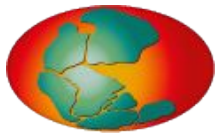
Persistent Identification of Instruments

Markus Stocker (1) and Kerstin Lehnert (2)

(1) PANGAEA, MARUM, University of Bremen, Germany
@envinf, https://orcid.org/0000-0001-5492-3212

(2) Lamont-Doherty Earth Observatory, Columbia University, New York, USA



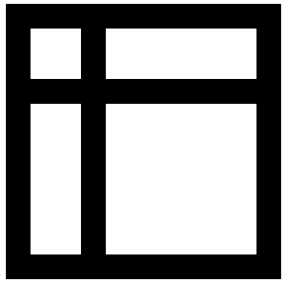
marum
Center for Marine Environmental Sciences

Universität Bremen

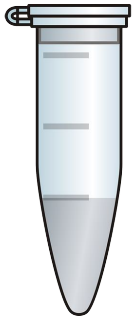
Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

THOR

plus ENVRI



PID



Y-A-PID

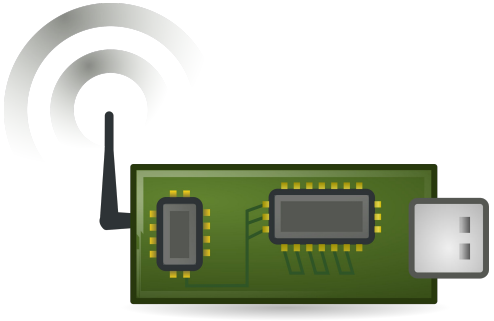
Yet another persistent identifier

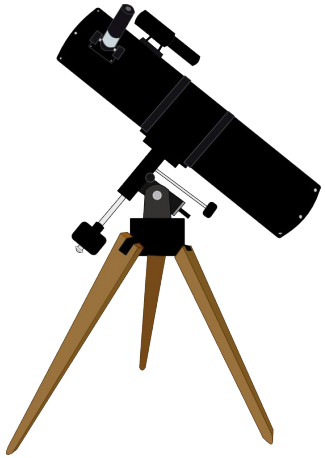
Identification of scientific instruments is not new

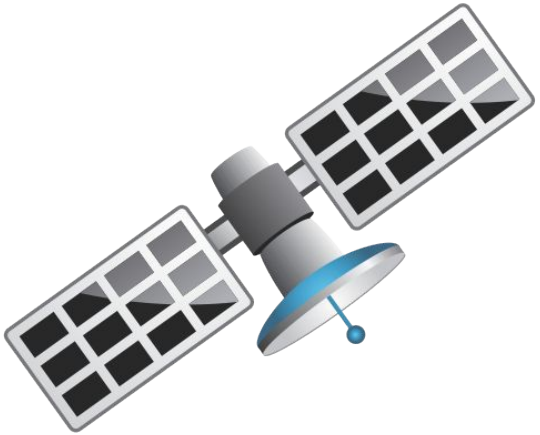
Journal of large-scale research facilities

… articles describing large-scale scientific equipment
… reference large-scale facilities in publications

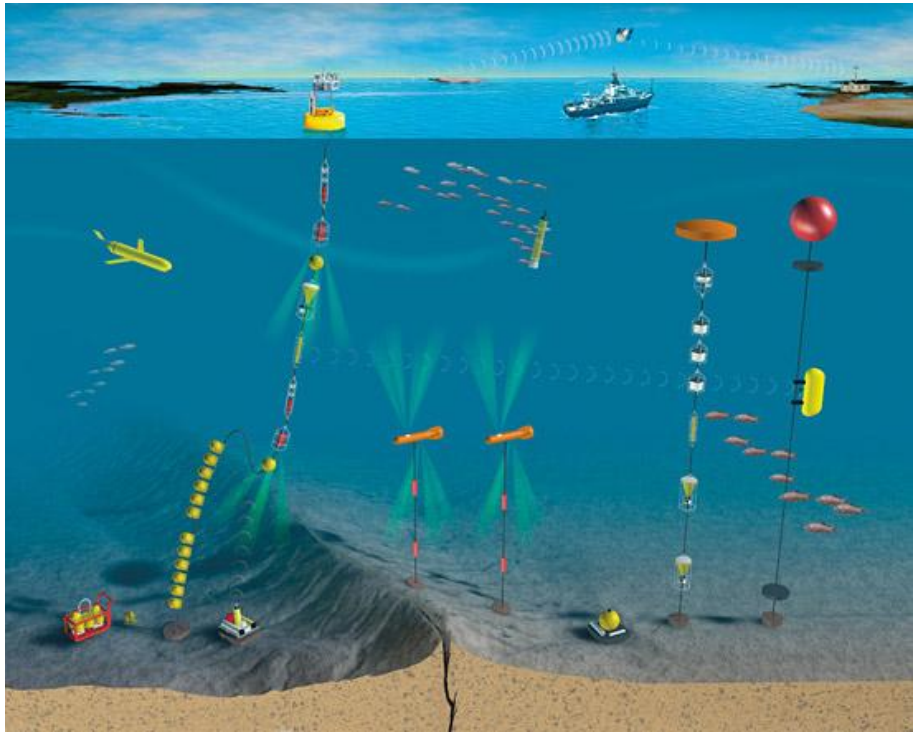
https://jlsrf.org/index.php/lsf

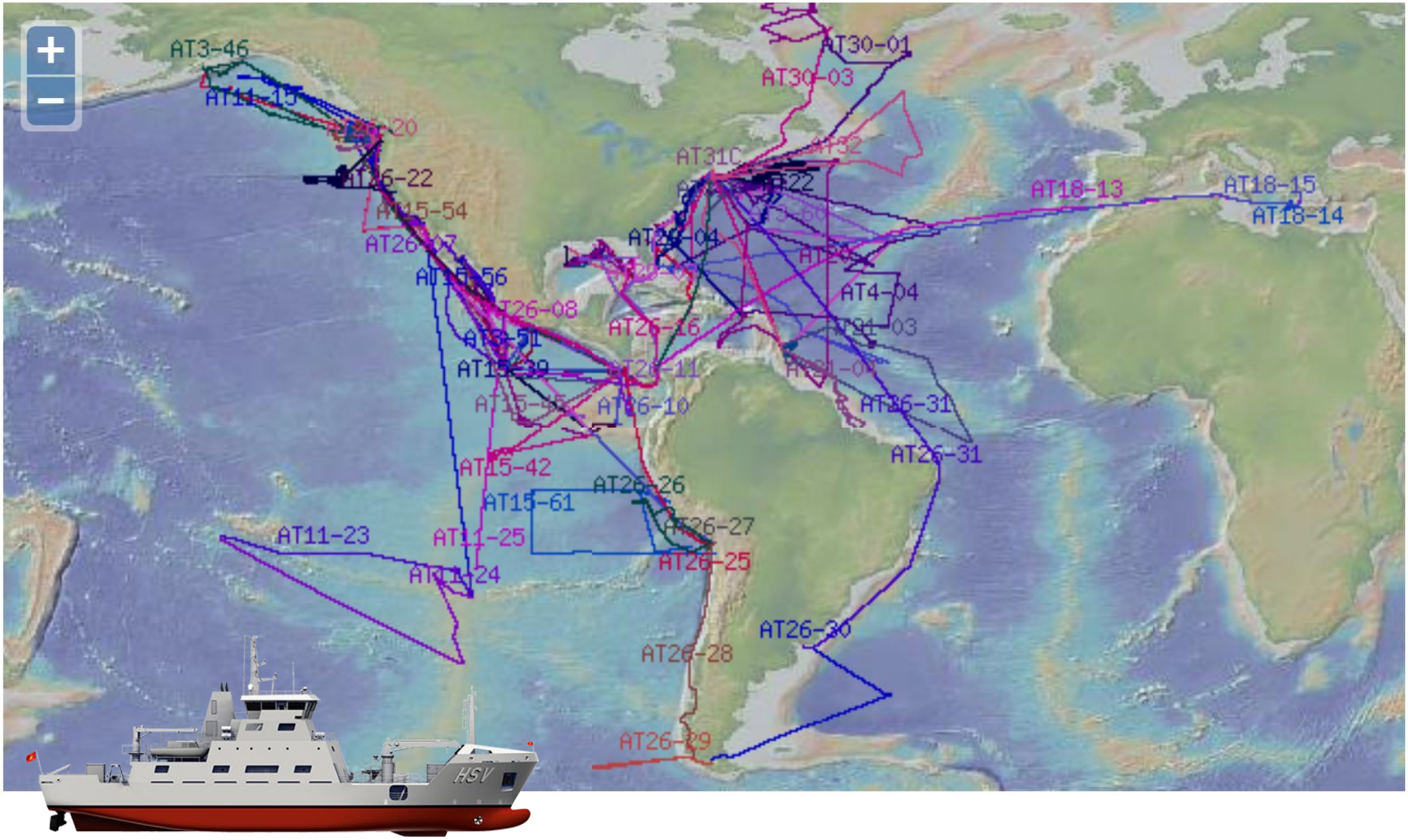







HSV




AT3-46
AT30-01
AT30-03
AT18-13
AT18-15
AT18-14
AT4-04
AT26-31
AT26-31
AT15-42
AT26-26
AT15-61
AT26-27
AT11-23
AT11-25
AT26-25
AT26-30
AT26-28
AT26-29
HSV

Why should we care

"To interpret a digital dataset, much must be known about the hardware used to generate the data, whether sensor networks or laboratory machines."

-- Christine L. Borgman

Big Data, Little Data, No Data

MIT Press, 2015 (p. 46)

"When questions arise [...] about calibration [...], they sometimes have to locate the departed student or postdoctoral fellow most closely involved."

-- Christine L. Borgman

Big Data, Little Data, No Data

MIT Press, 2015 (p. 105)

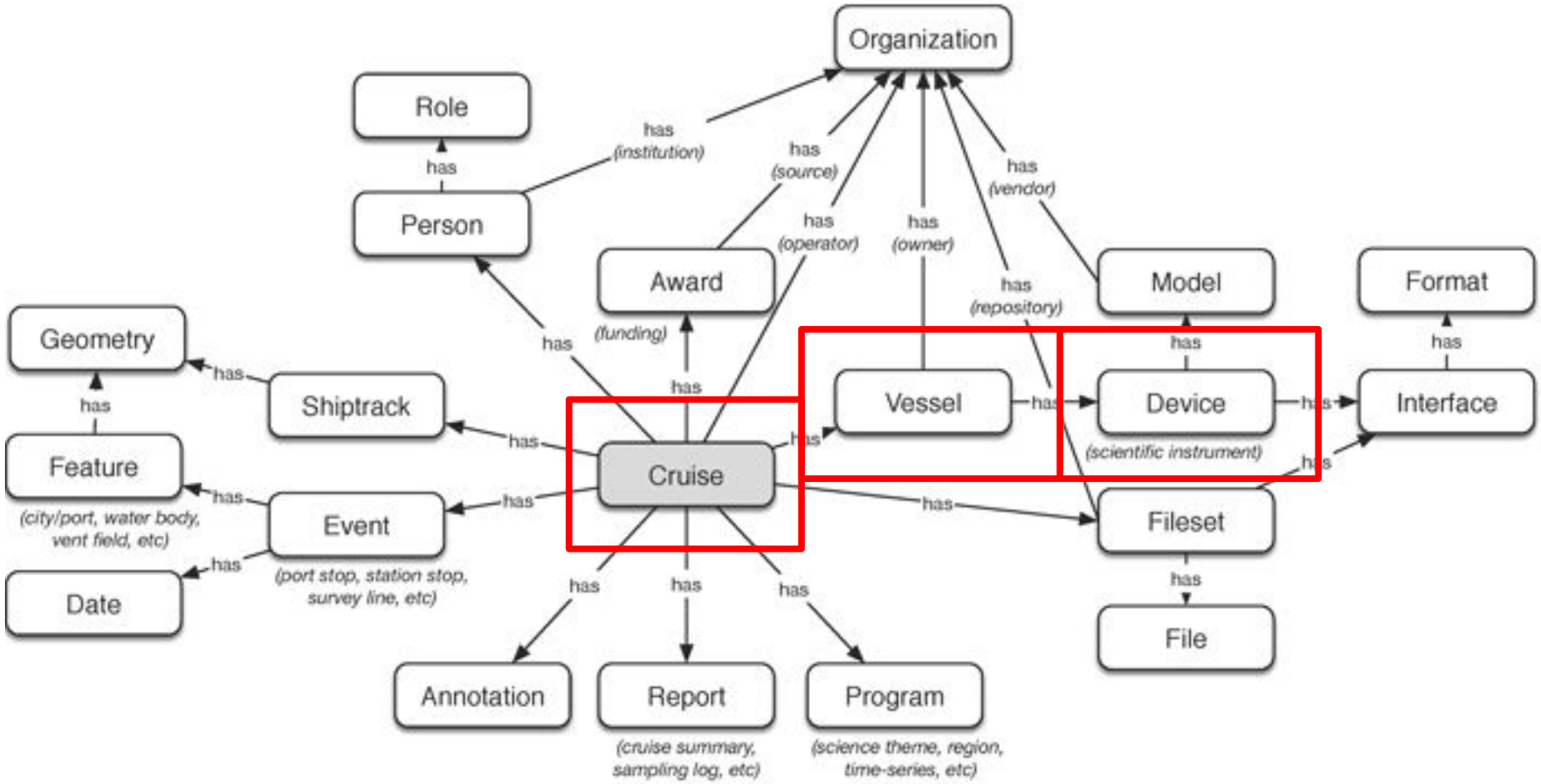
Examples

Rolling Deck to Repository

- Fleet-wide management of underway data
- Provide data documentation for each expedition
- Cruise-level metadata record
- Ensure preservation and access to data

http://www.rvdata.us/

Rolling Deck to Repository



Catalog Status
(In Service) Vessels: 24
Cruises: 6292
Archived Files: 24153789
November 1, 2016

Home

Cruise Catalog: AT30-01

Cruise DOI: 10.7284/906342

Operator: Woods Hole Oceanographic Institution
Vessel: Atlantis

Cruise DOI: 10.7284/906342

Cruise ID	Start Date	Start Port	End Date	End Port
	Details			
AT30-01	2015-08-05	Woods Hole, Massachusetts	2015-09-01	Nuuk (Godthab), Greenland

Project: Ocean Observatories Initiative (OOI): Irminger Sea Array, Leg 2 (Info)

SCIENCE PARTY

FILE MANIFEST

UNDERWAY DATA SETS (ORIGINAL FIELD DATA)

Device Type	Make-Model [Location]	Files	DOI	Archive Status	
adcp	Hawaii UHDAS	List	10.7284/118786	R2R	Download
acqsys (primary)	WHOI Calliope	List	10.7284/118793	R2R	Download
ctd	Sea-Bird SBE-911plus	List	10.7284/118787	R2R	Download

Operator: Woods Hole Oceanographic Institution
Vessel: Atlantis

Cruise DOI: 10.7284/906342

Cruise ID	Start Date	Start Port	End Date	End Port
	Details			
AT30-01	2015-08-05	Woods Hole, Massachusetts	2015-09-01	Nuuk (Godthab), Greenland

Project: Ocean Observatories Initiative (OOI): Irminger Sea Array, Leg 2 (Info)

SCIENCE PARTY

FILE MANIFEST

UNDERWAY DATA SETS (ORIGINAL FIELD DATA)

Device Type	Make-Model [Location]	Files	DOI	Archive Status	
adcp	Hawaii UHDAS	List	10.7284/118786	R2R	Download
acqsys (primary)	WHOI Calliope	List	10.7284/118793	R2R	Download
ctd	Sea-Bird SBE-911plus	List	10.7284/118787	R2R	Download
fluorometer	WET Labs WETStar	List	10.7284/118785	R2R	Download
gnss	C&C C-Nav 2050G	List	10.7284/118784	R2R	Download
metstation	Vaisala WXT520 [stbd]	List	10.7284/118789	R2R	Download
metstation	Vaisala WXT520 [port]	List	10.7284/118790	R2R	Download
multibeam	Kongsberg EM122	List	10.7284/118788	NCEI	Download
radiometer	Eppley PIR	List	10.7284/118791	R2R	Download
radiometer	Eppley PSP	List	10.7284/118792	R2R	Download

AT30-01 metstation (Vaisala WXT520)

Resource URI: http://data.rvdata.us/id/fileset/118789

Property	Value
owl:SameAs	<http://doi.org/10.7284/118789>
r2r:hasCruise	<http://data.rvdata.us/id/cruise/AT30-01>
r2r:hasDevice	<http://data.rvdata.us/id/device/100566>
r2r:hasFormat	<http://data.rvdata.us/id/format/100086>
is dcterms:identifier of	<http://data.rvdata.us/id/fileset/118789>
dcterms:identifier	<http://data.rvdata.us/id/fileset/118789>
rdfs:label	AT30-01 metstation (Vaisala WXT520)
dcterms:source	<http://get.rvdata.us/cruise/AT30-01/fileset/118789>
dcterms:tableOfContents	<http://www.rvdata.us/list/fileset.php?id=118789>
dcterms:title	AT30-01 metstation (Vaisala WXT520)
rdf:type	r2r:Fileset

Metadata

<http://data.rvdata.us/data/fileset/118789>

dc:date	2016-11-02T15:54:42.443Z
prv:containedBy	<http://data.rvdata.us/dataset>
void:inDataset	<http://data.rvdata.us/dataset>
rdf:type	prv:DataItem
rdf:type	foaf:Document

```
@prefix r2rmodel:  <http://voc.rvdata.us/> .
@prefix xhtml:   <http://www.w3.org/1999/xhtml/vocab/#> .
@prefix d2rq:    <http://www.wiwiss.fu-berlin.de/suhl/bizer/D2RQ/0.1#> .
@prefix meta:    <http://www4.wiwiss.fu-berlin.de/bizer/d2r-server/metadata#> .
@prefix dcterms:  <http://purl.org/dc/terms/> .
@prefix rdfs:    <http://www.w3.org/2000/01/rdf-schema#> .
@prefix prvTypes:  <http://purl.org/net/provenance/types#> .
@prefix d2r:     <http://sites.wiwiss.fu-berlin.de/suhl/bizer/d2r-server/config.rdf#> .
@prefix map:     <http://data.rvdata.us/id/#> .
@prefix rdf:     <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix prv:     <http://purl.org/net/provenance/ns#> .
@prefix dc:      <http://purl.org/dc/terms/> .
@prefix db:      <http://data.rvdata.us/id/> .
@prefix geo:     <http://www.w3.org/2003/01/geo/wgs84_pos#> .
@prefix foaf:    <http://xmlns.com/foaf/0.1/> .
@prefix sp:      <http://spinrdf.org/sp#> .
@prefix void:    <http://rdfs.org/ns/void#> .
@prefix sf:      <http://www.opengis.net/ont/sf#> .
@prefix r2r:     <http://data.rvdata.us/vocab/id/class/> .
@prefix vcard:   <http://www.w3.org/2001/vcard-rdf/3.0#> .
@prefix gn:      <http://www.geonames.org/ontology#> .
@prefix geosparql:  <http://www.opengis.net/ont/geosparql#> .
@prefix gl:      <http://schema.geolink.org/1.0/base/main#> .
@prefix xsd:     <http://www.w3.org/2001/XMLSchema#> .
@prefix owl:     <http://www.w3.org/2002/07/owl#> .
@prefix doap:    <http://usefulinc.com/ns/doap#> .
@prefix skos:    <http://www.w3.org/2004/02/skos/core#> .

<http://data.rvdata.us/id/fileset/118789>
      a       r2r:Fileset ;
      rdfs:isDefinedBy <http://data.rvdata.us/data/fileset/118789> ;
      rdfs:label "AT30-01 metstation (Vaisala WXT520)" ;
      r2r:hasCruise <http://data.rvdata.us/id/cruise/AT30-01> ;
      r2r:hasDevice <http://data.rvdata.us/id/device/100566> ;
      r2r:hasFormat <http://data.rvdata.us/id/format/100086> ;
      dc:identifier <http://data.rvdata.us/id/fileset/118789> ;
      dc:source <http://get.rvdata.us/cruise/AT30-01/fileset/118789> ;
      dc:tableOfContents <http://www.rvdata.us/list/fileset.php?id=118789> ;
      dc:title "AT30-01 metstation (Vaisala WXT520)" ;
      owl:SameAs <http://doi.org/10.7284/118789> ;
      foaf:page <http://data.rvdata.us/page/fileset/118789> .

<http://data.rvdata.us/data/fileset/118789>
      a       foaf:Document , prv:DataItem ;
      rdfs:label "RDF Description of AT30-01 metstation (Vaisala WXT520)" ;
      dc:date "2016-11-02T15:54:51.01Z"^^xsd:dateTime ;
      prv:containedBy <http://data.rvdata.us/dataset> ;
      void:inDataset <http://data.rvdata.us/dataset> ;
      foaf:primaryTopic <http://data.rvdata.us/id/fileset/118789> .
```

And .... are instruments persistently identified?

AT30-01 metstation (Vaisala WXT520)

Resource URI: http://data.rvdata.us/id/fileset/118789

Property	Value
owl:SameAs	<http://doi.org/10.7284/118789>
r2r:hasCruise	<http://data.rvdata.us/id/cruise/AT30-01>
r2r:hasDevice	<http://data.rvdata.us/id/device/100566>
r2r:hasFormat	<http://data.rvdata.us/id/format/100086>
is dcterms:identifier of	<http://data.rvdata.us/id/fileset/118789>
dcterms:identifier	<http://data.rvdata.us/id/fileset/118789>
rdfs:label	AT30-01 metstation (Vaisala WXT520)
dcterms:source	<http://get.rvdata.us/cruise/AT30-01/fileset/118789>
dcterms:tableOfContents	<http://www.rvdata.us/list/fileset.php?id=118789>
dcterms:title	AT30-01 metstation (Vaisala WXT520)
rdf:type	r2r:Fileset

Metadata

<http://data.rvdata.us/data/fileset/118789>

dc:date	2016-11-02T15:54:42.443Z
prv:containedBy	<http://data.rvdata.us/dataset>
void:inDataset	<http://data.rvdata.us/dataset>
rdf:type	prv:DataItem
rdf:type	foaf:Document

is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/118819>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/118829>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/118839>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/118849>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/122144>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/122152>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/122162>
is r2r:hasDevice of	<http://data.rvdata.us/id/fileset/122172>
r2r:hasModel	<http://data.rvdata.us/id/model/100167>
is dcterms:identifier of	<http://data.rvdata.us/id/device/100566>
dcterms:identifier	<http://data.rvdata.us/id/device/100566>
rdfs:label	Vaisala WXT520 metstation on Atlantis (stbd)
rdf:type	r2r:Device

Metadata

<http://data.rvdata.us/data/device/100566>

dc:date	2016-11-02T16:01:08.253Z
prv:containedBy	<http://data.rvdata.us/dataset>
void:inDataset	<http://data.rvdata.us/dataset>
rdf:type	prv:DataItem
rdf:type	foaf:Document

Vaisala WXT520

Resource URI: http://data.rvdata.us/id/model/100167

Property	Value
r2r:hasDeviceType	<http://data.rvdata.us/id/devicetype/metstation>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100028>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100173>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100546>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100566>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100567>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100598>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100703>
is r2r:hasModel of	<http://data.rvdata.us/id/device/100704>
r2r:hasVendor	<http://data.rvdata.us/id/organization/com.vaisala>
is dcterms:identifier of	<http://data.rvdata.us/id/model/100167>
dcterms:identifier	<http://data.rvdata.us/id/model/100167>
rdfs:label	Vaisala WXT520
owl:sameAs	<http://vocab.nerc.ac.uk/collection/L22/current/TOOL0683/>
rdf:type	r2r:Model

Metadata

<http://data.rvdata.us/data/model/100167>

dc:date	2016-11-02T16:02:55.073Z
prv:containedBy	<http://data.rvdata.us/dataset>
void:inDataset	<http://data.rvdata.us/dataset>
rdf:type	prv:DataItem
rdf:type	foaf:Document

⇑ -- Vaisala WXT520 weather transmitter --

URI	http://vocab.nerc.ac.uk/collection/L22/current/TOOL0683/
Identifier ()	SDN:L22::TOOL0683
Preferred label (en)	**Vaisala WXT520 weather transmitter**
Alternative label (en)	Vaisala WXT520
Definition (en)	This is a a self-contained weather station measuring wind speed and direction, precipitation , air temperature, humidity and barometric pressure. The station has the following sensors: Vaisala WINDCAP ultrasonic wind sensor measuring average, maximum and minimum windspeed accurate to the 3% at 10 m/s and average, maximum and minimum wind direction to an accuracy of 3 degrees. Default averaging interval is 60 minutes. Vaisala RAINCAP sensor-2 - a piezoelectrical sensor that measures rainfall amount and intensity (rate) to an accuracy of 5% by counting raindrop impacts. Capacitive silicon BAROCAP air pressure sensor giving an accuracy of 0.5 hPa at 0-30C or 1 hPa at -52-60C. Capacitive ceramic THERMOCAP air temperature sensor giving an accuracy of 0.3C at 20C. Capacitive thin film polymer HUMICAP 180 humidity sensor giving an accuracy of 3% below 90% humidity or 5% above 90% humidity. The precipitation and wind sensors may be optionally heated to keep them free from snow and ice. Output is via USB connection. This is an upgrade of the WXT510 weather transmitter that may be applied to existing units during service by Vaisala. More information may be found at http://www.vaisala.com/en/products/multiweathersensors/Pages/WXT520.aspx.
Version Info ()	1
Deprecated()	false
Broader	http://vocab.nerc.ac.uk/collection/L05/current/102/
Date ()	2014-04-01 16:56:45.0

IRIS

- Incorporated Research Institutions for Seismology
- Discovery, research, and education in seismology
- Data Management Center
- Meta Data Aggregator

http://www.iris.edu/

http://ds.iris.edu/mda/

IRIS MDA Usage

IRIS DMC MetaData Aggregator

Legend: R A R P

Permanent Network List (400) :: Click column title to sort :: Jump to temporary networks or virtual networks or assembled data

Network	Description	Start Year	End Year	Stations	Reports	DOI
A	Generic Asian Strong Motion Network	1970	2500	0	N	
A1	Southern African Co-located Academic Network	2014	2500	0	N	
AA	Anchorage Strong Motion Network	1995	2500	0	N	
AB	National Seismic Network of Azerbaijan	2003	2500	0	N	
R A AC	Albanian Seismological Network :: Network Map	2002	2500	8	N	
AD	ACROSS Strong Motion Network	2015	2500	0	N	
R A AE	Arizona Broadband Seismic Network :: Network Map	2009	2500	8	N	DOI
R A AF P	Africa Array :: Network Map	2004	2500	52	N	DOI
R A AG	Arkansas Seismic Network :: Network Map	2009	2500	9	N	
AH	Arkhangelsk Seismic Network	2002	2500	0	N	
R A AI	Antarctic Seismographic Argentinean Italian Network (ASAIN) :: Network Map	1992	2500	6	N	DOI
R A AK	Alaska Regional Network :: Network Map	1990	2500	127	N	DOI
A AL	Alaskan Long Period Array :: Network Map	1966	1979	19	N	
AM	Public Seismic Network	0	2500	1	N	
AN	Altay-Sayan Regional Seismic Network	1963	2500	0	N	
A AO	Arkansas Seismic Observatory :: Network Map	2011	2500	1	N	
AP	APS Free Field Array	2015	2045	0	N	DOI
AQ	Central Queensland Seismic Network	2003	2500	0	N	DOI
R A AR	Northern Arizona Network :: Network Map	2000	2500	19	N	
A AS	Modified High Gain Long Period Observatory :: Network Map	1976	1993	6	N	DOI
R A AT	National Tsunami Warning System :: Network Map	1999	2500	14	N	DOI
R A AU	Geoscience Australia :: Network Map	1994	2500	155	N	
R A AV	Alaska Volcano Observatory :: Network Map	1971	2500	227	N	
AW	AWI Network Antarctica	2006	2500	0	N	
R A AX	Aruba :: Network Map	2012	2500	1	N	
A AY	Haitian Seismic Network :: Network Map	2010	2500	8	N	
R A AZ	ANZA Regional Network :: Network Map	1982	2500	92	N	DOI
BA	UniBAS	2005	2500	0	N	
BB	Brunei Darussalam National Seismic Network	2013	2500	0	N	
R A BC	Red Sismica del Noroeste de Mexico :: Network Map	1980	2500	36	N	
BD	Bakun Dam Micro-Seismic Monitoring Network	2007	2500	0	N	
R A BE	Belgian Seismic Network :: Network Map	1998	2500	3	N	DOI
A BF	Black Forest Observatory :: Network Map	1979	1995	1	N	
BG	Berkeley Geysers Network	1989	2500	0	N	
BH	Bay Area Urban Hazards	1991	2500	0	N	
A BI	University of Dhaka Seismographic Network-Bangladesh :: Network Map	2008	2500	1	N	

AF: AfricaArray

FDSN Network Information

Are you the operator of this network? Update this information.

FDSN code	AF	Operated by	Penn State University
Network name	AfricaArray	Deployment region	United States
Start date	Jan. 1, 2004	End date	-
Network Website	http://www.africaarray.psu.edu/		
Short description	A new Pan-African network of permanent broadband stations being developed by Penn State University in co-ordination with several local network operators in Africa. Initially, most of the stations will be in southern African countries, and the stations will be operated and maintained by the Seismology unit at the Council for Geoscience, Pretoria, South Africa. More information about AfricaArray can be found at http://africaarray.psu.edu/default.htm		

Citation Information

Digital Object Identifier (DOI)	doi:10.7914/SN/AF
Citation	`Penn State University (2004): AfricaArray. International Federation of Digital Seismograph Networks. Other/Seismic Network. doi:10.7914/SN/AF`

Data Access

Data Availability	Data available from IRISDMC (IRIS Data Management Center) using FDSN Web Services. See http://ds.iris.edu for more information including data access tools.
Additional Notes	The data from the closed stations is embargoed for 3 years. All data should be open after 3 years.

Stations in this Network

Found 52 stations

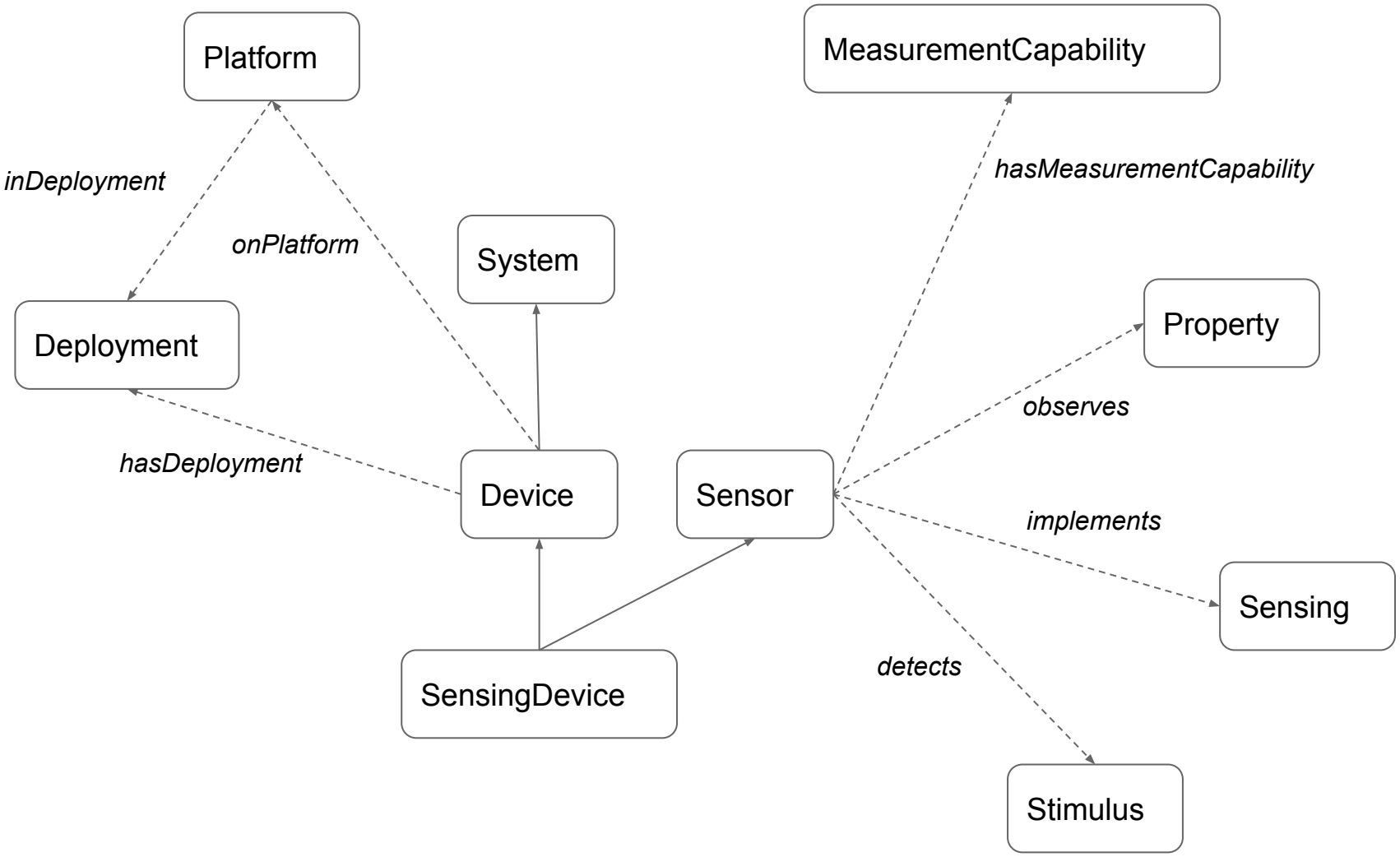
Station Code	Station Name	Latitude	Longitude
AAUS	Addis Ababa University, Ethiopia	9.0349	38.7665
ANKE	Ankober, Ethiopia (near Debra Birhan)	9.5827	39.7418
BLWY	Bulawayo, Zimbabwe	-20.143	28.611
BLWY	Bulawayo, Zimbabwe	-20.143	28.611
BLWY	Bulawayo, Zimbabwe	-20.143	28.6113
BOBN	Bobandana, DRC, Africa	-1.66	29.23666
CNG	Changalane Maputo Province Mozambique	-26.2917	32.1883
CRLN	Carolina, Mapumpalanga, South Africa	-25.9949	30.0227
CVNA	Calvinia KS2000 Earth data Low gain	-31.482	19.762
CVNA	Calvinia KS2000 Earth data Low gain	-31.482	19.762
DESE	Dese, Ethiopia	11.118	39.635
DODT	Dodoma, Tanzania	-6.186	35.748

What metadata should be captured?

SSN Ontology

- Semantic Sensor Network ontology
- Semantic specification of sensing
- Describe sensors and the observations
- Joined effort between W3C and OGC

https://www.w3.org/TR/vocab-ssn/


Platform
MeasurementCapability
inDeployment
onPlatform
hasMeasurementCapability
System
Property
Deployment
observes
hasDeployment
Device
Sensor
implements
Sensing
SensingDevice
detects
Stimulus

Conclusion

- Uniquely identify instruments, e.g. in papers
- As well as platforms, deployments
- Examples do exist, surely more out there
- Metadata preservation critical for science
- Avoid having to locate students

References

https://maxcdn.icons8.com/Share/icon/Messaging//new_spreadsheet1600.png

http://www.pd4pic.com/images/sample-vial-phial-probe-laboratory-science-liquid-1.png

http://www.freeiconspng.com/uploads/person-icon-8.png

http://www.freeiconspng.com/uploads/review-icon-png-21.png

http://clipart-finder.com/data/mini/wireless-sensor.png

http://classroomclipart.com/images/gallery/Clipart/Science/Microscope_Clipart/TN_microscope_7097RB.jpg

https://desktopgenetics.cdn.prismic.io/desktopgenetics/3501e96c15339e60748a70d71e050786a43187d6_sequencing-icon.png

http://www.clipartlord.com/wp-content/uploads/2013/09/telescope3.png

http://lhnav.com/media/catalog/category/TN_Satellite-02.jpg

http://products.damen.com/-/media/Products/Images/Clusters-groups/Offshore-and-Transport/Research-Vessel/RV-6613/3d-renderings/oceanographic_vessel.png?h=384&la=pt-PT&w=650

http://blog.marinebio.org/wp-content/uploads/Ocean-Observatories-Initiative.jpg

https://c402277.ssl.cf1.rackcdn.com/photos/7122/images/magazine_large/WeatherStation_final.jpg?1404243359