to mashup usage: Robodata information flow.

## How: Open Source and Open Web Standards

Robodata project design is able to support all manner of robots, unmanned systems and networked sensors in a scientifically rigorous, repeatable way.

- Adapts 10 years of operations using Spatial Temporal Oceanographic Query System ([STOQS](#)) by Monterey Bay Aquarium Research Institute (MBARI).
- Entire software stack is open source, thus adaptable and free to use (or fix).
- Multiple forms of visualization are suitable for figures in theses and reports.
  - Filters focus on platforms, sensors, locations and time periods of interest.
  - Time-series data plots are provided for each recorded parameter
  - 2D charts and KML map annotations show geographic context.
  - Immersive scenes show X3D Graphics models viewable in Web browsers.
- Initial system design and prototype online at <https://my.nps.edu/web/robodata>

## What: Store All Data from NPS Robotics Experiments

JIFX robodata project is establishing NPS data-collection capabilities for a wide variety of unmanned system and sensor experiments.

- Database types, metadata annotations and structure are carefully defined.
- Robots collect well-defined track and sensor telemetry, imagery, video etc.
- Mission operators record narratives, goals, outcomes, image captions, etc.
- Conversion software reads telemetry according to metadata definitions, building a well-structured NetCDF mission file.
- STOQS server loads NetCDF into the campaign database of robot missions.
- End users query STOQS server for filtered results, plots and visualizations.
- Operator narratives, imagery, videos and 3D models will be stored separately.

## Why: Building a Lasting Foundation

- NPS performs many experiments with unmanned systems, but few projects are able to record results in a systematic reusable way.
- Utilizing open assets in a repeatable, sustainable way can build an institutional archive of worthy examples that is easy to adopt.
- Utilizing open standards and software assets in a repeatable, sustainable way builds an institutional archive of worthy examples that is easy to adopt & adapt.
- Initial implementation efforts for NPS data-collection in unmanned system experiments are suitable for broader application in Data-Centric Navy.
- Long-term access to ongoing NPS and partner experimentation is accessible via the Calhoun institutional archive and (someday) larger DoD archives.
- Broader applications with big-data mashups of information become possible.