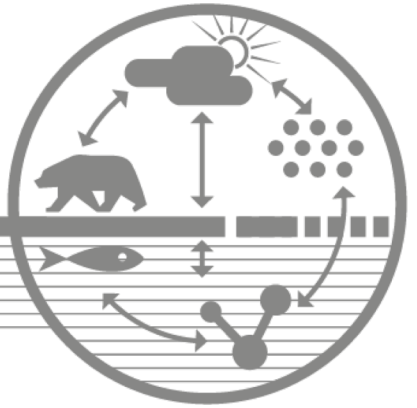
MOSAiC
International Arctic Drift Expedition



DataManagement in MOSAiC
Overview
Safety Briefing Leg 1 - Tromsø

Antonia Immerz, Johannes Käßbohrer, Peter Gerchow, Franziska Nehring

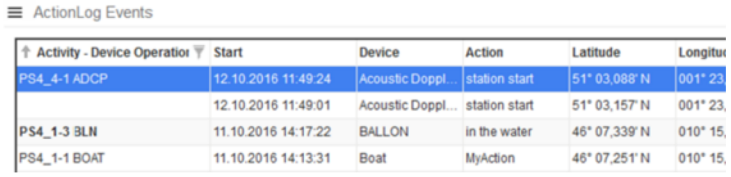
FIELAX

15.09.2019

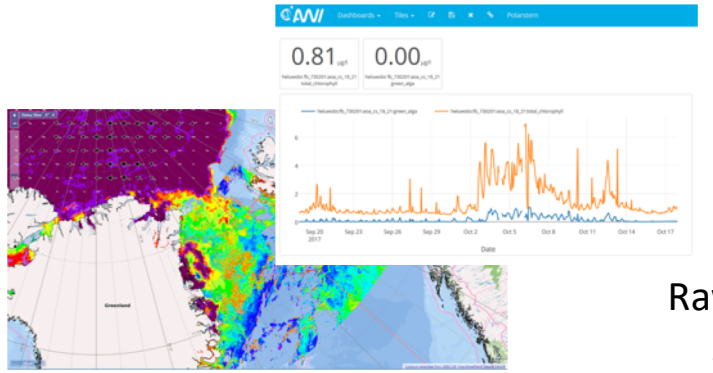
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Data Flow in MOSAiC

SENSORWeb for management of device metadata



DSHIP-ActionLog for Device-Operation ID management



DSHIP-Mapviewer and **Dashboard**

...

Raw and primary data archiving at AWI and primarily PANGAEA. Majority of data transfers after each leg

Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analysis → Data Archiving

Data transfer via satellite, local LAN, radio LAN as stream and/or in delayed mode

MOSAiC Central Storage and workspace

Using workspace and **Marketplace (VMs)** e.g. with **Jupyter** Notebook (R or Python) or Bash-Script or or ...?

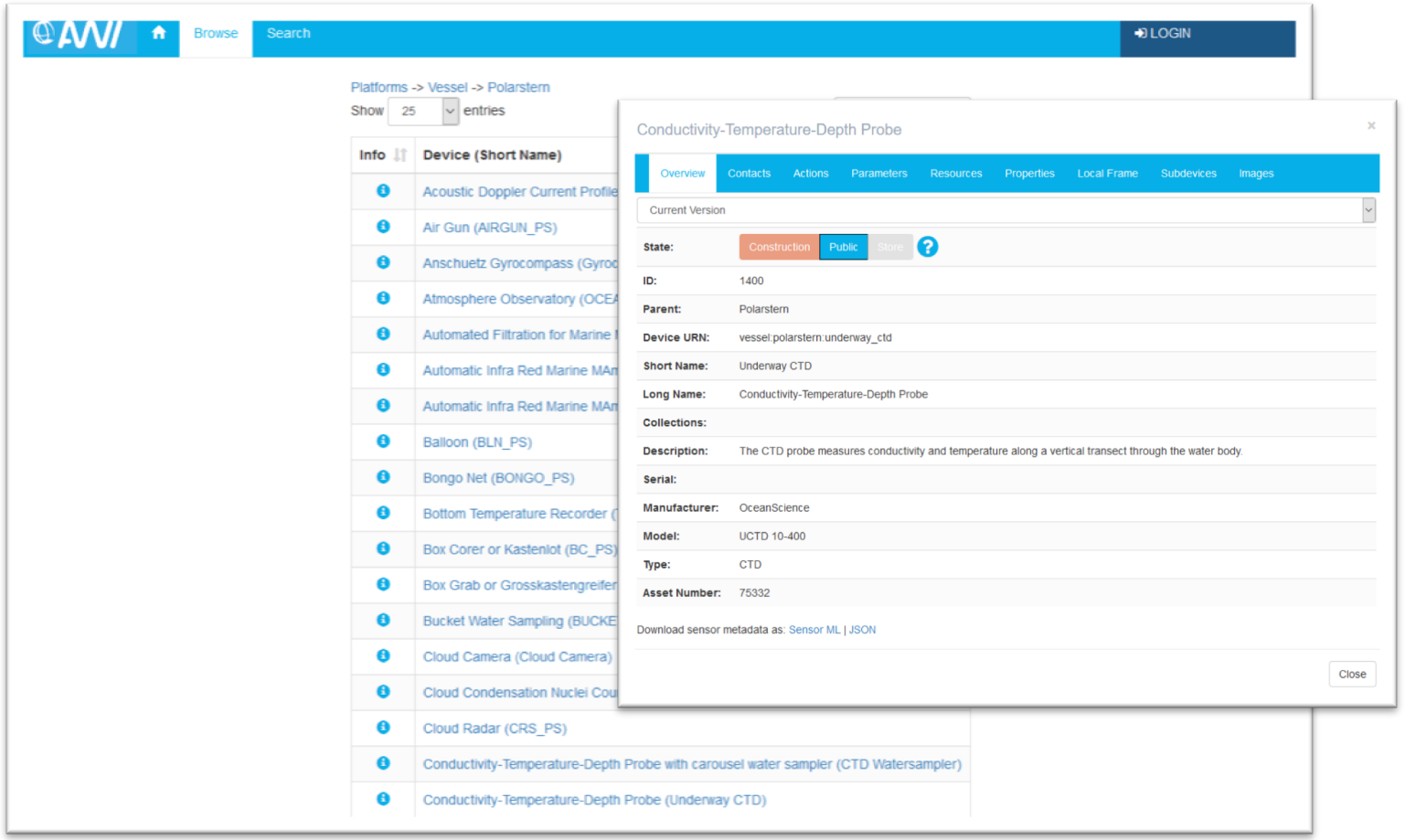
Sensor metadata description (SENSORWeb) is the basis for all parts!!!

MOSAiC International Arctic Drift Expedition

AWI

SENSOR

- ✓ Describe your sensor only once with SENSORWeb
- ✓ Then sensor data can be ingested, stored, monitored, analysed and archived



Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analytics → Data Archiving

HELMHOLTZ

What is SENSORWeb?

SENSOR

- SENSORWeb does not manage measurement data
- SENSORWeb manages metadata of
  - Research platforms
  - Sensors
  - Sampling Devices

SENSOR

SENSORWeb

- Sensor Information System - Create and manage meta data of devices and sensors

https://sensor.awi.de/?urn=vessel:polarstern:ctd_watersampler

Parent Item-Type: Vessel
Parent Item: RV Polarstern
Sub Item: CTD Watersampler

Overview
Long and short names
Manufacturer
Model-Nr.

Subdevices
Altimeter
Lowered Acoustic Doppler Current Profiler
SBE32 water sampler
SBE3plus temperature sensor
SBE4 conductivity sensor
SBE43 oxygen sensor
Transmissiometer

Properties
- used for quality checks: e.g. Water temperature min/max values

Contact
Owner: *AWI*
Editor: Peter Gerchow
Engineer in Charge: Marius Hirsekorn
Principal Investigator: …
Data Scientist: …
Data Provider: …

Parameters
conductivity
temperature
altimeter
transmission
oxygen
pressure
fluorescence

Resources
- factsheets
- calibration certificates
- manuals

Actions
Deployment
Recovery

SENSOR

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images | Ingest

2018-06-04 02:00:00 Mount Mounted to heluw1

SENSOR (2014). Sensor metadata for SST_CTD_183 of Station AWIPEV Underwater Observatory Svalbard Alfred Wegener Institute for Polar and Marine Research. https://hdl.handle.net/10013/sensor.82f77b6c-a35d-40ff-ba8d-65442cfb49e7#subItemID=1285&subItemEventID=3389

PIDs + Citation for all actions of type: calibration, comissioned, deployment, mount

https://hdl.handle.net/10013/sensor.82f77b6c-a35d-40ff-ba8d-65442cfb49e7#subItemID=1285&subItemEventID=3389

State:	public
ID:	1285
Parent:	Svalbard Underwater Node 2
Device URN:	station:svluwobs:svluw2:ctd_183
Short Name:	CTD_183
Long Name:	SST_CTD_183
Collections:	undefined
Description:	High quality, high accuracy multi parameter probe for oceanographic and li parameters.
Serial:	183
Manufacturer:	Sea and Sun Technology
Model:	CTD 90
Type:	CTD

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images | Ingest

Current Version

Show 25 entries Search:

ID	Name	E-Mail	Role	Organization
70	Cornelia Roder	cornelia.roder@awi.de	Editor	Alfred-Wegener-Institute

Showing 1 to 1 of 1 entries Previous 1 Next

Inherited Contacts

Show 25 entries Search:

ID	Name	Role	Organization	Inherited from
73	Alexandra Kraberg	Editor	Alfred-Wegener-Institute	Helgoland Underwater Observatory

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images

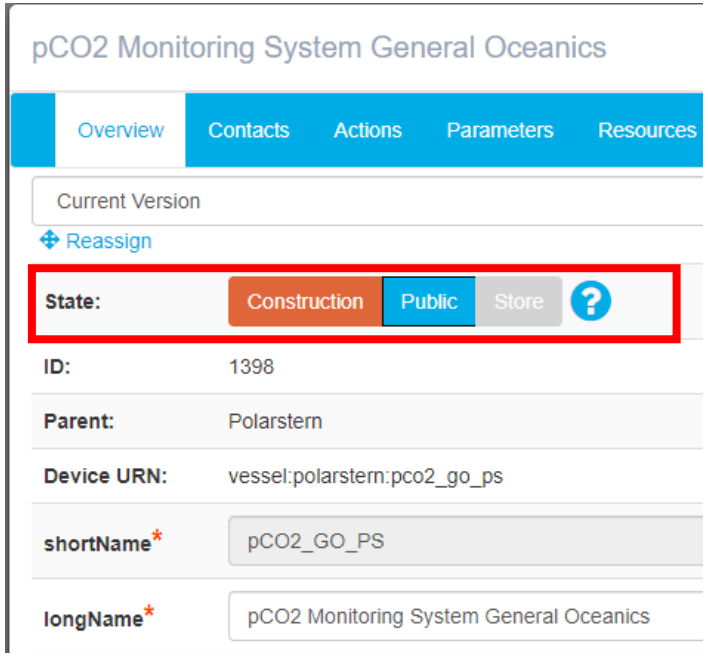
Current Version

Show 25 entries Search:

ID	Short Name	Name	Sensor Output Type	Units
861		Conductivity	conductivity	mS/cm
862		Salinity	salinity	PSU

SENSOR

Item State



Construction:

- Seen only by “editor” of this device under “My Devices”
- Not ready for publication

Public:

- Seen by everybody (no Login)
- Ready for publication
- Public devices should not be deleted. (Measured data would loose metadata)

Store:

- Devices that are not in use
- Devices at the store

Further Features

Facetted Search

SENSOR

Browse | Search | Device Store | My Devices | Create Item

Item type
MicroCAT (171)

Parameters
conductivity (12)
depth (9)
oxygen (9)
temperature (9)
water temperature (3)
See more...

Action type
Deployment (150)
Recovery (62)
Calibration (1)
Mount (1)
Unmount (1)

Action
NABOS/2309-1 (7)
NABOS/2409-1 (7)
NABOS/2409-2 (7)
NABOS/3008-1 (7)
HE451-2/2-1 (6)
See more...

Contact
Vernaleken, Jutta (150)
von Appen, Wilken-Jon (150)
Lochthofen, Normen (21)
Hattermann, Tore (12)
Scholz, Daniel (11)

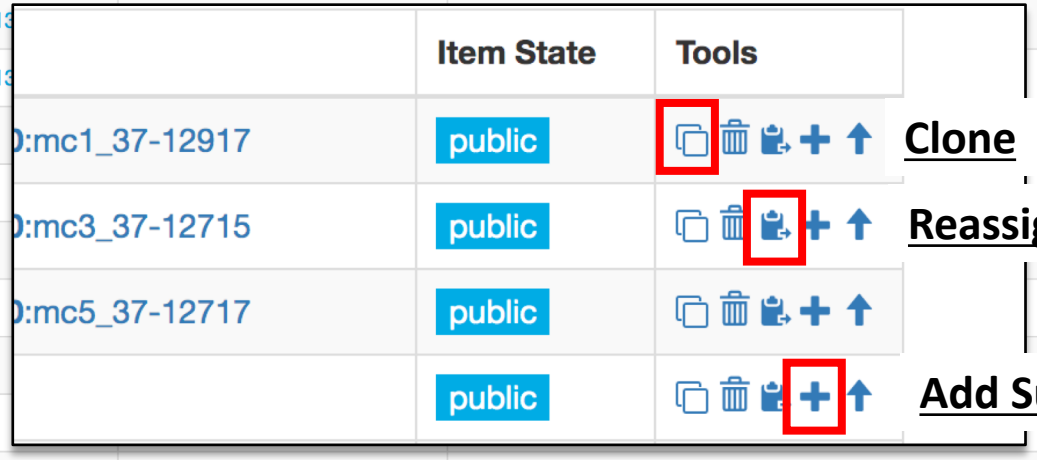
Collections
FRAM (2)

Search...

Selected facets: MicroCAT ✖

Sort by relevance | Sort alphanumerically

Info	Long Name	Short Name	URN	Item State	Tools
	MC1	MC1_37-12917	mooring:fsw1_300234061031800:mc1_37-12917	public	
	MC3	MC3_37-12715	mooring:fsw1_300234061031800:mc3_37-12715	public	
	MC5	MC5_37-12717	mooring:fsw1_300234061031800:mc5_37-12717	public	
	SBE-37 SM	SBE-37-SM_1606	mooring:f4-16:sbe-37-sm_1606	public	
	SBE37-SMP-ODO_13			public	
	SBE37-SMP-ODO_13			public	
	SBE-37 SM			public	
	SBE-37 SM			public	
	SBE-37 SMP			public	
	SBE-37 SM			public	
	SBE-37 SM			public	
	SBE-37 SMP			public	
	SBE-37 SMP	SBE-37-SMP_10935	mooring:f5-16:sbe-37-smp_10935	public	
	SBE-37 SMP	SBE-37-SMP_12502	mooring:ak5-1:sbe-37-smp_12502	public	
	SBE-37 SMP	SBE-37-SMP_12492	mooring:ak5-1:sbe-37-smp_12492	public	



Showing 1 to 15 of 171 entries

« 1 2 3 4 5 6 7 8 9 »

Platformtypes in SENSOR

- Aircraft
- Buoy
- Laboratory
- Mooring
- **Pack Ice**
- Satellite
- Small Boat
- Station
- TowedSystem
- Vehicle
- **Vessel**
- Model

Device URNs

- URN (Uniform ResourceName)
  - Unique name of an item
    - Example: vessel:ps:adcp
  - Composed of short names
  - The path to your data on the MOSAiC Central Storage (MCS) is based on the URN
    - Example: …/vessel/ps/adcp
  - It is human readable in contrast to a numeric ID
- Short name
  - catchy abbreviations of your item name
    - Polarstern-> PS
    - AcousticDoppler CurrentProfiler-> ADCP
  - can‘t be edited by a user, only admins can change the short name

Structure of an Item: Contact Roles

- Special function of roles:
  - **Editor**: can edit items, has write acess respective device directory on MOSAiC Central Storage (MCS)
  - **Owner**: defines the institute owning the item
  - **dship connector** -> import sensors into DSHIP
  - **Data Provider** -> write acess to raw data directory on MCS

- Other roles
  - Data Scientist
  - Engineer in Charge
  - Principal Investigator

Collections

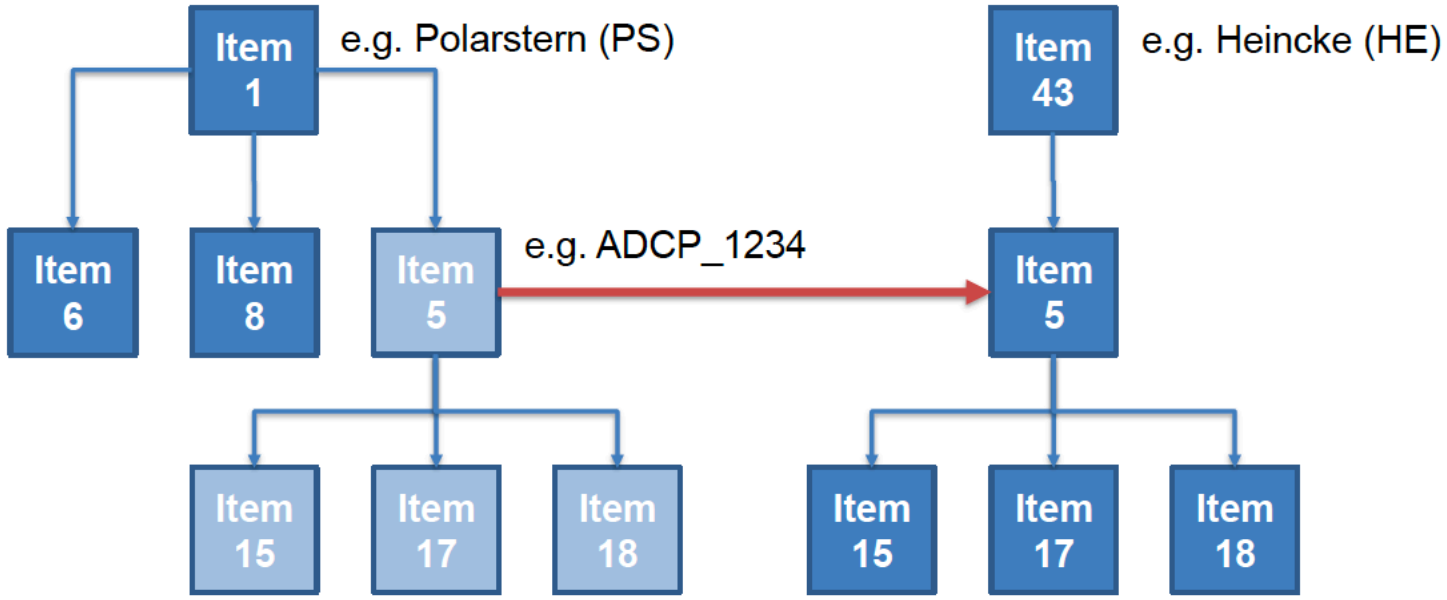
- MOSAiC-Aircraft
- MOSAiC-ATMOS
- MOSAiC-BGC
- MOSAiC-ECO
- MOSAiC-ICE
- MOSAiC-Modelling
- MOSAiC-OCEAN
- MOSAiC-RemoteSensing

Action Types in SENSOR

- **Calibration** (create version)
- **Comissioned** (create version)
- Configuration
- Decomissioned
- Deployment (create version)
- Information
- Maintenance
- Mission
- **Mount** (create version)
- Partial failure
- Recovery
- Total failure

Reassignment

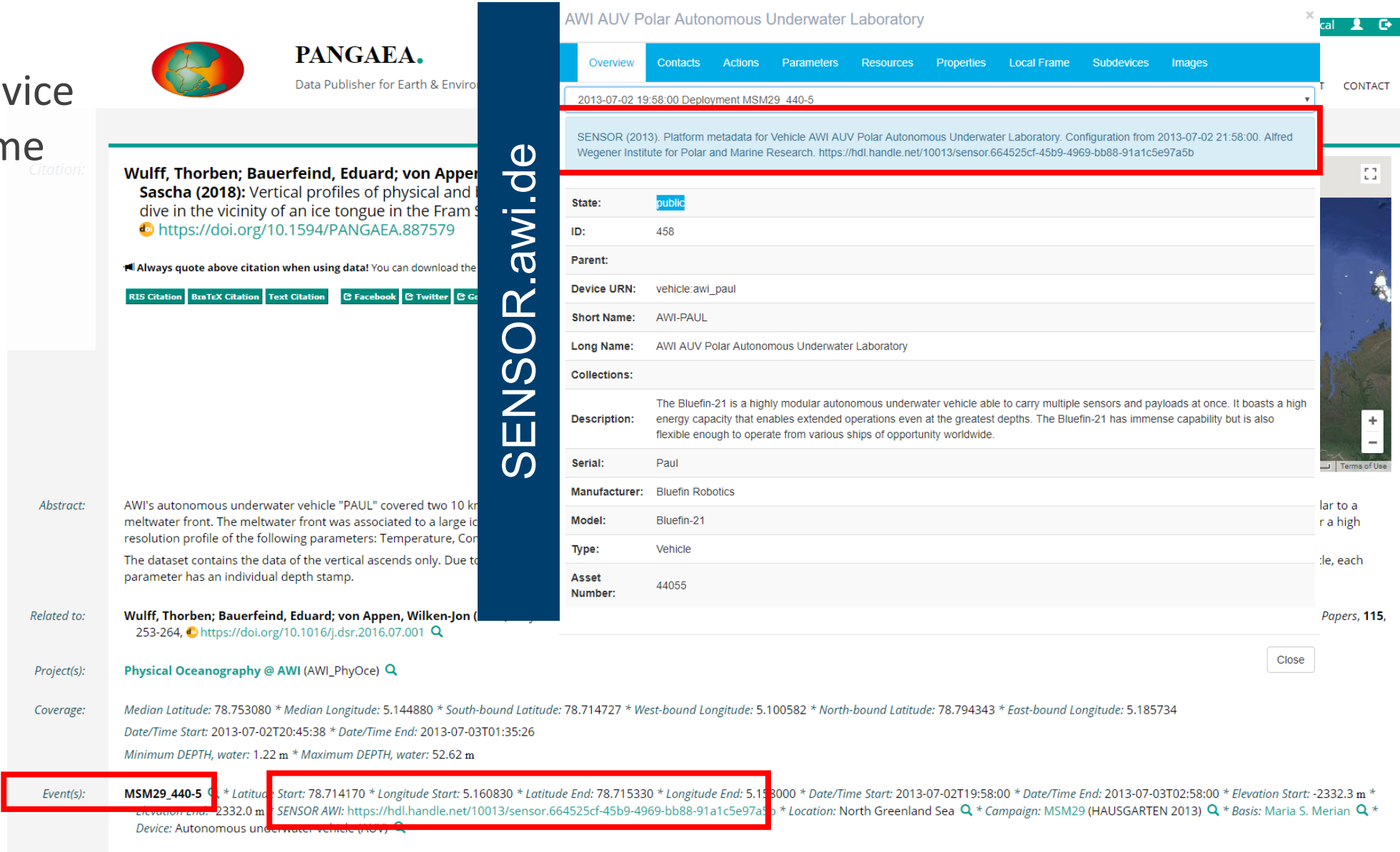
- Items can be assigned to a different parent
  - Changes URN of device
  - Best practice: create a new version of device



Device URN change from vessel:**ps**:adcp_1234 to vessel:**he**:adcp_1234

Linking PANGAEA to SENSOR

- Configuration of device at measurement time linked directly to SENSORWeb



Data Flow in MOSAiC

ActionLog Events

Activity - Device Operatio	Start	Device	Action	Latitude	Longitu
PS4_4-1 ADCP	12.10.2016 11:49:24	Acoustic Doppl...	station start	51° 03,088' N	001° 23
	12.10.2016 11:49:01	Acoustic Doppl...	station start	51° 03,157' N	001° 23,
PS4_1-3 BLN	11.10.2016 14:17:22	BALLON	in the water	46° 07,339' N	010° 15,
PS4_1-1 BOAT	11.10.2016 14:13:31	Boat	MyAction	46° 07,251' N	010° 15,

SENSORWeb for management of device metadata

DSHIP-ActionLog for Device-Operation ID management

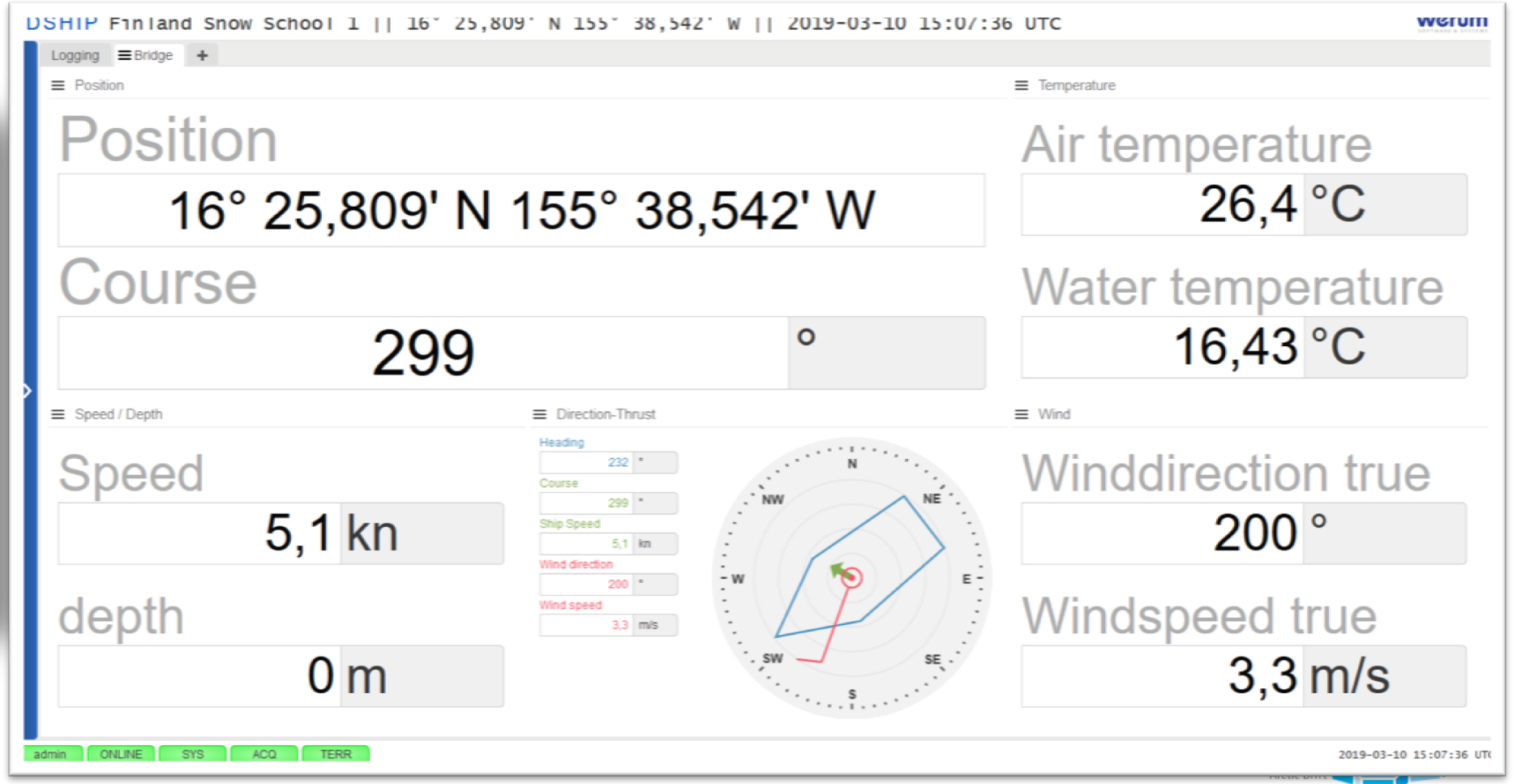
Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analytics → Data Archiving

Sensor metadata description (SENSORWeb) is the basis for all parts!!!

DSHIP

✓ *Monitoring real-time data from ship sensors*

DSHIP



Expedition

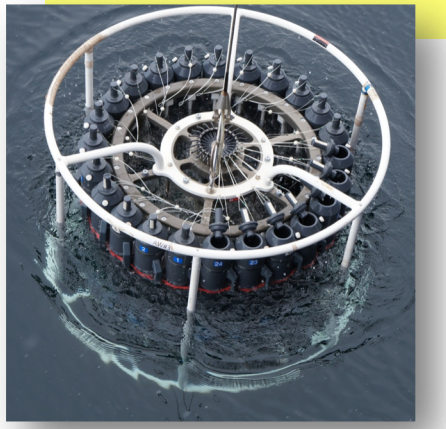
HELMHOLTZ GEMEINSCHAFT

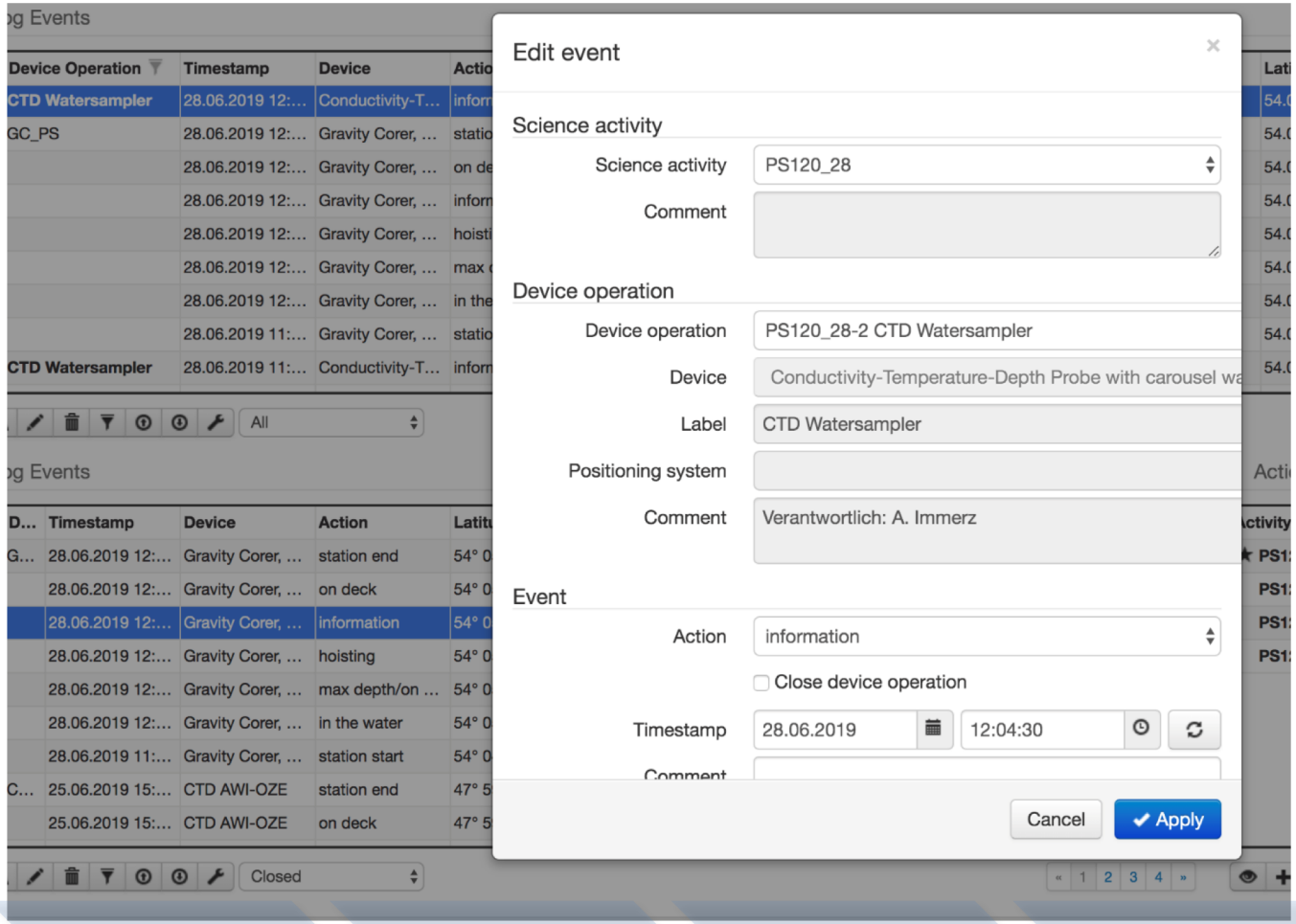
DSHIP-ActionLog

- ✓ Logs „Science Activities“ and “Device Operations“ during cruise
- ✓ Logging can be easily done in Webbrowser or using the IceFloeNavi-App

! Devices are imported from SENSORWeb where

- Item state: public
- Contact/role:
  - polarstern dship/ dship connector





Sensor Metadata Description | **Data Acquisition** | Data Ingestion | Data Storage | Data Monitoring | Data Analytics | Data Archiving

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DSHIP-ActionLog

Structure

- Expedition (per Leg)
  - Science Activity (weekly)
    - Device Operation

Device Operation ID:

<Campaign/Expedition-Leg>_
<Science Activity>-
<No. of Device Operation within Science Activity>

Display in ActionLog:

<Campaign/Expedition-Leg>_<Science Activity>-<Number of Device Operation within Science Activity> <Shortname>
(e.g. PS120_28-2 CTD Watersampler“)

ActionLog Events

Activity - Device Operation	Timestamp	Device	Action	Latitude	Longitude	Depth (m)	Speed (kn)	Course	Latitude (deg)	Longitude (deg)	Wind Dir	Wind Velocity	Transp
PS120_28-2 CTD Watersampler	28.06.2019 12:...	Conductivity-T...	information	54° 04,977' N	007° 58,006' E	21.3	1.0	285.0	54.082946	7.966764	295.0	4.8	
PS120_27-1 GC_PS	28.06.2019 12:...	Gravity Corer, ...	station end	54° 05,044' N	007° 57,271' E	22.4	9.3	257.9	54.084065	7.954517	330.0	5.2	
	28.06.2019 12:...	Gravity Corer, ...	on deck	54° 05,015' N	007° 58,072' E	21.2	0.0	36.8	54.083582	7.967863	314.0	4.1	
	28.06.2019 12:...	Gravity Corer, ...	information	54° 05,009' N	007° 58,069' E	20.9	0.2	233.5	54.083486	7.967815	310.0	5.2	
	28.06.2019 12:...	Gravity Corer, ...	hoisting	54° 05,011' N	007° 58,078' E	21.2	0.1	305.1	54.083523	7.967969	321.0	3.2	
	28.06.2019 12:...	Gravity Corer, ...	max depth/on ...	54° 05,011' N	007° 58,076' E	20.8	0.3	110.0	54.083511	7.967926	309.0	4.4	
	28.06.2019 12:...	Gravity Corer, ...	in the water	54° 05,010' N	007° 58,073' E	21.0	0.4	94.5	54.083504	7.967879	309.0	4.4	
	28.06.2019 11:...	Gravity Corer, ...	station start	54° 04,345' N	007° 58,260' E	20.7	7.3	45.8	54.072423	7.971005	318.0	6.7	
PS120_28-1 CTD Watersampler	28.06.2019 11:...	Conductivity-T...	information	54° 03,956' N	007° 57,546' E	22.2	13.7	48.6	54.065936	7.959104	317.0	7.6	
PS120_27-2 topAWI	28.06.2019 11:...	Towed Ocean ...	information	54° 03,575' N	007° 57,025' E	23.2	13.9	30.2	54.059586	7.950411	316.0	7.9	

All

« 1 2 3 4 »

Extract from DHIP Archive (dms.awi.de)

	A	B	C	D	E	F	G	H	I	J	
1	**Campaign**	**Station - Device Operation**	**Device Types**	**Device Types Code**	**Device**	**Device Code**	**Date/Time (Start)**	**Action (Start)**	**Latitude (deg) (Start)**	**Longitude (deg) (Start)**	**D**
2	PS118	PS118_0_Underway-10	Thermosalinograph	TSG	Thermosalinograph Keel	TSG_KEEL	20.02.19 08:54	profile start	-57.897.329	-61.533.381	0
3	PS118	PS118_0_Underway-13	Magnetometer	MAG	Magnetometer	MAG	20.02.19 09:03	profile start	-57.908.644	-61.514.114	3
4	PS118	PS118_5-3	Video,Multi Corer	VIDEO,MUC	Video Multi Corer	TVMUC	04.03.19 18:32	station start	-64.983.699	-57.751.797	4
5	PS118	PS118_5-4	Multi Corer,Video	MUC,VIDEO	Video Multi Corer	TVMUC	04.03.19 20:26	station start	-64.981.029	-57.746.836	0
6	PS118	PS118_6-5	Plankton Net	PLA	Epibenthossledge	EBS	05.03.19 16:58	station start	-64.973.826	-57.786.732	0
7	PS118	PS118_6-6	Plankton Net	PLA	Epibenthossledge	EBS	05.03.19 19:07	station start	-64.970.863	-57.798.089	0
8	PS118	PS118_6-7	Bottom Net	BN	Agassiz Trawl	AGT	05.03.19 21:31	station start	-64.964.397	-57.836.353	0
9	PS118	PS118_6-8	Remotely Operated Vehicle	ROV	Remotely Operated Vehicle	ROV	06.03.19 00:54	station start	-64.953.392	-57.795.686	0
10	PS118	PS118_9-4	Plankton Net	PLA	Epibenthossledge	EBS	12.03.19 14:24	station start	-64.017.813	-55.918.205	4
11	PS118	PS118_9-5	Plankton Net	PLA	Epibenthossledge	EBS	12.03.19 15:50	station start	-64.019.655	-55.901.400	4
12	PS118	PS118_9-6	Bottom Net	BN	Agassiz Trawl	AGT	12.03.19 17:43	station start	-64.023.801	-55.918.680	4

Extract of Device Operation ID in ActionLog:

<Campaign/Expedition-Leg>_<Science Activity>-<Number of Device Operation within Science Activity>

(e.g. PS120_28-2“)

Data Flow in MOSAiC

ActionLog Events

Activity - Device Operatio	Start	Device	Action	Latitude	Longitu
PS4_4-1 ADCP	12.10.2016 11:49:24	Acoustic Doppl...	station start	51° 03,088' N	001° 23
	12.10.2016 11:49:01	Acoustic Doppl...	station start	51° 03,157' N	001° 23,
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SENSORWeb for management of device metadata

DSHIP-ActionLog for Device-Operation ID management

Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analysis → Data Archiving

Data transfer via satellite, local LAN, radio LAN as stream and/or in delayed mode

MOSAiC Central Storage and workspace

Sensor metadata description (SENSORWeb) is the basis for all parts!!!

MOSAiC Central Storage (MCS)

- Central Storage for raw data and data products on board Polarstern
- Naming convention of device area is derived from SENSORWeb
- Data transferred to MCS at AWI for common access by MOSAiC consortium members after every leg

Device Area (Raw Data)

platforms

vessel
- polarstern
  - ctd_watersampler
    - SBE3plus temperature sensor
      - exdata
        - DSHIP-DEVICEOPERATION-ID
          - SensorFile.xxx
  - FerryBox
    - exdata
      - DSHIP-DEVICEOPERATION-ID
        - SensorFile.xxx

vehicle
- BEAST
  - ECO-Triplet Fluorometer
    - …

Workspace Area

Tasks

Coring
- Site 1
  - Quicklooks
  - Processed Data
  - Combined Datasets
- Site 2
  - DN
  - …

SnowPits
- Site 1
- Site 2
- DN

ROV

Team-Folders

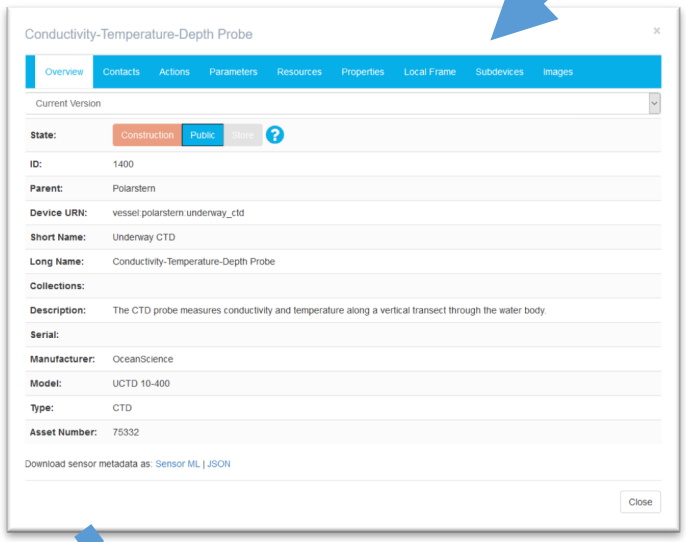
OCEAN
ICE
ATMOS
…

Data Fow in more detail

Devices has to be created in SENSOR (only once)

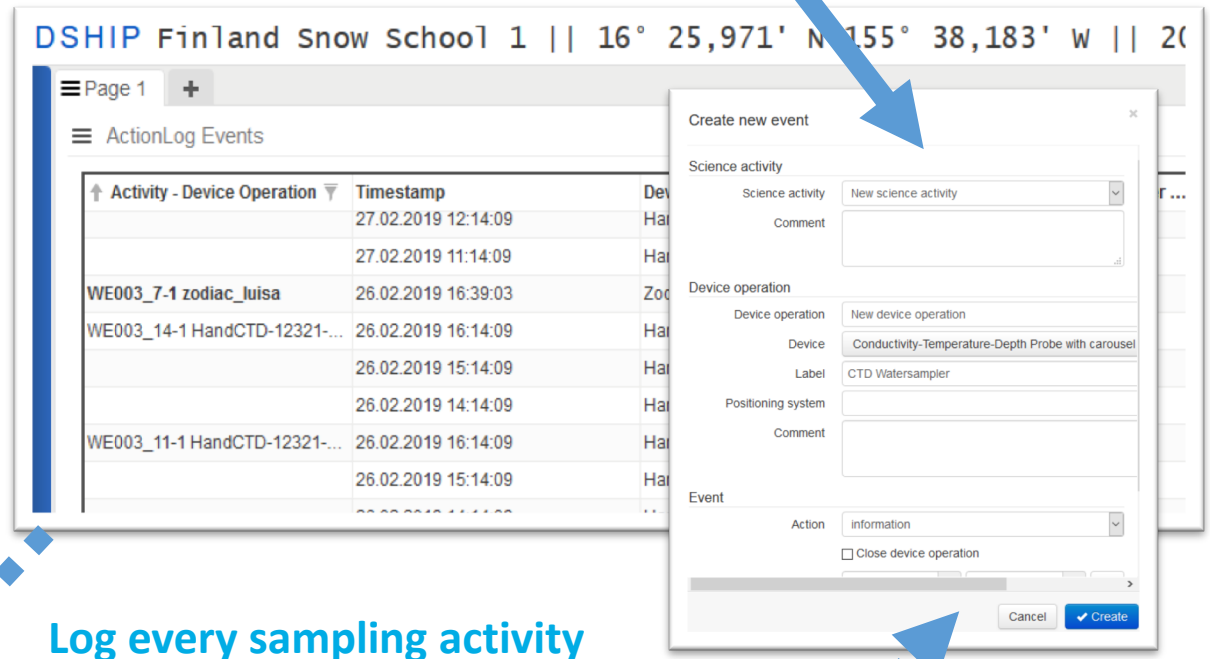
Log every device operation

SENSOR.fs-polarstern.de



background Synching (device & device operation)

DSHIP-ActionLog



Background creating directories (device & device operation)

Log every sampling activity

Storage MCS

vessel/polarstern/ctd_watersampler/SBE3plus_temperature_sensor/exdata/DEVICEOPERATION_ID/

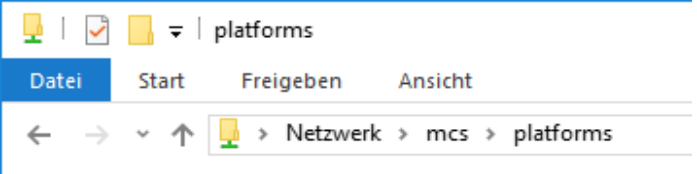
IceFloeNavi-App

manually Synching (device & device operation)

Data Flow in Short

- Directory structure on MCS resembles structure of devices in SENSORWeb
  - Directories automatically created for devices in SENSORWeb with state ‘public‘ and contact ‚polarstern dship‘ with role ‚dship connector‘!
- Every device directory has subdirectory ‚exdata‘ (stands for „expedition data“)
- Device Operation in DSHIP automatically triggers creation of subdirectory with according name in all (sub) device directories selected for operation (within ‚exdata‘).
- Device Operation is to written to device in SENSORWeb (Tab Actions)
- (Raw)data and sampling log sheets are to be uploaded in the respective directories of the Device Operation ID

Demo of Meta Data Flow



- vehicle
- vessel
  - polarstern
    - adcp
    - aimmms_0001
    - aimmms_0002
    - airgun_ps
    - autofim_10001_125
    - bc_ps
    - bln_ps
    - bongo_ps
    - bow_sonic_3d
    - bucket_ps
    - canberra-awi-det_2
    - ccnc_ps
    - cloud_camera
    - crds_ghg_ship_bow
    - crs_ps
    - ctd_watersampler
      - altimeter
        - exdata
          - PS120_28-1
          - PS120_28-2
      - exdata
        - PS120_28-1
        - PS120_28-2
      - ladcp
      - sbe3plus

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images | Ingest

Current Version

Show 25 entries Search:

ID	Type	Label	Date	Lat/Long/elevation	Tools
4630	Information	PS120_28-2	2019-06-28T12:51:52+02:00	54.408908° / -7.934236 / 21.3	
4603	Recovery	PS120_25-15	2019-06-24T17:51:52+02:00	44.482408° / -10.965533° / 4941 m	

ActionLog Events

Activity - Device Operation	Timestamp	Device	Action	Latitude	Longitude	Depth (m)	Speed (kn)	Course
PS120_28-2 CTD Watersampler	28.06.2019 12:...	Conductivity-T...	information	54° 04,977' N	007° 58,006' E	21.3	1.0	285.0
PS120_27-1 GC_PS	28.06.2019 12:...	Gravity Corer, ...	station end	54° 05,044' N	007° 57,271' E	22.4	9.3	257.9
	28.06.2019 12:...	Gravity Corer, ...	on deck	54° 05,015' N	007° 58,072' E	21.2	0.0	36.8
	28.06.2019 12:...	Gravity Corer, ...	information	54° 05,009' N	007° 58,069' E	20.9	0.2	233.5
	28.06.2019 12:...	Gravity Corer, ...	hoisting	54° 05,011' N	007° 58,078' E	21.2	0.1	305.1
	28.06.2019 12:...	Gravity Corer, ...	max depth/on ...	54° 05,011' N	007° 58,076' E	20.8	0.3	110.0
	28.06.2019 12:...	Gravity Corer, ...	in the water	54° 05,010' N	007° 58,073' E	21.0	0.4	94.5
	28.06.2019 11:...	Gravity Corer, ...	station start	54° 04,345' N	007° 58,260' E	20.7	7.3	45.8
PS120_28-1 CTD Watersampler	28.06.2019 11:...	Conductivity-T...	information	54° 03,956' N	007° 57,546' E	22.2	13.7	48.6
PS120_27-2 topAWI	28.06.2019 11:...	Towed Ocean ...	information	54° 03,575' N	007° 57,025' E	23.2	13.9	30.2

IceFloeNaviApp to DSHIP

- Log scientific events on the ice
- Available Sensors are imported from DSHIP (SENSOR) (contact Data Supporters)
- Actions from IceFloeNaviApps imported into DSHIP daily by Data Supporters
  - Default: one individual log entry on the ice resembles one Device Operation in DSHIP
  - Actions can be grouped into one Device Operation

ActionLog Events

Activity - Device Operation	Timestamp	Device	Action	Latitude	Longitude	Depth (m)	Speed (kn)	Course
PS120_28-2 CTD Watersampler	28.06.2019 12:...	Conductivity-T...	information	54° 04,977' N	007° 58,006' E	21.3	1.0	
PS120_27-1 GC_PS	28.06.2019 12:...	Gravity Corer, ...	station end	54° 05,044' N	007° 57,271' E	22.4	9.3	
	28.06.2019 12:...	Gravity Corer, ...	on deck	54° 05,015' N	007° 58,072' E	21.2	0.0	
	28.06.2019 12:...	Gravity Corer, ...	information	54° 05,009' N	007° 58,069' E	20.9	0.2	
	28.06.2019 12:...	Gravity Corer, ...	hoisting	54° 05,011' N	007° 58,078' E	21.2	0.1	
	28.06.2019 12:...	Gravity Corer, ...	max depth/on ...	54° 05,011' N	007° 58,076' E	20.8	0.3	
	28.06.2019 12:...	Gravity Corer, ...	in the water	54° 05,010' N	007° 58,073' E	21.0	0.4	
	28.06.2019 11:...	Gravity Corer, ...	station start	54° 04,345' N	007° 58,260' E	20.7	7.3	
PS120_28-1 CTD Watersampler	28.06.2019 11:...	Conductivity-T...	information	54° 03,956' N	007° 57,546' E	22.2	13.	
PS120_27-2 topAWI	28.06.2019 11:...	Towed Ocean ...	information	54° 03,575' N	007° 57,025' E	23.2	13	

All

DSHIP

- One account for every teams
- Create Science Activity: Cruise Leader?
- Create Device Operation: PIs/Scientists
  - Include/Exclude Subdevices
  - Add Actions
  - Change Devices Operations (Date, Time, Subdevices)

Synchronisation Details

- SENSOR AWI to SENSOR Polarstern (autom. every 10 min)
- SENSOR Polarstern to SENSOR AWI (directly)

- (Re-)Import device from SENSOR Polarstern to DSHIP
  - Once a day by Data Supporters, additional imports upon request
  - Re-Import Sensors after creating new version in SENSORWeb (e.g. subdevice exchange, recalibration, …)
- Write DSHIP actions to SENSOR AWI/Polarstern (autom. every 5 min)
- Import Actions from IceFloeNavi App to DSHIP
  - Once a day by Data Supporters, additional imports upon request
- You can edit devices on Polarstern in SENSOR but it is not very convenient due to the limited bandwidth!

SENSOR Best Practices and Workflows

- See Best Practices in MOSAiC Handbook for first orientation
- Will be further documented during the cruise
- Ask Data Supporters, Data Contact Persons and Chief Editors

- Special Cases
  - Reassign/Add new subdevices to SENSOR
    - New Version in SENSOR
    - Reimport in DSHIP necessary
  - Recalibrate devices
    - New Version in SENSOR
    - Reimport in DSHIP necessary
  - Run Labinstruments onboard
    - Use ‘Add Action‘ -> Event Relations
  - ….

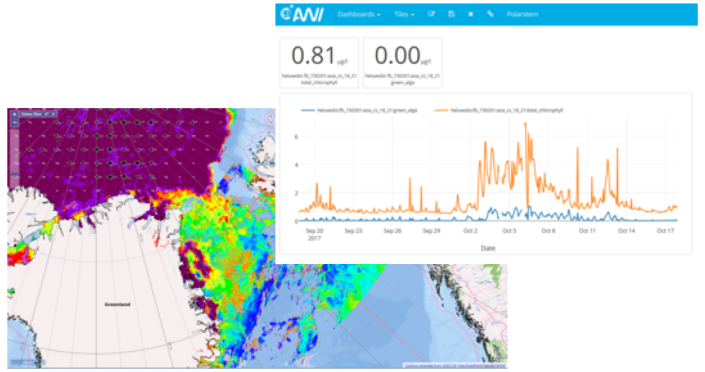
Data Flow in MOSAiC

SENSORWeb for management of device metadata

ActionLog Events

Activity - Device Operatio	Start	Device	Action	Latitude	Longitu
PS4_4-1 ADCP	12.10.2016 11:49:24	Acoustic Doppl...	station start	51° 03,088' N	001° 23
	12.10.2016 11:49:01	Acoustic Doppl...	station start	51° 03,157' N	001° 23,
PS4_1-3 BLN	11.10.2016 14:17:22	BALLON	in the water	46° 07,339' N	010° 15,
PS4_1-1 BOAT	11.10.2016 14:13:31	Boat	MyAction	46° 07,251' N	010° 15,

DSHIP-ActionLog for Device-Operation ID management



DSHIP-Mapviewer and **Dashboard**

Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analysis → Data Archiving

Data transfer via satellite, local LAN, radio LAN as stream and/or in delayed mode

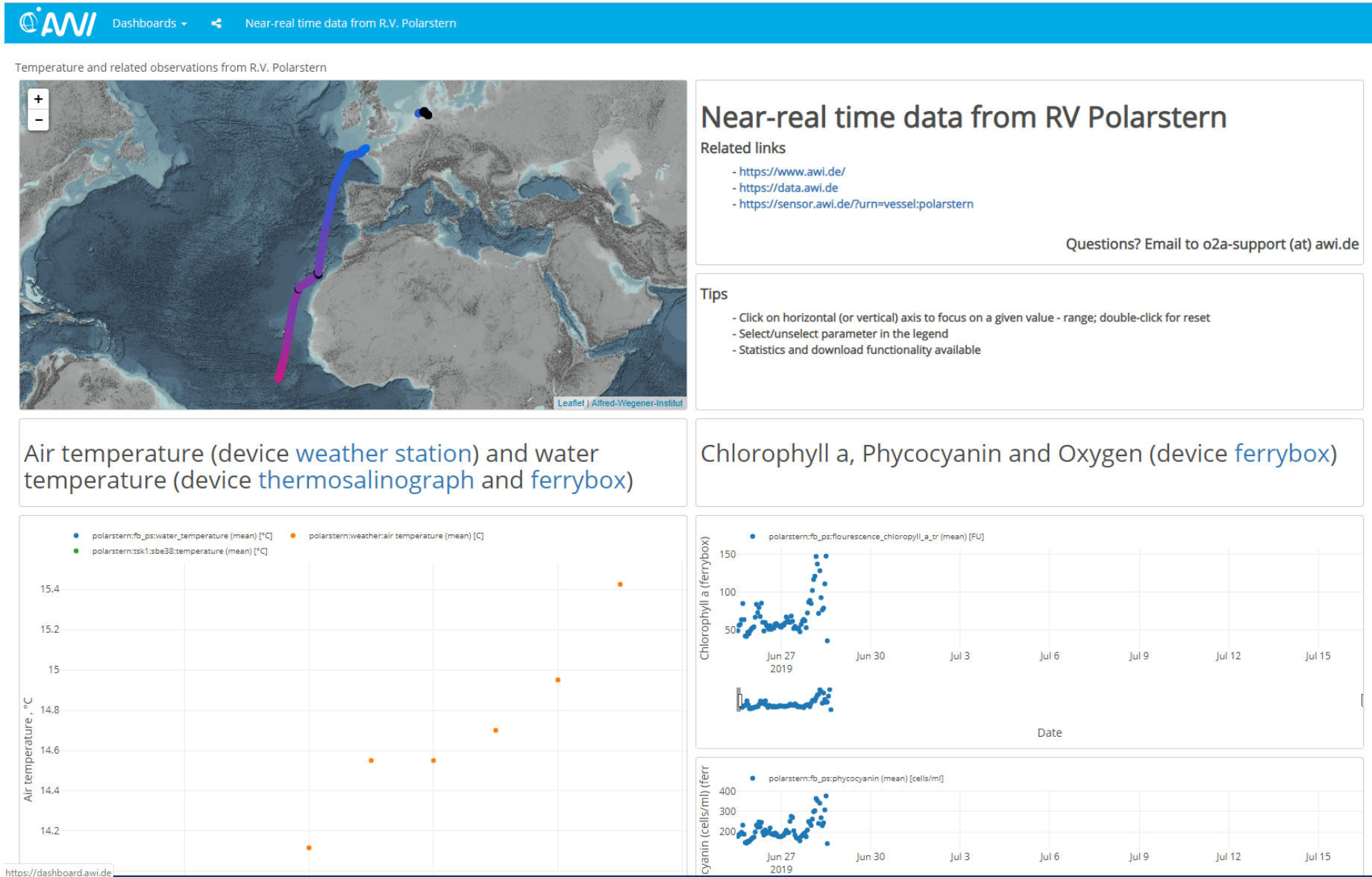
MOSAiC Central Storage and workspace

Sensor metadata description (SENSORWeb) is the basis for all parts!!!

Dashboard

Monitoring of near real-time and delayed-mode data

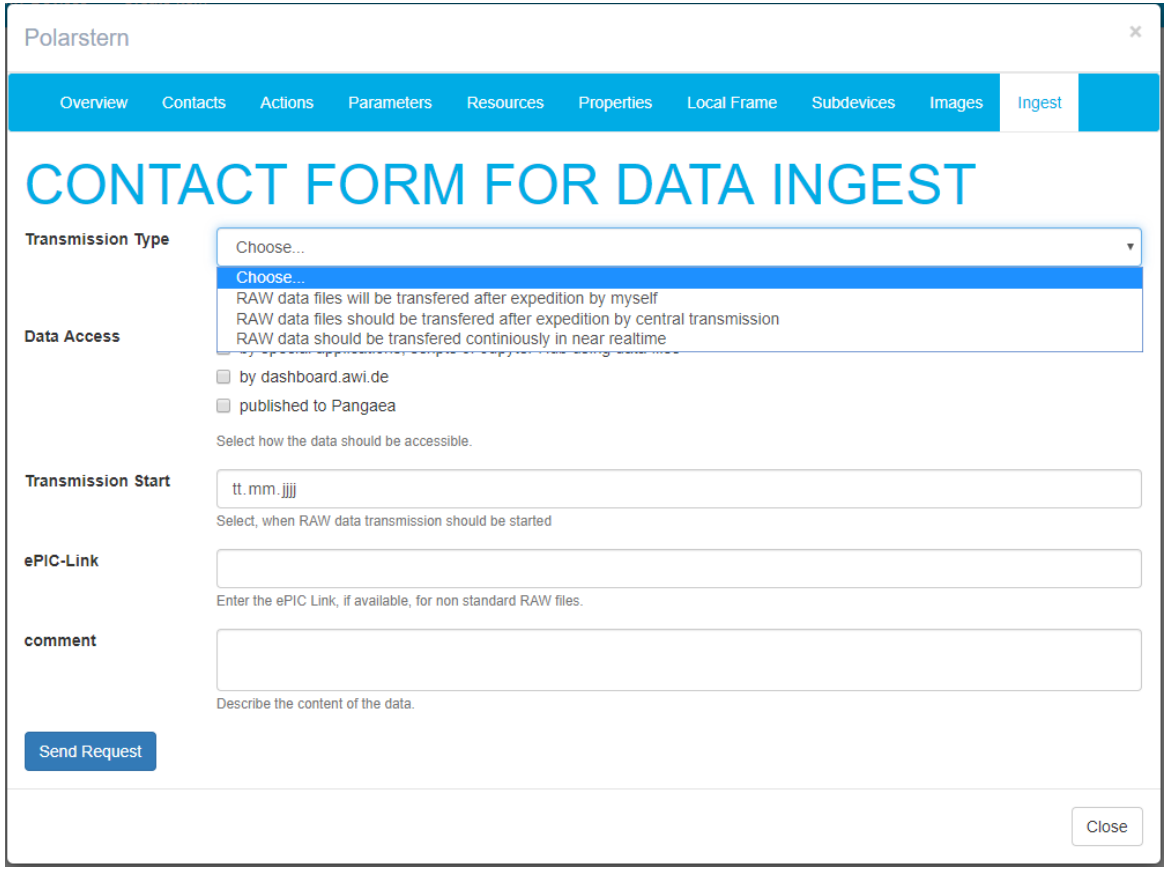
- 2D graph
- Heatmap
- Map widgets color-coded paramterts
- and more tools…



Ingest Data automatically to MCS

- Contact Data Supporters for Help

- **Transmission Methods**
  - E-Mail
  - sftp
  - ftp
  - smb (Windows-Share)
  - rsync (only Download)

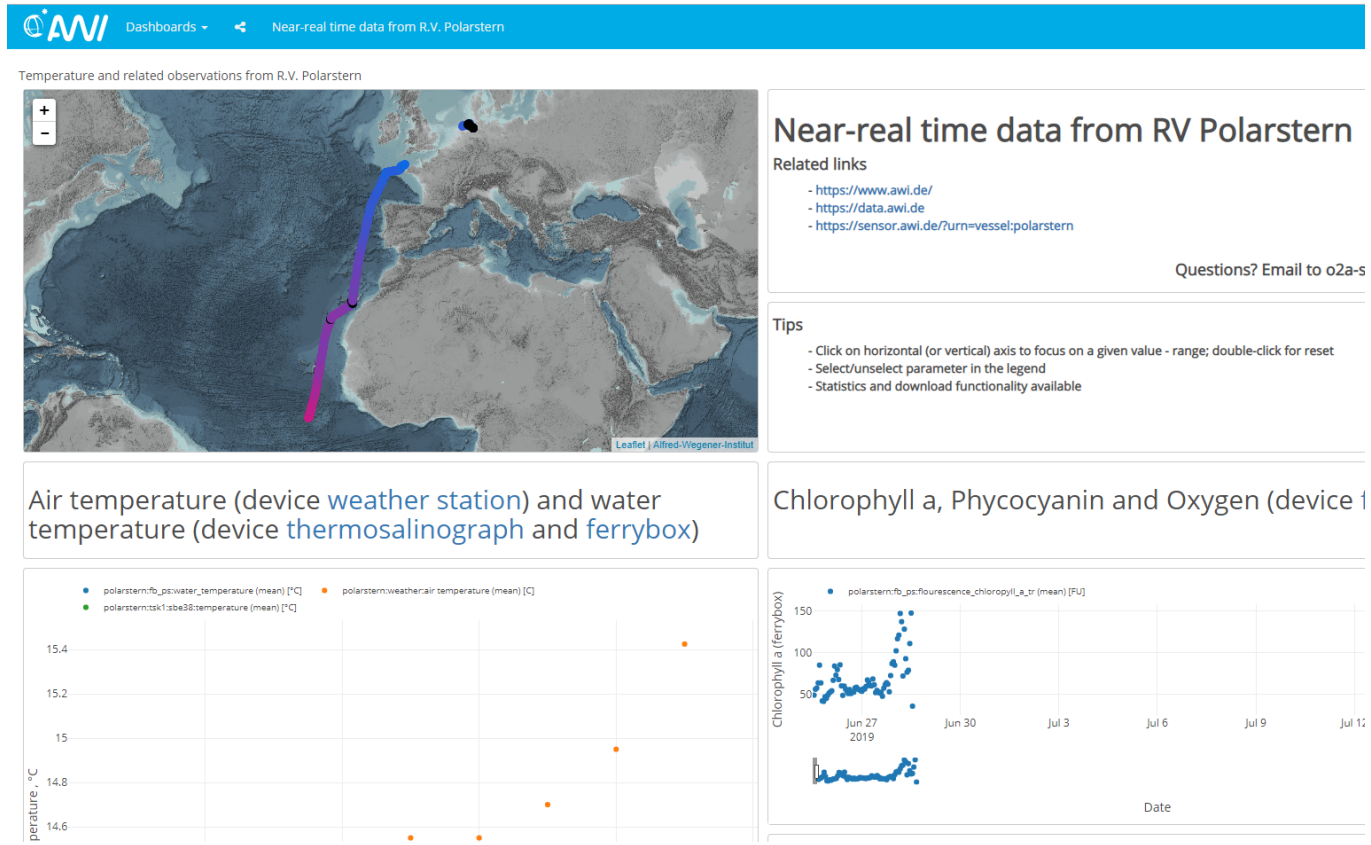


Choose transmission type “…continuously in near real-time ”

Provide Data in Ingest Database

- Contact Data Supporters For Help

- Convert data into CSV Format for import into database
  - To access data via defined interface
  - For display in DASHBOARD



datetime	vessel:polarstern:tsk1:salinity [psu]	vessel:polarstern:tsk1:sbe38:temperature [°C]
2019-02-28 15:50:00.000	34.1234	2.443
2019-02-28 15:50:01.000	34.1345	2.564
2019-02-28 15:50:02.000	34.1456	2.544

MOSAiC Central Storage (MCS) - Workspace

- Central Storage for raw data and data products on board Polarstern
- Naming convention of device area is derived from SensorWeb
- Data transferred to in Bremerhaven for common access by MOSAiC consortium members

Device Area
(Raw Data)

Workspace Area

platforms

vessel
- polarstern
  - ctd_watersampler
    - SBE3plus temperature sensor
      - exdata
        - DSHIP-DEVICEOPERATION-ID
          - SensorFile.xxx
  - FerryBox
    - exdata
      - DSHIP-DEVICEOPERATION-ID
        - SensorFile.xxx

vehicle
- BEAST
  - ECO-Triplet Fluorometer
    - …

Tasks

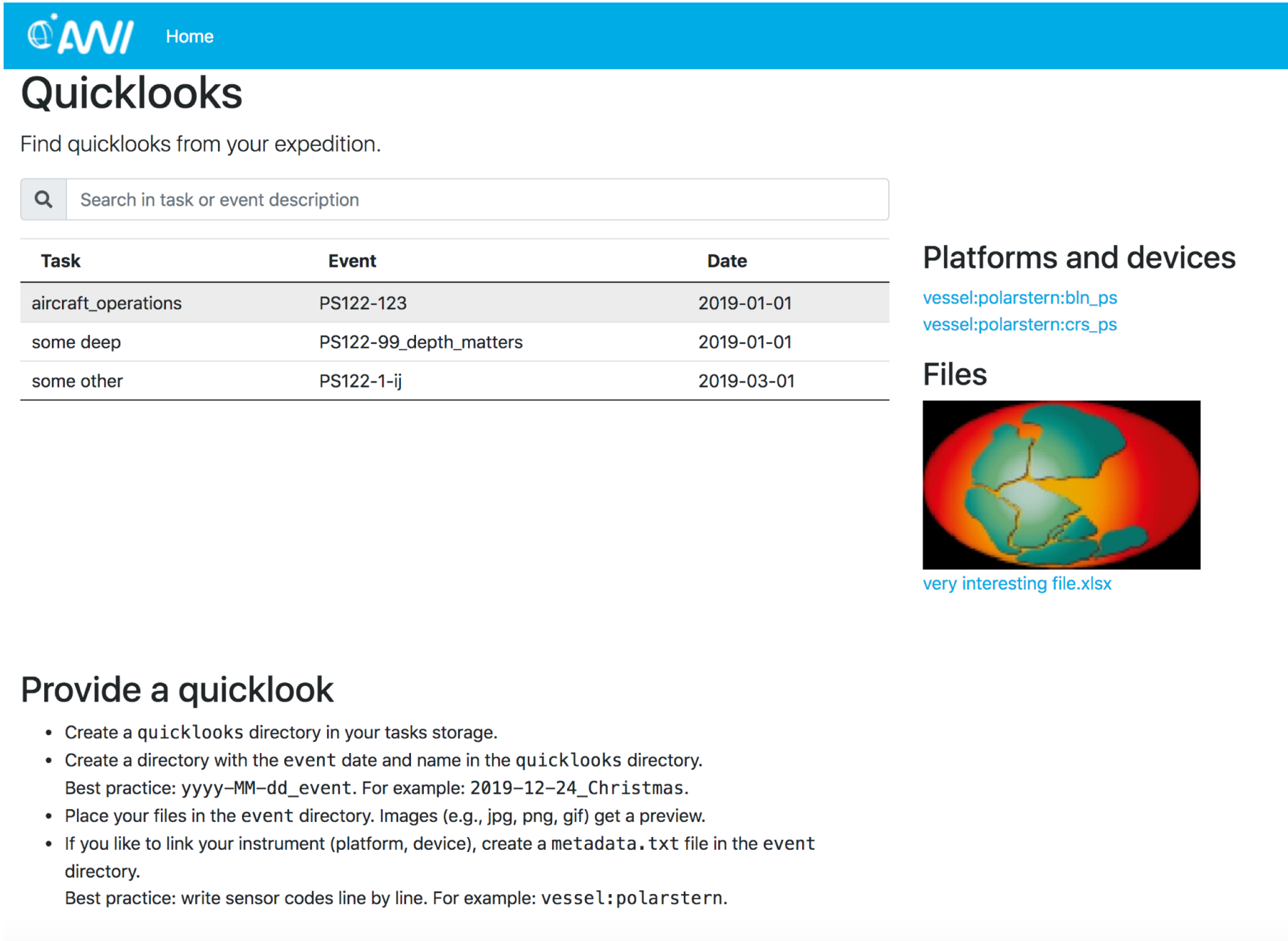
- Coring
  - Site 1
    - **Quicklooks**
    - Processed Data
    - Combined Datasets
  - Site 2
    - DN
    - …
- SnowPits
  - Site 1
  - Site 2
  - DN
- ROV

Team-Folders

- OCEAN
- ICE
- ATMOS
- …

Quicklooks

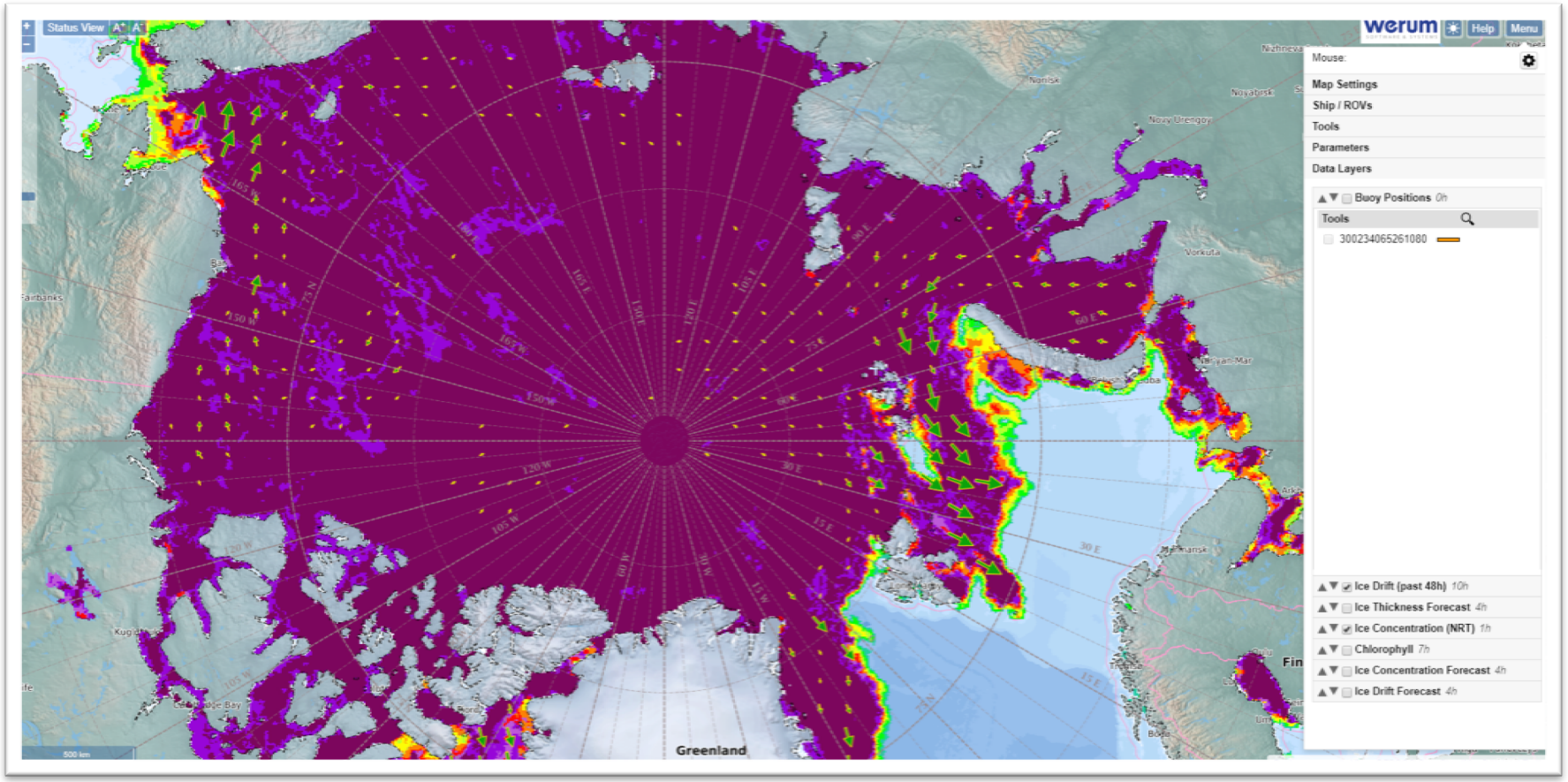
- Share quicklooks (plots, CSV files, etc.) of data for a device operation for scientists on board



MOSAiC International Arctic Drift Expedition

MAPVIEWER

- ✓ *A browser based mapping and viewing system available on board*
- ✓ *Decision support on board*

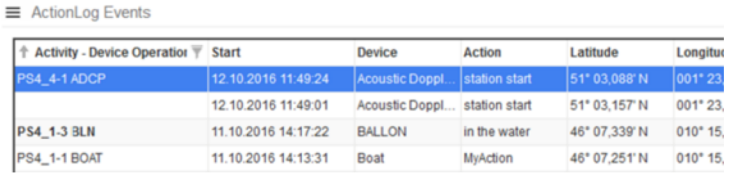


Sensor Metadata Description | Data Acquisition | Data Ingestion | Data Storage | **Data Monitoring** | Data Analytics | Data Archiving

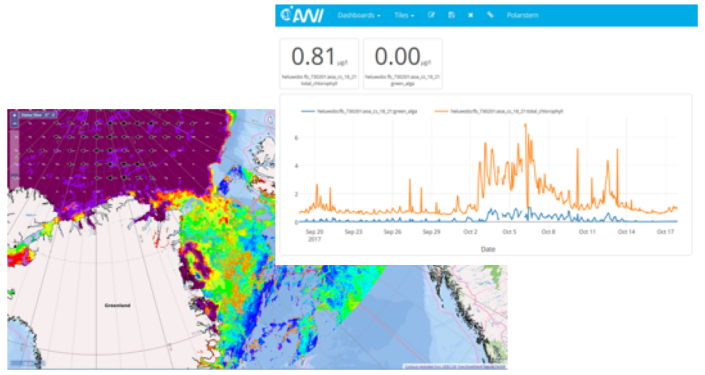
HELMHOLTZ

Data Flow in MOSAiC

SENSORWeb for management of device metadata



DSHIP-ActionLog for Device-Operation ID management



DSHIP-Mapviewer and **Dashboard**

Sensor Metadata Description → Data Acquisition → Data Ingestion → Data Storage → Data Monitoring → Data Analytics → Data Archiving

Data transfer via satellite, local LAN, radio LAN as stream and/or in delayed mode

MOSAiC Central Storage and workspace

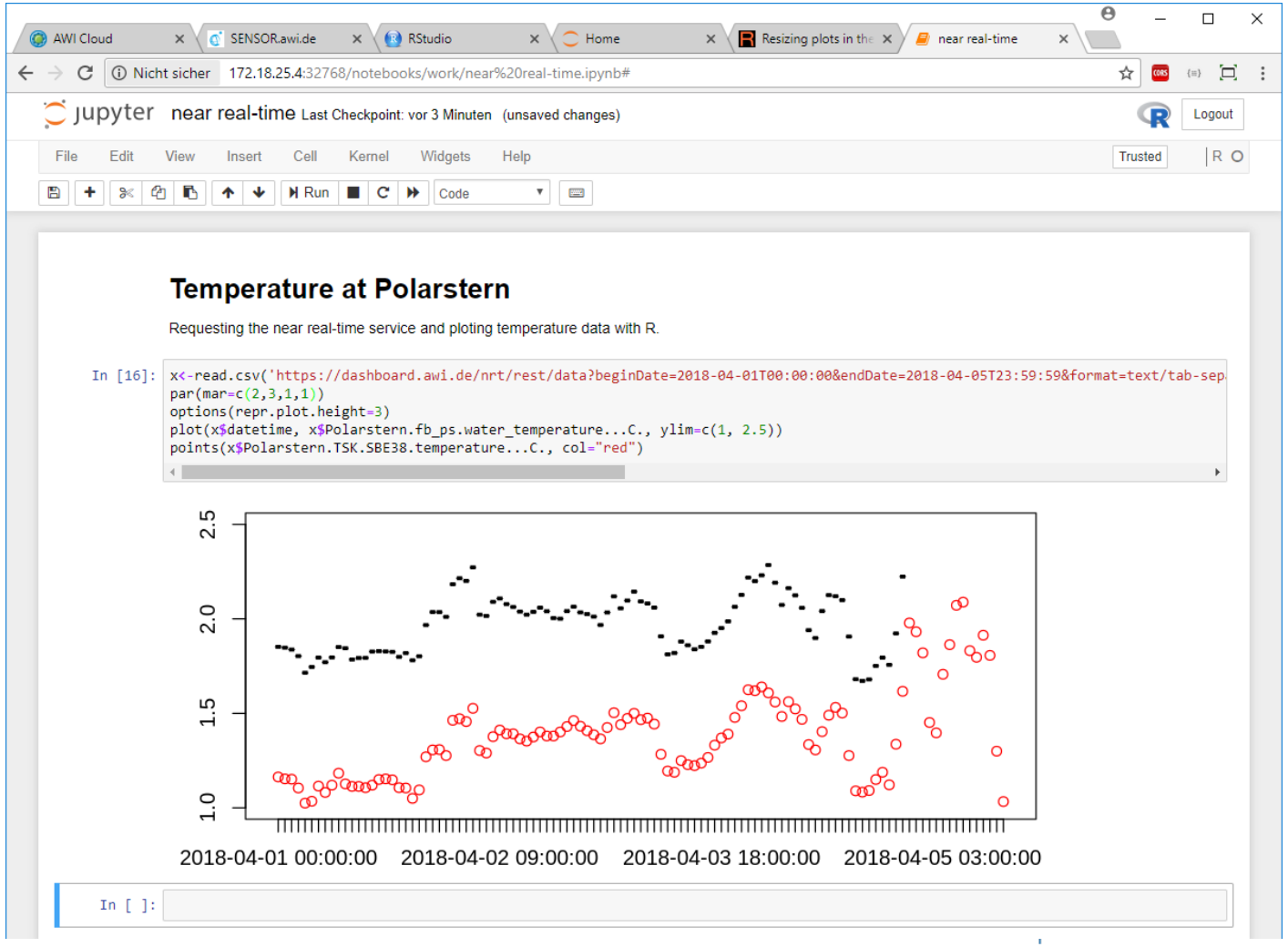
Using workspace and **Marketplace (VMs)** e.g. with **Jupyter** Notebook (R or Python) or Bash-Script or or …?

Sensor metadata description (SENSORWeb) is the basis for all parts!!!

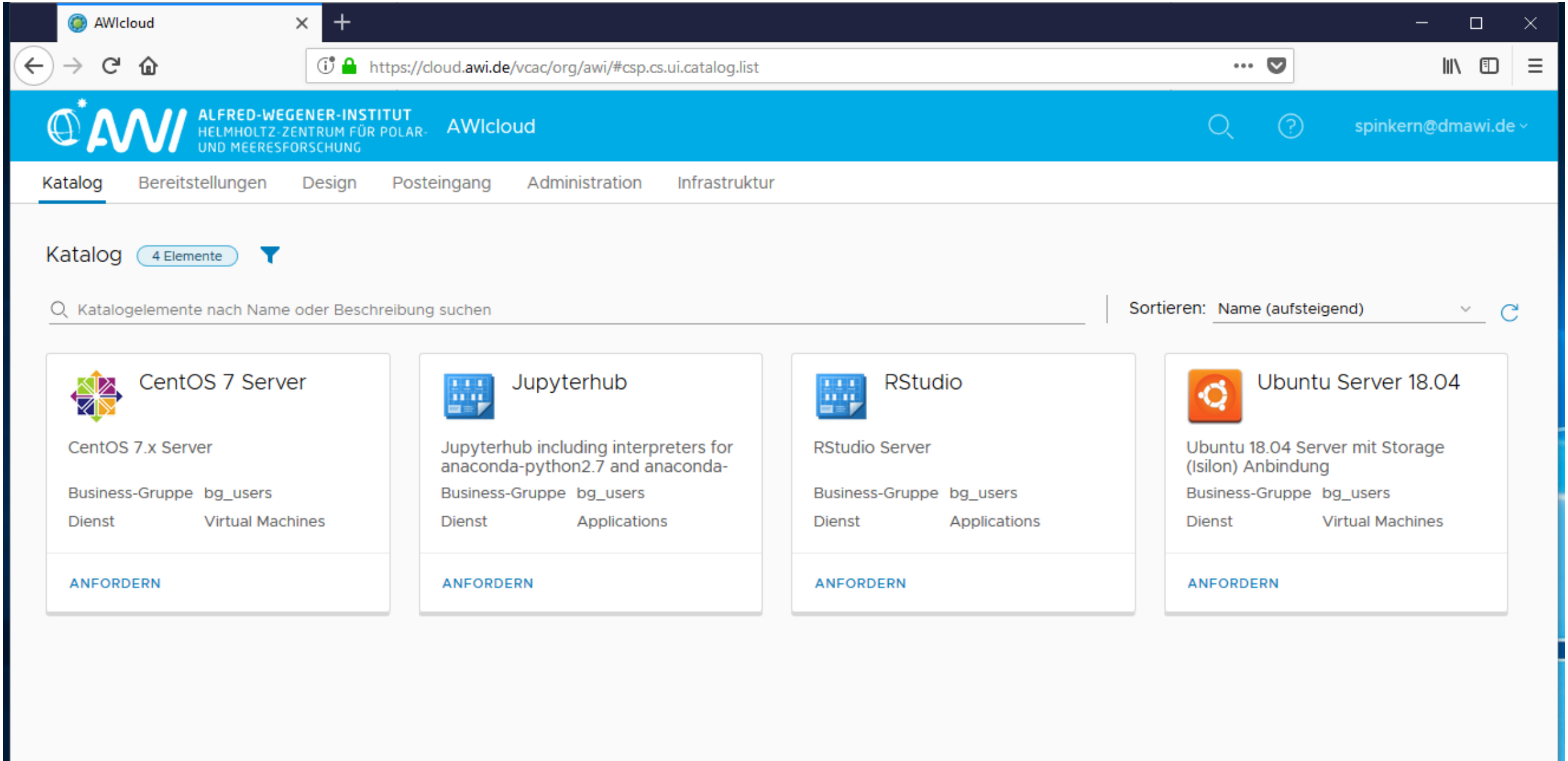
WORKSPACE

Workspace - Solutions

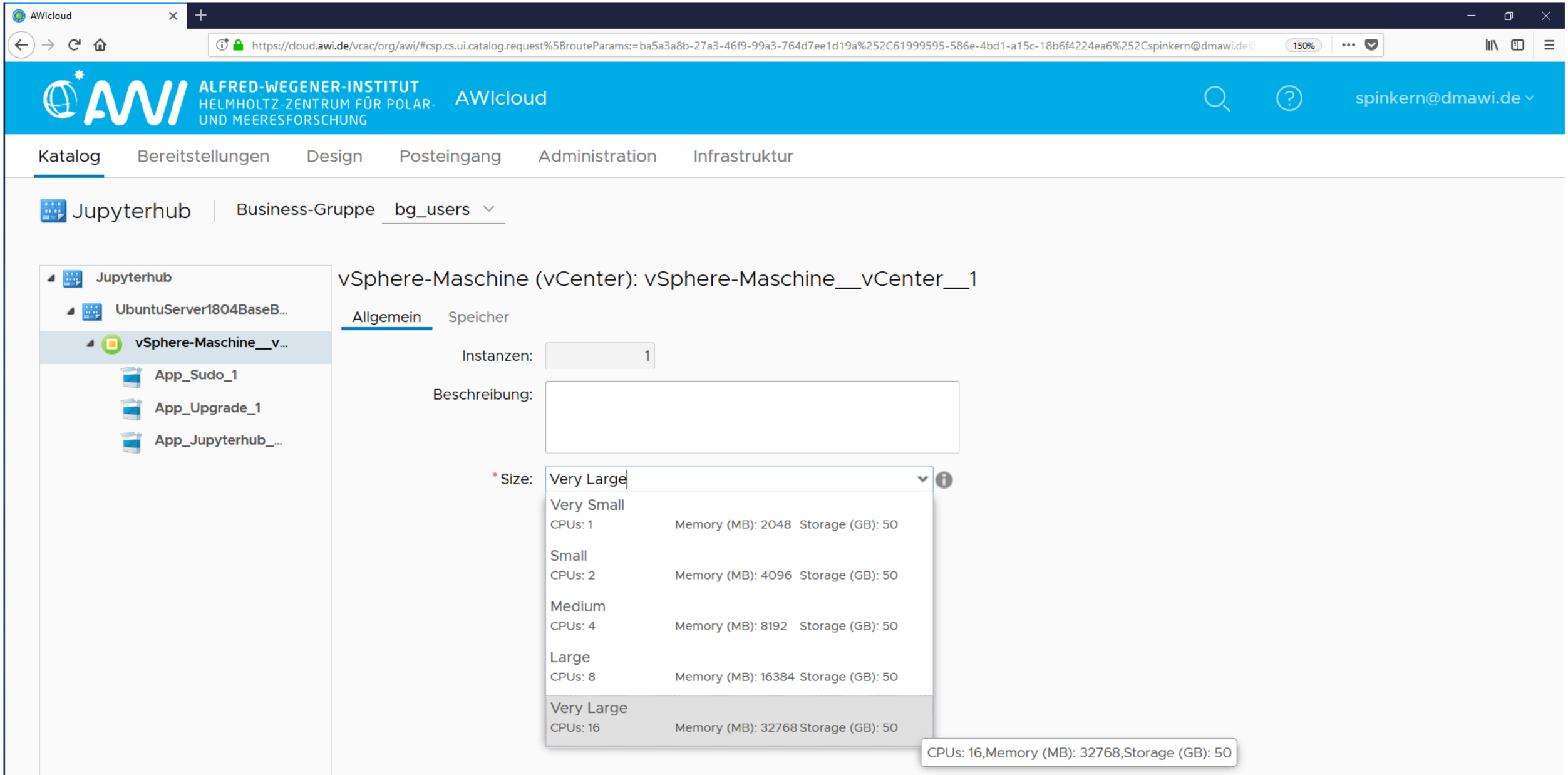
- Virtual Machines with e.g.
  - Jupyter Notebook,
  - R
  - your tools..?



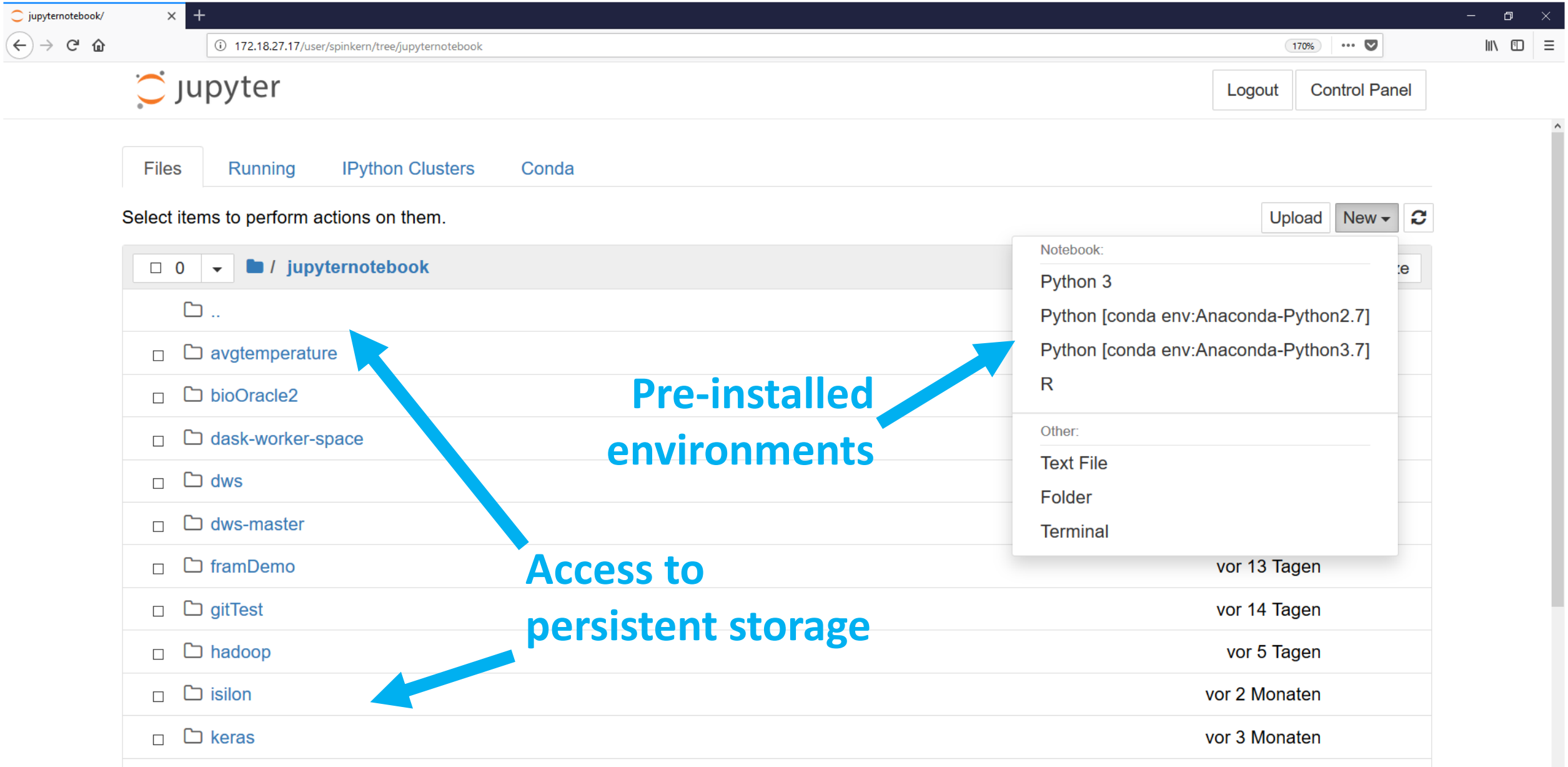
Marketplace Catalog



Ordering an individual compute instance



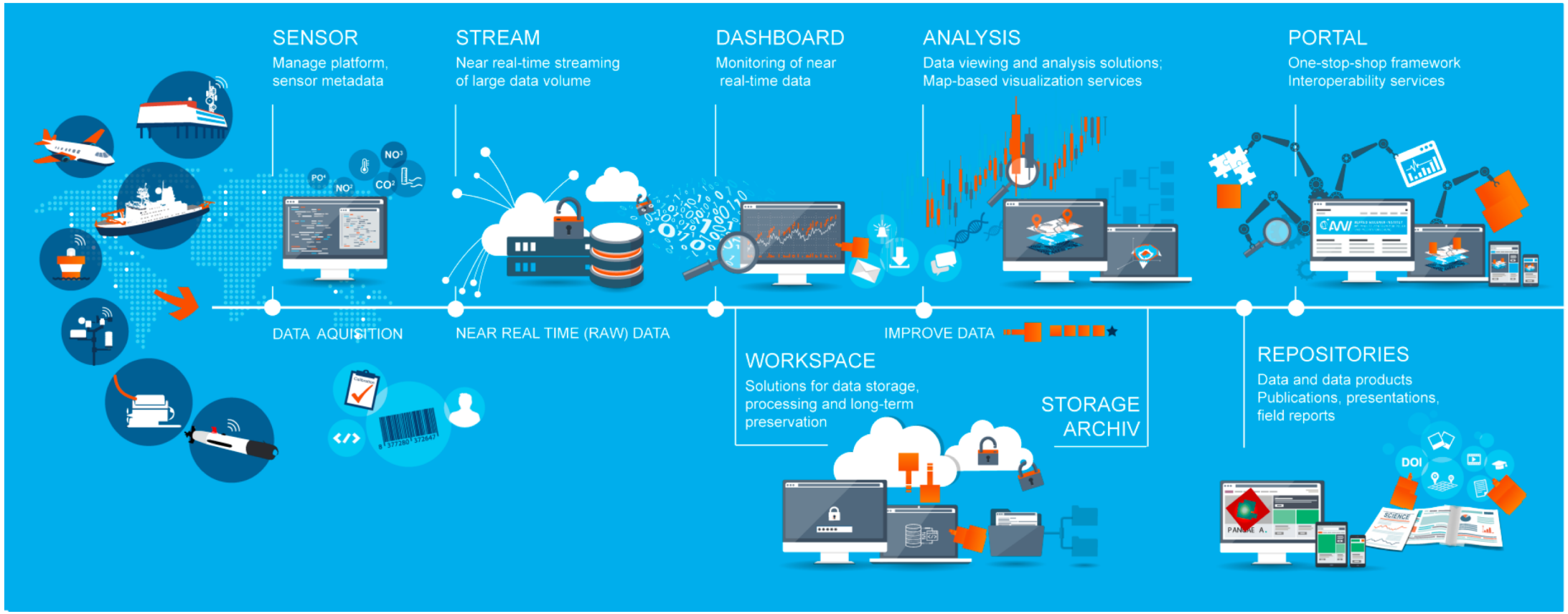
Example: Jupyter Notebook Server



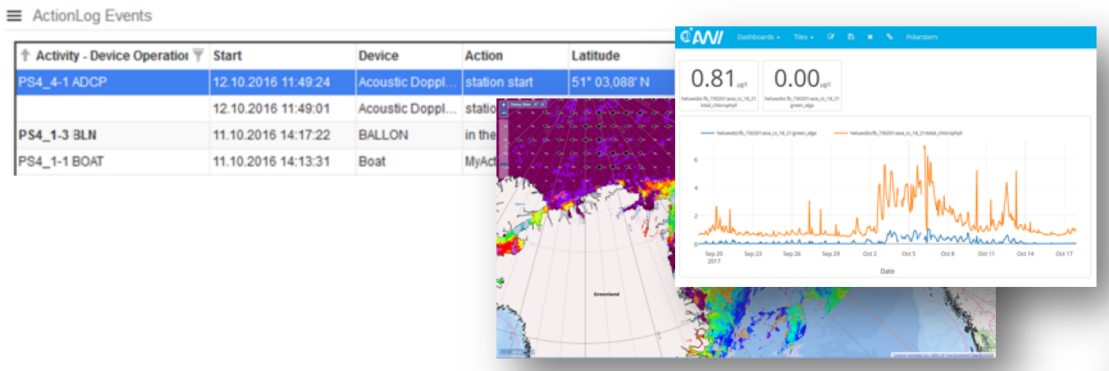
Advantages of Virtual Machines (VMs)

- No configuration of laptop needed to access storage, databases etc. on board
- VMs accessible through network
  - work on machine via any laptop/PC on ship with network access
- No need to carry laptop around
  - Access same state of maschine anywhere
- Accessible to many
  - Share virtual machine with colleagues
- VMs run on server
  - skripts may run overnight while you shut down your laptop

O2A Framework

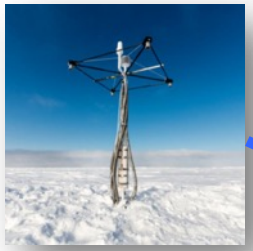


Overview Architecture

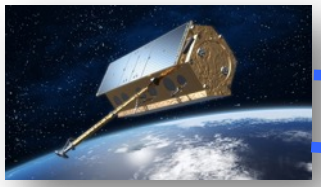


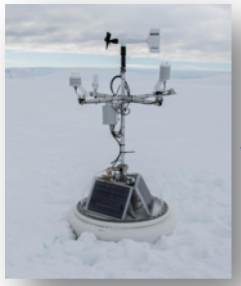
DSHIP ActionLog, DShip-Mapviewer and Dashboard

SENSORWeb



Iridium satellite link to earth station, followed by Iridium satellite link for downloading to Polarstern





RadioLAN

LAN

USB-Drive („delayed mode“ data)

Ingest raw data by centralised Ingest-Software on Board

Files

Parameter values

Device Drivers

700 TB With Backup

MOSAiC Central Storage and workspace

Polarstern Network

Network between Polarstern and RadioLAN, LAN, etc...

User Notebooks, PCs, VMs, Tablets, MobilPhones

Sensor metadata description (SENSORWeb) is the basis for all parts!!!

MOSAiC International Arctic Drift Expedition

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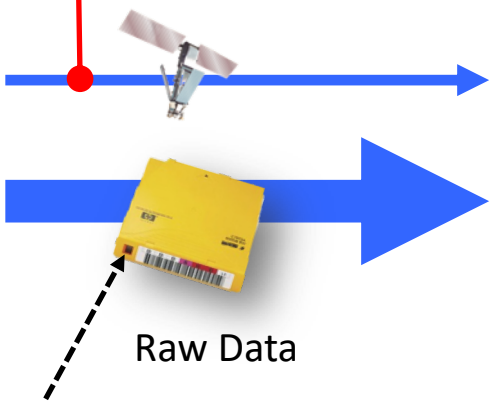
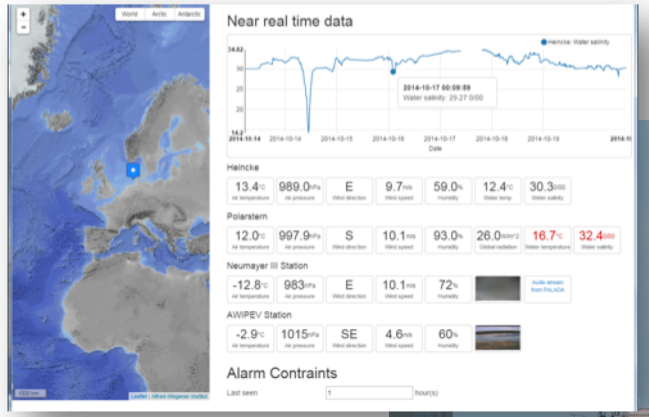
Raw Data at AWI

Currently only 3 x 200MB/day

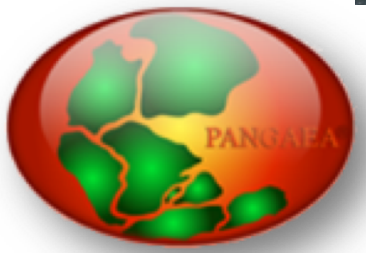


Raw Data

Onshore Data Transfer



Land-MOSAiC Central Storage



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Satellite Communication

Version	Volume	Transfer Rates	Remarks
IRIDIUM	Max. 2x100 MB/day	2x128 kbps	Max. 2x 5GB/month Used by buoys
IRIDIUM Certus	Max. 3x200 MB/day	3x700 kbps	1 backup Max.3-4x 10GB/month Testing phase
Nano Satellites		Store & Forward!!	Early testing phase

No internet access available for user pcs and personal laptops!

Email Quotas:

Suggested limitations	Iridium
Cruise leader	1 MByte
Group leader	100 kByte
German Weather Service	1 MByte
Helicopter crew	100 kByte
Captain	1 MByte
Ship's management	100 kByte
Scientific participants	50 kByte

Collaboration Tools

- MOSAiC Logbook
- Public server for personal data available on Polarstern
- RocketChat for communication on board

- **NOT: MS Teams!, google docs, etc.**

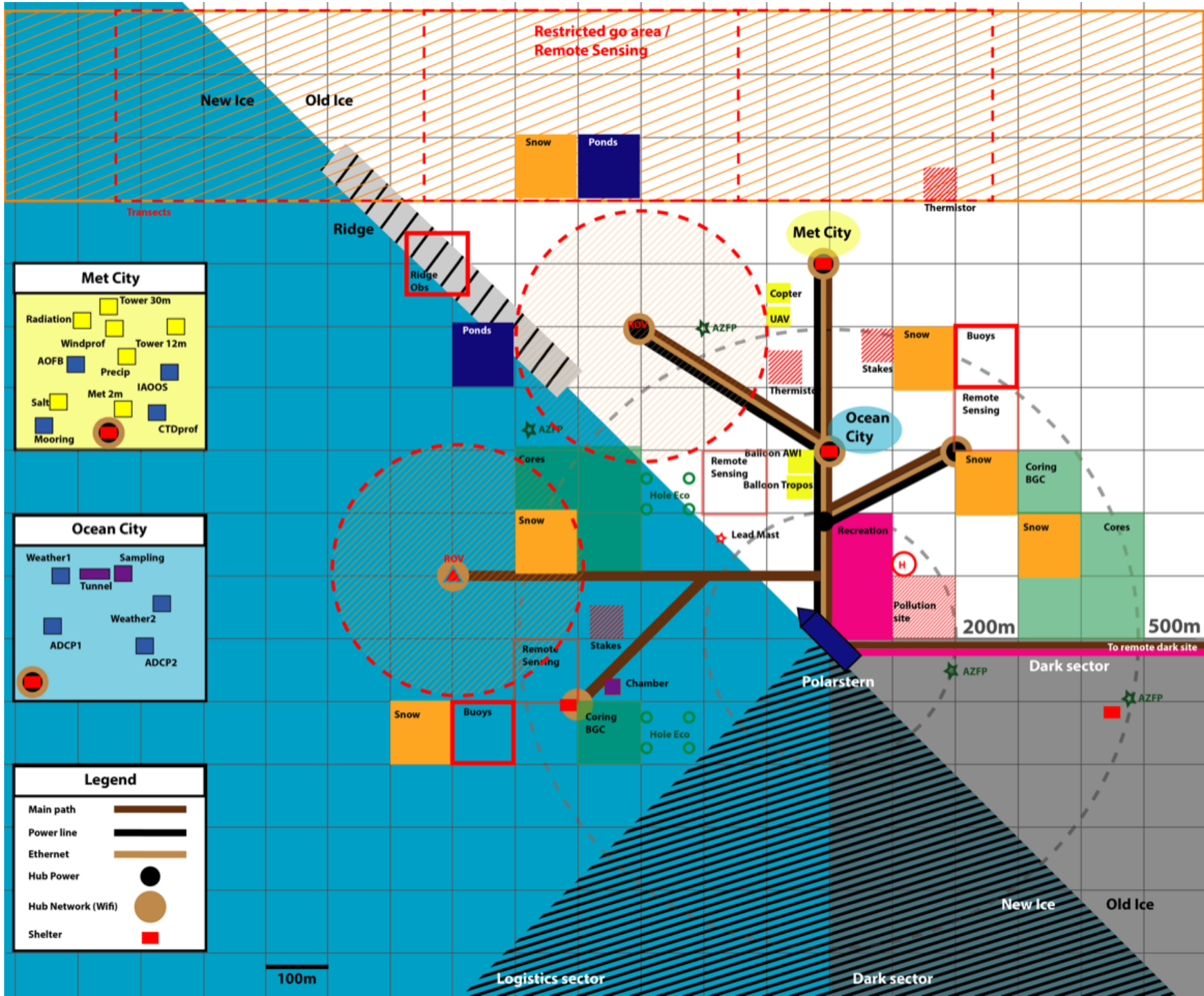
Network Access

Cabled LAN (glas fibre)

- at power lines
- 1Gbit/s

Radio LAN (Estimated transfer rates (not yet tested in polar regions)

- 50-200 Mbit/s near Polarstern
- 3Mbit/s in 20km distance
- Needs mobile power supply



MOSAiC Services

Documentation of all components is found in the MOSAiC Handbook.
If you have any questions, please contact the data supporters.

- User Accounts
  - To obtain your user account with which you can access the services please contact the communications officer on board.
- Storage
  - mcs.fs-polarstern.de
- (Meta)-Data Management Tools
  - SENSORWeb:
    - http://sensor.fs-polarstern.de/
  - Dashboard:
    - http://dashboard.fs-polarstern.de/
- Virtual Workspace Environment and Software Repository
  - Marketplace:
    - http://marketplace.fs-polarstern.de/vcac
  - Repository:
    - https://reposrv1.fs-polarstern.de/
- Communication
  - RocketChat:
    - http://rocket.fs-polarstern.de/
- Quicklooks
  - http://frame-rem1.fs-polarstern.de/quicklooks

SENSOR Chief Editors

- Collect list of devices to be entered in SENSOR for your team
- Act as a multiplicator for SENSOR in team.
  - spread knowledge on updates of SENSOR in team.
  - Filter questions which can already be answered by you for your team
    - Best practices
    - Best configuration of instruments
    - Where to get documentation
  - Spread knowledge
    - on best practices in SENSOR specific for team
    - How SENSOR, DSHIP and MCS relate
  - Act as first contact for questions on SENSOR for team.
- Monitor devices in SENSOR for your team to ensure best practices are followed
  - Item state, mandatory Contacts/Roles, correct configuration

Data Contact Person on Board

- Act as a multiplicator for knowledge
  - on best practices in SENSOR specific for team
  - on SENSOR, DSHIP, MCS on Board
  - how SENSOR, DSHIP and MCS relate
- First contact for questions regarding SENSOR
  - Know Best practices
  - Help reassigning, editing (and entering new) devices
  - Know where to get documentation
- Keep an eye on data for your team.
  - Is raw data being stored in MCS appropriately and in time?

Data Contact Persons and Chief Editors

- Data Contact Persons Leg 1
  - ATMOS: Byron Blomquist
  - BGC: Dorothea Bauch
  - ECO: Allison Fong
  - ICE: Julia Regnery
  - OCEAN: Mario Hoppmann
- Chief Editors
  - ATMOS: Peter von der Gathen, Byron Blomquist, Giri Prakash
  - BGC: Dorothea Bauch
  - ECO: Allison Fong, Clara Hoppe
  - ICE: Julia Regnery, Amy MacFarlane
  - OCEAN: Julia Regnery, Sandra Tippenhauer

Data Supporters

- Help with DSHIP, SENSOR, data access and storage on MCS
- Assist with acessing virtual solutions
- Keep an eye on data flow
  - Is raw data being stored in MCS appropriately and in time?
- Help with technical network problems on the ice
- Transfer data from MCS to AWI after each leg

Data Supporters Leg 1

- Leg 1a

  Franziska Nehring

  Peter Gerchow

- Leg 1 a and b
  - Antonia Immerz
  - Johannes Käßbohrer

- Find us in the Bathymetry Room ☺

Ready to start?

- Register all scientific devices in SENSOR
  - Contact Chief Editor of your team to start
- SENSOR Checklist
  - Add mandatory contacts/roles
    - DSHIP Connector
    - Owner
    - Editor (and Data Provider)
- Ready?
  - Set Item State to „Public“
  - Create Initial Version of type “Comissioned“

- Software to bring to Polarstern for your personal laptops and cellphones
  - RocketChat App
  - Remote Desktop Client to access Virtual Machines:
    - X2Go, or if desired: NX (NoMachine)
    - Microsoft RDP for Windows 10

MOSAiC User Account

- To obtain your user account with which you can access the services please contact the communications officer on board.
- MOSAiC-User-Account created for you using your email address in EIS.awi.de (prerequisite: sign data policy)
- With this user you can afterwards also access the MCS and MOSAiC Infrastructure at the AWI (see mosaic-data.org)

Links and Further Documentation

- MOSAiC Handbook: https://spaces.awi.de/display/EFPW/PS122+-+MOSAiC+-+Information

- sensor.fs-polarstern.de
- dashboard.fs-polarstern.de
- sensor.fs-polarstern.de/quicklooks
- ….

- O2A-Wiki: https://spaces.awi.de/display/DM/MOSAiC

- Access MCS at AWI: mosaic-data.org