SECoP AND METADATA – THE SAMPLE ENVIRONMENT COMMUNICATION PROTOCOL

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ABSTRACT The integration of sample environment (SE) equipment in a beam line experiment is a complex challenge both in the physical world and in the digital world. Different experiment control software offer different interfaces for the connection of SE equipment. Therefore, it is time-consuming to integrate new SE or to share SE equipment between facilities. To tackle this problem, the International Society for Sample Environment (ISSE) developed the Sample Environment Communication Protocol (SECoP) to standardize the communication between instrument control software and SE equipment (see [1] and references therein). SECoP offers, on the one hand, a generalized way to control SE equipment. On the other hand, SECoP holds the possibility to transport SE metadata in a well-defined way. Using SECoP as a common standard for controlling SE equipment and generating SE metadata will save resources and intrinsically give the opportunity to supply standardized and FAIR data compliant SE metadata. It will also supply a well-defined interface for user-provided SE equipment, for equipment shared by different research facilities and for industry. In this presentation we will give an overview of the present status of SECoP and the developments within the SECoP@HMC project supported by the Helmholtz Metadata Collaboration.

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REFERENCES

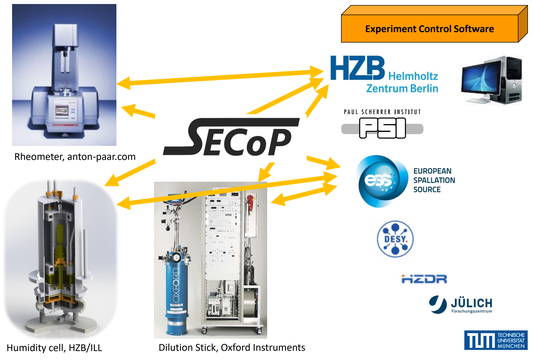
An introduction to SECoP
[1] K. Kiefer, et al. (2020). An introduction to SECoP – the sample environment communication protocol.
Journal of Neutron Research, 21(3-4), pp.181–195
https://doi.org/10.3233/jnr-190143

SECoP on GitHub
https://github.com/SampleEnvironment/SECoP

International Society for Sample Environment (ISSE)
https://sampleenvironment.org/

Helmholtz Metadata Collaboration:
https://helmholtz-metadaten.de/de

The SECoP Idea



The SECoP Philosophy

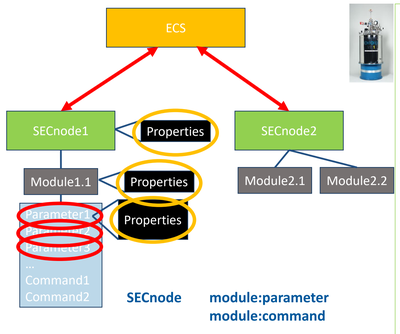
SECoP

Sample Environment Communication Protocol

simple, inclusive, self explaining, provides metadata

Flexible Accessible Interoperable Reusable

Structure



SECnode ("wet cryostat")
- temperature_sample (module)
  - value (parameter)
  - _sensor_value
  - _calibration_table
  - status, …
- temperature_reg
  - value
  - target
  - ramp
  - stop (command)
  - ctrlpars [p, i, d, …]
  - control_active
  - status, …
- heliumlevel
  - value
  - status

SECoP Goals

- Standardize the **control** of SE equipment
- Standardize the provision of **metadata** for SE equipment
- Enable **plug&play operation** of SE equipment
- Ease the **exchange** of SE equipment

Message example

read request	request	**read**	*module*:*parameter*
	reply	**reply**	*module*:*parameter value*
change value	request	**change**	*module*:*parameter value*
	reply	**changed**	*module*:*parameter value*

```
> read temp1:value
< reply temp1:value [295.13,{"t":1505396348.188}]

> change temp1:target 295
< changed temp1:target [300,{ "t":1505396349.123}]
```

Metadata in SECoP

Parameter

Calibration curve of a sensor (static)

Additional information (e.g. valve position, Helium level,…)

Properties

description
equipment_id of a SEC-node

description
meaning of a module

description
datainfo of a parameter

Metadata plug&play

Predefined parameters

- value, status, target, ramp, …

Interface classes

- Readable, Writable, Drivable
- complex interface classes

Module property „meaning“

meaning (tuple, optional)

- "temperature" (the sample temperature)
- "temperature_regulation" (to be specified only if different from 'temperature')
- "magneticfield"
- "electricfield"
- "pressure"
- "rotation_z" (counter clockwise when looked at 'from sky to earth')
- …

SECoP@HMC Work Packages

WP1: Standards for Sample Environment metadata in SECoP
(K. Kiefer, HZB)
WP2: Standards for storage of Sample Environment metadata
(T. Kracht, DESY)
WP3: Implementation into experimental control systems
(G. Brandl, FZJ)
WP4: Outreach, Dissemination & Training
(T. Herrmannsdörfer, HZDR)

PARTNERS

ISSE · HMC Helmholtz Metadata Collaboration · HZB Helmholtz Zentrum Berlin · DESY. · HZDR · JÜLICH Forschungszentrum · PAUL SCHERRER INSTITUT PSI · TECHNISCHE UNIVERSITÄT MÜNCHEN · EUROPEAN SPALLATION SOURCE

NEXT STEPS

- Further develop SECoP standard, libraries and programming frameworks
- Publish SECoP SEC-Node structures for standard applications as examples (on GitHub, including metdata definitions)
- Develop the mapping SECoP to Nexus for metadata and data
- Integrate SECoP in different experimental control systems (e.g. BlueSky, Tango,…)

INTERESTED?

- Contact the SECoP working group
- Get started with SECoP