

Data Management for Animal Tracking Activities



IOOS DMAC 2015
Jon Pye
[@OceanTracking](#)

“OTN is a biological observing system of the UN’s Global Ocean Observing System.” Following on from the Census of Marine Life (CoML), OTN has the Global Ocean Observing System (GOOS) mandate for integrating acoustic receiver array data from all of the world oceans plus the Mediterranean Sea and Great Lakes.



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Many separate observing systems comprise the GOOS. These vary from a few buoys operated by a research lab, to intergovernmental cooperations which organize globe spanning efforts. The GOOS seeks to find the value of associating these many systems together to create a value greater than the separate parts. By integrating disparate systems the unique data and distribution systems of each can become part of a greater system, enhancing the value and utility of the individual systems as well as creating a global view of the earth's oceans.

OTN is a global network built on **partnerships**

Strategic receiver arrays deployed in **collaboration** with independent **partners** to ensure effective monitoring and stewardship of our valued aquatic resources

Data partnerships built on intelligent open access and interoperability

Fostering new technology development and innovative use of existing technology

OTN-affiliated receivers
Locations as of June 2014



Collaborations with over 100 tagging projects
sharing at least a subset of their tagging metadata
with OTN
Ever-expanding global network of acoustic receivers
listening for over 90 different key animal species

Standards Based/Best Practices

OTN follows international standards, including:

- *OBIS (DarwinCore)
- Open Geospatial Consortium (OWS)



We are also dedicated to open-source platforms:
PostgreSQL / PostGIS,
Plone CMS, R, Python

IOOS / NERACOOS / IMOS /
OTN developed and implemented
Marine Metadata Initiative (MMI)
Registered Animal Acoustic
Telemetry (AAT) Exchange
standard

- Minimal **required** field set with large *optional* field set allows assumptions to be made without excluding data sources
- AAT will facilitate ingestion for modelers (NetCDF)

* : Ocean Biogeographic Information System (iobis.org)

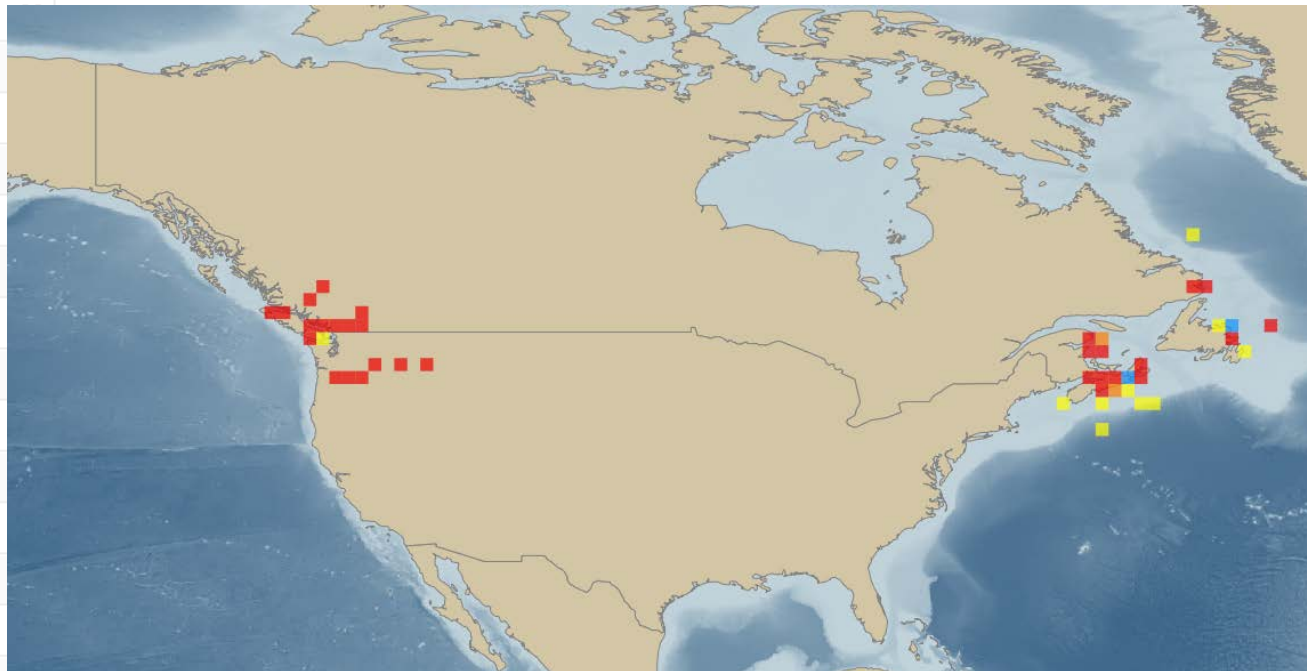
IOOS® Z-GRAM – 28 June 2013

Animal Telemetry: OTN, a project of Global Ocean Observing System (GOOS), led by Canada, has accepted to adopt the Animal Acoustic Telemetry (AAT) Data solutions recently reconciled by U.S. IOOS, NANOOS, OTN, and Australia's Integrated Marine Observing System (IMOS) and other partners. These data solutions include a) standard AAT data content and standard discovery metadata (based on FGDC and ISO) and b) standard access using ERDDAP and GEOSERVER services. These AAT data solutions are expected to facilitate data exchange between data centers, unite oceanographers and trackers and users getting the data they want in formats they need.

See also: <https://code.google.com/p/ioostech/wiki/AnimalAcousticTelData>

OTN Data on the Ocean Biogeographic Information System

OTN Bras d'Or Lakes Array - Tag Release Metadata
OTN Canada Pacific Sockeye Salmon Tagging Project 2 ...
OTN Goukou Estuary fish tracking - Tag Release Metadata
OTN Kintama 2004-2011 tags - Tag Release Metadata
OTN NS Blue Shark Tracking - Tag Release Metadata
OTN Ponta do Ouro zambezi shark tracking - Tag Relea...
OTN Raby Coho Salmon Tagging - Tag Release Metadata
OTN Shark Spotters shark tracking - Tag Release Meta...
OTN/ACADIA Minas Passage of the Bay of Fundy fish A...
OTN/DFO Maritimes Grey seals as bioprobes
OTN/DFO Maritimes Inner Bay of Fundy Atlantic Salmon ...
OTN/DFO Maritimes Spiny Dogfish Tagging
OTN/DFO Maritimes St. Mary's River Salmon Tracking - ...
OTN/DFO NE Newfoundland Acoustic Array and Atlantic ...
OTN/DFO NL Gilbert Bay Acoustic Telemetry - Tag Rele...
OTN/DFO-GFC Gulf of St Lawrence Cod Acoustic Tele...
OTN/DFO: Porbeagle and Blue Sharks - Tag Release M...



- Public tag release metadata for >12k animals / 17 proj.
- Submission process now push-button automated using the OTN Database & Python's **requests** module

Screenshots via iobis.org

Per OTN
Animal tag
approved
Registered

IMI

Scientific
Contacts

Related
URLs (May
require
login)

Access and
Usage
Constraints

Print

Pro

OB

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Get

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to o

animals

- datelastmodified: 2011-01-19T00:00:00Z
- institutioncode: DFO-BIO
- collectioncode: WDG
- datacenter_reference: OTN-Global
- catalognumber: WDG-1071390
- scientificname: Squalus acanthias
- longitude: -66.364
- latitude: 43.672
- basisofrecord: O
- datecollected: Aug 19, 2009 12:00:00 AM
- yearcollected: 2009
- monthcollected: 8
- daycollected: 19
- timeofday: 0.0
- timezone: UTC
- observedindividualcount: 1
- collector: WARREN JOYCE
- julianday: 231
- locality: WEDGEPORT
- animal_origin: W
- stock: 4X
- sex: M
- life_stage: ADULT
- length: 0.75
- length_type: FORK
- length_units: m
- vernacularname: spiny dogfish
- aphiaid: 105923
- tsn: 160617
- authorityaccepted: Linnaeus, 1758
- kingdom: Animalia
- phylum: Chordata
- classname: Elasmobranchii
- ordername: Squaliformes
- family: Squalidae
- genus: Squalus
- species: acanthias

Directions: [To here](#) - [From here](#)

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

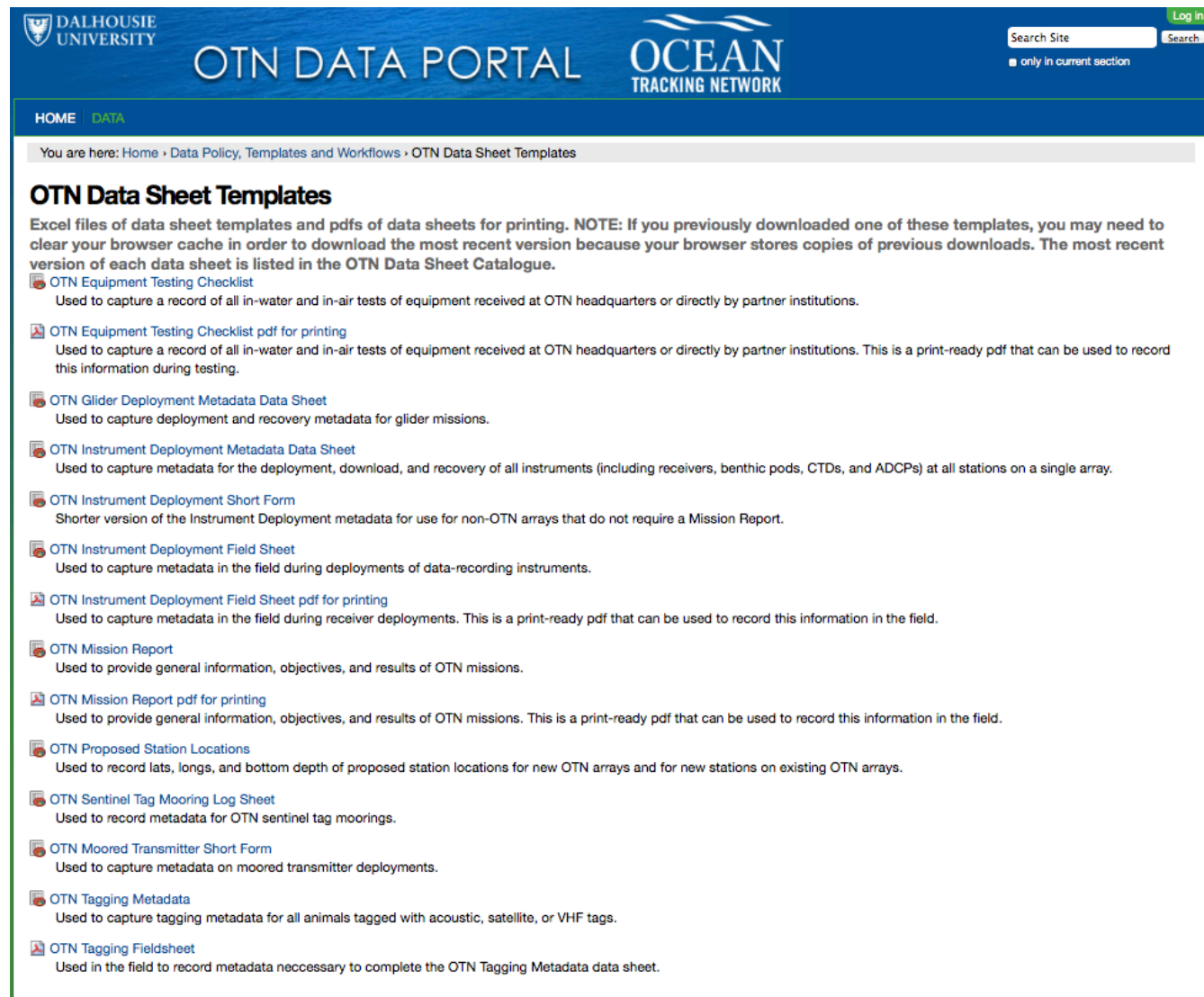
Tour Guide

Imagery Date: 4/9/2013 44°33'47.89" N 65°18'56.29" W elev 169 m eye alt 309.27 km

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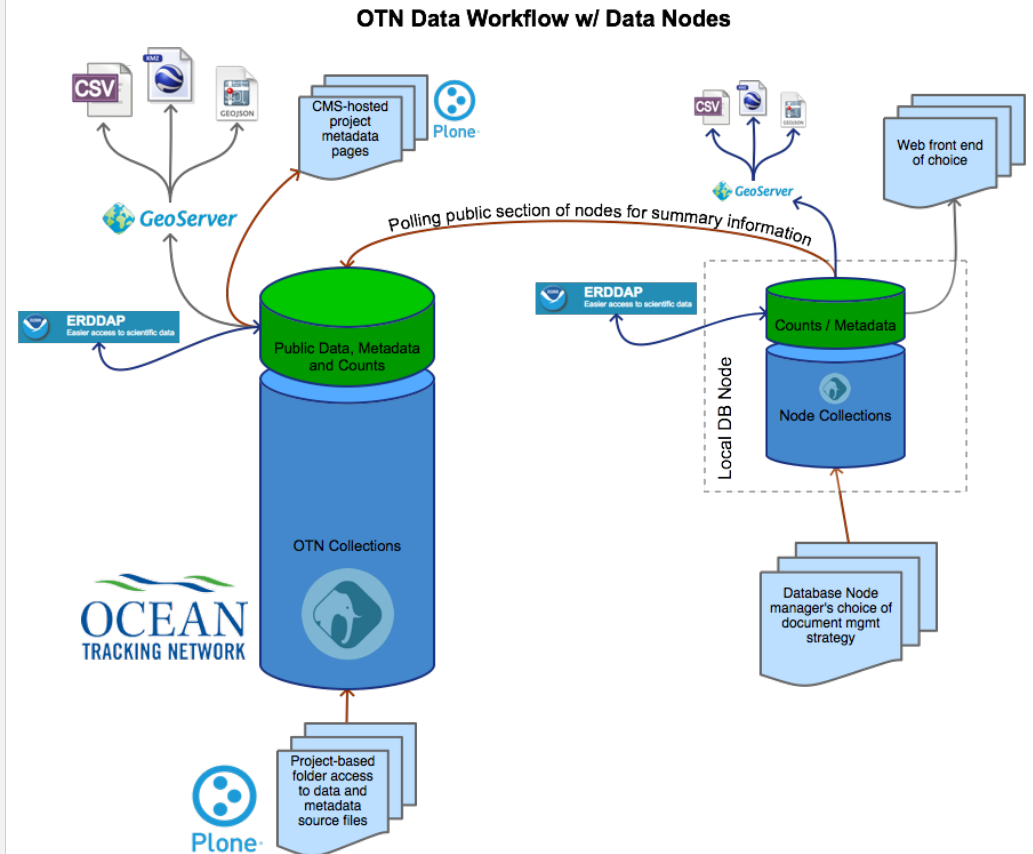
- OTN provides metadata templates (with included data dictionaries for how to complete)
- We will ingest any electronic format (no need to reformat if you already have electronic data)
- “Be conservative in what you do, be liberal in what you accept from others.”
-Jon Postel




The screenshot shows the OTN Data Portal website. At the top, there is a header with the Dalhousie University logo, the text "OTN DATA PORTAL", and the "OCEAN TRACKING NETWORK" logo. A search bar is located in the top right corner. Below the header, there is a navigation bar with "HOME" and "DATA" links. The main content area is titled "OTN Data Sheet Templates" and contains a list of templates with their descriptions. The list includes:

- OTN Equipment Testing Checklist**: Used to capture a record of all in-water and in-air tests of equipment received at OTN headquarters or directly by partner institutions.
- OTN Equipment Testing Checklist pdf for printing**: Used to capture a record of all in-water and in-air tests of equipment received at OTN headquarters or directly by partner institutions. This is a print-ready pdf that can be used to record this information during testing.
- OTN Glider Deployment Metadata Data Sheet**: Used to capture deployment and recovery metadata for glider missions.
- OTN Instrument Deployment Metadata Data Sheet**: Used to capture metadata for the deployment, download, and recovery of all instruments (including receivers, benthic pods, CTDs, and ADCPs) at all stations on a single array.
- OTN Instrument Deployment Short Form**: Shorter version of the Instrument Deployment metadata for use for non-OTN arrays that do not require a Mission Report.
- OTN Instrument Deployment Field Sheet**: Used to capture metadata in the field during deployments of data-recording instruments.
- OTN Instrument Deployment Field Sheet pdf for printing**: Used to capture metadata in the field during receiver deployments. This is a print-ready pdf that can be used to record this information in the field.
- OTN Mission Report**: Used to provide general information, objectives, and results of OTN missions.
- OTN Mission Report pdf for printing**: Used to provide general information, objectives, and results of OTN missions. This is a print-ready pdf that can be used to record this information in the field.
- OTN Proposed Station Locations**: Used to record lats, longs, and bottom depth of proposed station locations for new OTN arrays and for new stations on existing OTN arrays.
- OTN Sentinel Tag Mooring Log Sheet**: Used to record metadata for OTN sentinel tag moorings.
- OTN Moored Transmitter Short Form**: Used to capture metadata on moored transmitter deployments.
- OTN Tagging Metadata**: Used to capture tagging metadata for all animals tagged with acoustic, satellite, or VHF tags.
- OTN Tagging Fieldsheet**: Used in the field to record metadata necessary to complete the OTN Tagging Metadata data sheet.

Focus is now on generalizing these helper/translator scripts for Data Node / general use



Data loading and processing scripts managed in  GitLab

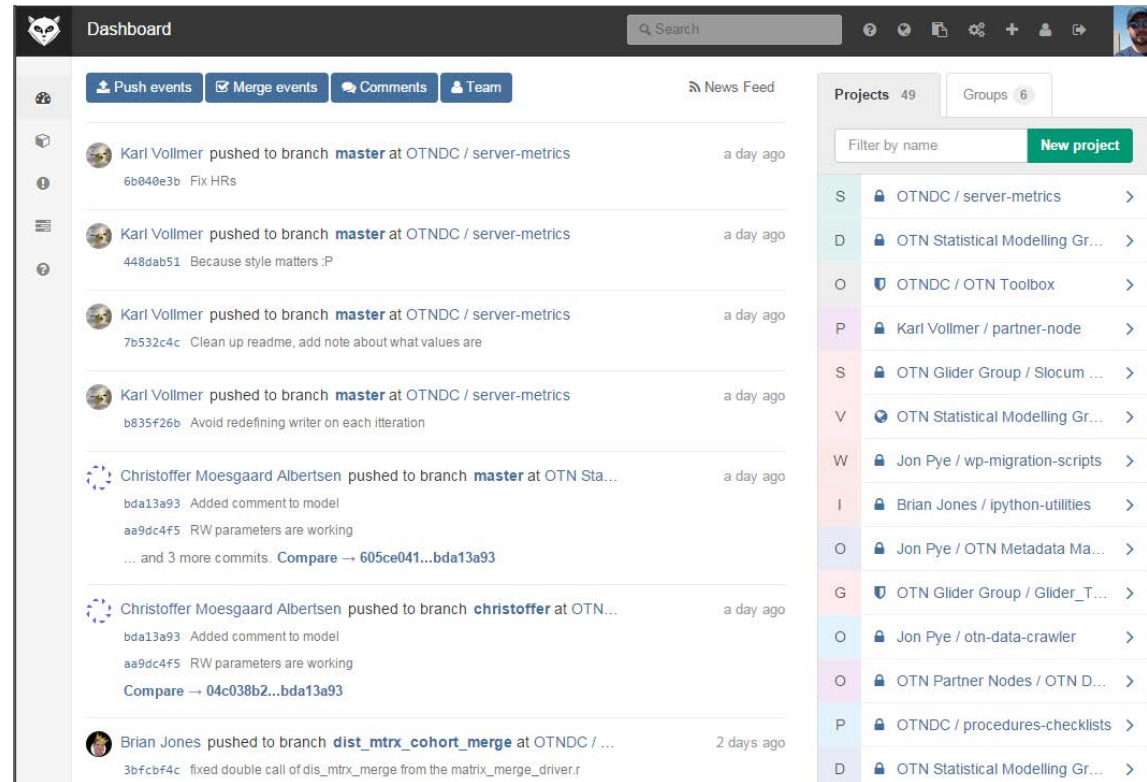


GitHub-style code repository host

- Issues/Milestones/Comments
- Forking/Merging
- Web-based Diffs
- Permissions and Private / Semi-Private repositories
- Code attribution, retention, distribution

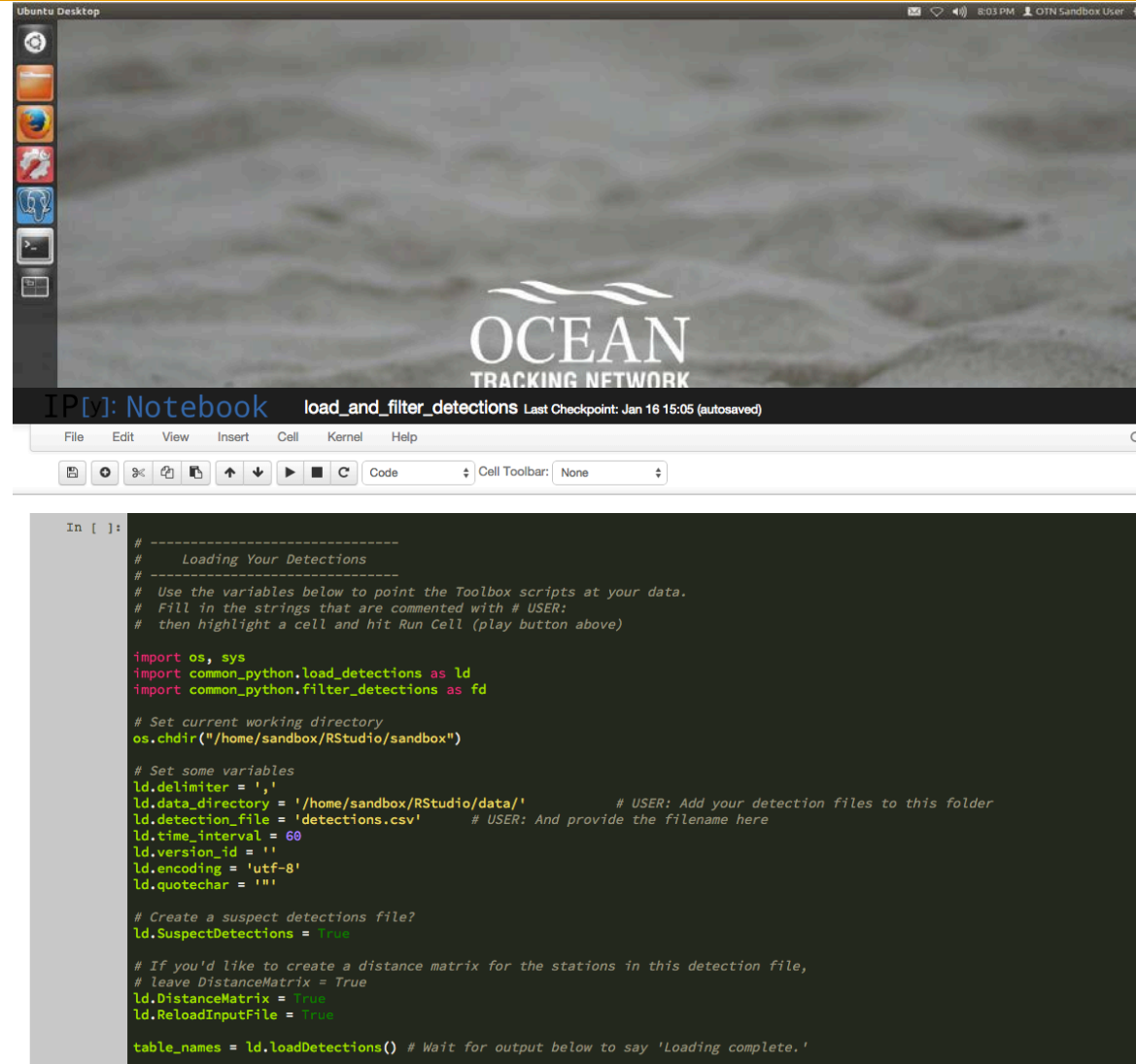
Some projects on the OTN GitLab:

- OTN Toolbox
- OTN Metadata Formatters
- Partner DB Node Puppet deployment
- OTNDC Data Loading / QA .ipynbs
- OTN Glider Tools
- OTN Tagging Mobile Application
- Statistical Modelling of Animal Paths
- Graduate work for OTN HQP



OTN Sandbox VM

- **Vagrant Cloud-registered VM**
 - Plug and play platform to enable collaborative development among OTN researchers
 - VM eliminates* compatibility issues
 - Vagrant versioning and deployment
- **Supports the growing OTN Toolbox**
 - Station Distance Matrix operations
 - White-Mihoff False Filtering
 - Interval aggregation of detections
 - Cohort identification
- **Python / RStudio environments**
 - iPython Notebook
 - Geospatial Data Tools
 - Full IOOS Python Vis. environment
 - Template Model Builder
 - Geospatial Data Tools
 - CoastWatch Xtractomatic



* Software compatibility issues are handled by VM maintainer

Summing up:

- AAT-compliant data available now for OTN **stations** via our GeoServer
- Public Detection / Release data can be made available pending end of embargo periods
- Currently working on reconfiguring ERDDAP as a part of our Data Partner Node deployment
- We at OTN see great value in supporting this standard, and welcome future collaborations



OCEAN TRACKING NETWORK

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