

Lessons from building semantic technologies for scientific drones and IoT

Jane Wyngaard (UND), Charles F Vardeman II (UND), <u>jwyngaar@nd.edu</u>

cvardema@nd.edu





Introduction



- 1. Research Data Management in Engineering IG
- 2. Small Unmanned Aircraft Systems' Data IG
- Linked-data API for Networked DRoneS: <u>LANDRS</u>





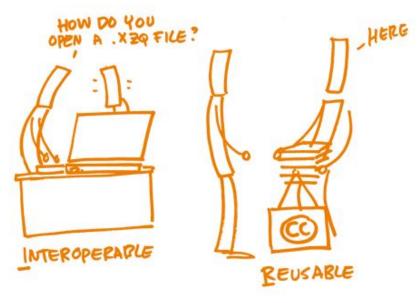
FAIR Data



FAIR DATA PRINCIPLES









Common needs in Engineering



- 1. Many data sources
- 2. Established workflows
- Closed source tool stacks
- 4. Complex systems



Addressing these for Drones



Problem: Complex and painful drone data pipeline costs significant data value

Goal: Allow users to capture the lost value by providing standards based APIs for building drone data wrangling tools.





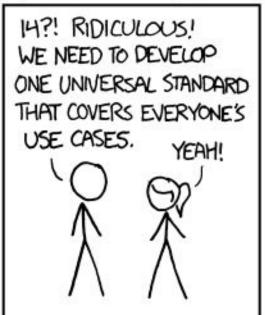
[Taking some steps towards enabling FAIR Drone Data]

The problem with "standards"



HOW STANDARDS PROLIFERATE: (SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)

SITUATION: THERE ARE 14 COMPETING STANDARDS.



SITUATION: THERE ARE



LANDRS approach

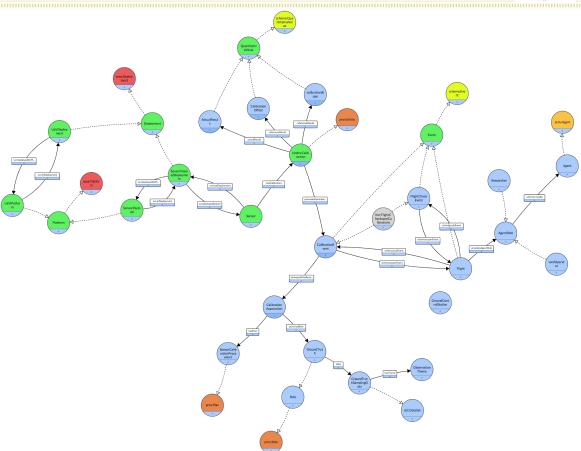


1. Smarter sensor data management tooling for data capture drones (and other edge sensors) in scientific data capture.



Minimum Information Model

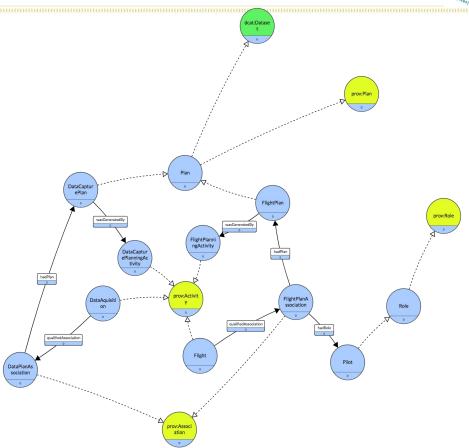






Data Capture Plan and Prov

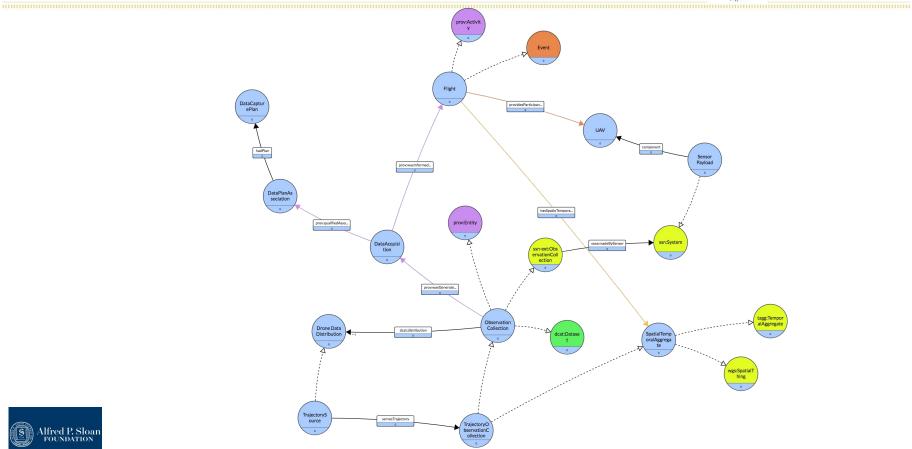






Data Source

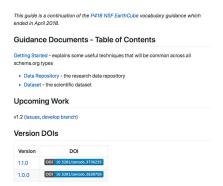


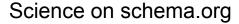




Starts with Common Ontologies











Semantic Sensor Network Ontology W3C Recommendation 19 October 2017 (Link errors corrected 08 December https://www.w3.org/TR/2017/REC-vocab-ssn-20171019/ Latest published version: Latest editor's draft: https://w3c.github.io/sdw/ssn Implementation reporthttps://w3c.github.jp/sdw/ssn-usage Previous version https://www.w3.org/TR/2017/PR-vocab-ssn-20170907/ Editors: Armin Haller, Australian National University Krzysztof Janowicz, University of California, Santa Barbara Simon Cox. CSIRO Danh Le Phugo, Technical University of Berlin Kerry Taylor, Australian National University Maxime Lefrançois, École Nationale Supérieure des Mines de Saint-Étienne Contributors (ordered alphabetically):

Data Catalog Vocabulary (DCAT) -Version 2

Raúl García-Castro, Universidad Politécnica de Madrid



W3C Recommendation 04 February 2020 https://www.w3.org/TR/2020/REC-vocab-dcat-2-20200204/

Latest published version https://www.w3.org/TR/vocab-dcat-2/

Latest editor's draft: https://w3c.github.io/dxwg/dcat

https://w3c.github.io/dxwg/dcat-implementation-report/ Previous version

https://www.w3.org/TR/2019/PR-vocab-dcat-2-20191119/ https://www.w3.org/TR/2014/REC-vocab-dcat-20140116/

Riccardo Albertoni (5) (CNR - Consiglio Nazionale delle Ricerche, Italy) David Browning (Refinitiv)

Alejandra Gonzalez Beltran () (Scientific Computing Department, Science and Technology Facilities Council, UK) (Previously at the University of Oxford) Andrea Perego (9) (Furnnean Commission Joint Research Centre)

Peter Winstanley (Scottish Government) Former editors:

John Erickson (Tetherless World Constellation (RPI)) Participate:

GitHub w3c/dxwg File a bug Commit history Pull requests

The English version of this specification is the only normative version. Non-normative translations may also be available Copyright © 2011-2013 W3C^{III} (MIT, ERCIM, Keip, Beihang), All Rights Reserved, W3C liability, trademark and document use rules apply

LANDRS approach



2. The multi-layered value of such an ontology through its application in an application (DroneDataBuddy) for execution onboard a drone.



Automatic Form Generation from SHACE WINDER



We can also use SHACL to generate human centric data entry and Schema.org markup for dataset landing pages facilitating code reuse

Form Generation using SHACL and DASH

Unofficial Draft 26 June 2020

Latest editor's draft:

http://datashapes.org/forms.html

Editor:

Holger Knublauch (TopQuadrant, Inc.)

Abstract

This document introduces how SHACL shape definitions can be used to drive user interfaces, esp display and edit forms. The document shows examples of recommended form layouts that mirror the definitions of properties in data shapes, and introduces extensions to the SHACL vocabulary from the DASH namespace that further assist in such form definitions.

http://datashapes.org/forms.html

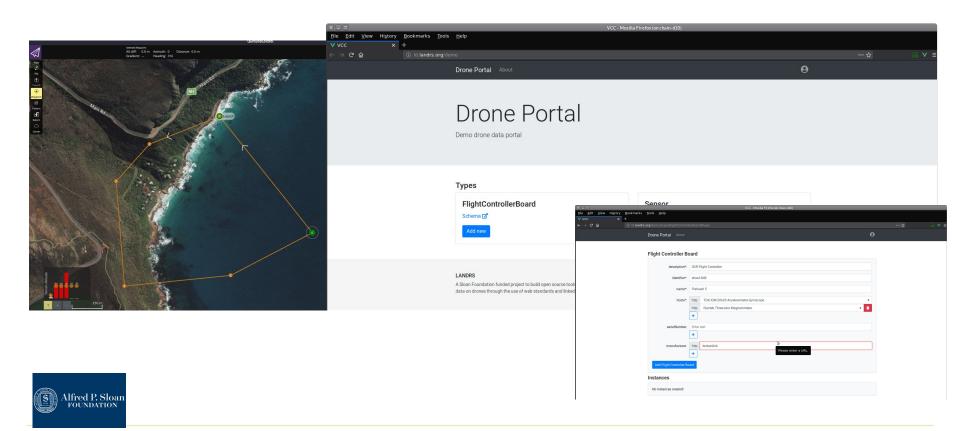


Status of This Document

This document is draft of a potential specification. It has no official standing of any kind and does not represent the support or consensus of any standards organization.

Smarter sensor data tooling





LANDRS approach



- 3. A cookie cutter tool stack to serve your use case using test driven development, continuous integration, and Git.
 - Uses continuous integration
 - Automated testing (including of the ontology)
 - Provides flexible interfaces



Contact Details



https://github.com/landrs-toolkit/

Jane Wyngaard (UND) - *jane.wyngaard@uct.ac.za* Charles F Vardeman II (UND) - *cvardema@nd.edu*,