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yaq - Yet Another Acquisition

A modular approach to spectroscopy software and instrumentation

Kyle F. Sunden

University of Wisconsin–Madison

2022-10-10



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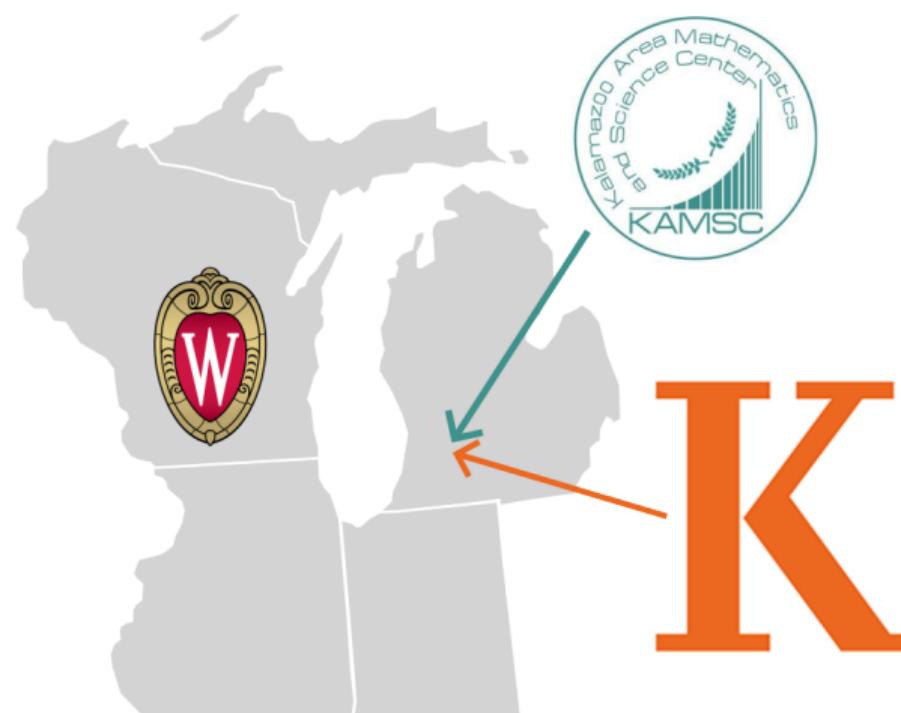
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matplotlib



Coherent Multidimensional Spectroscopy (CMDS)

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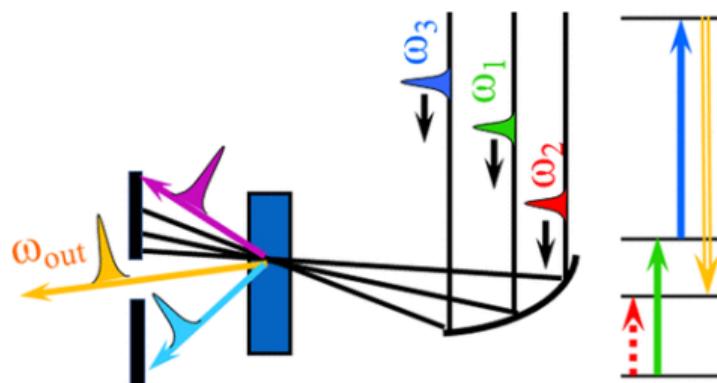
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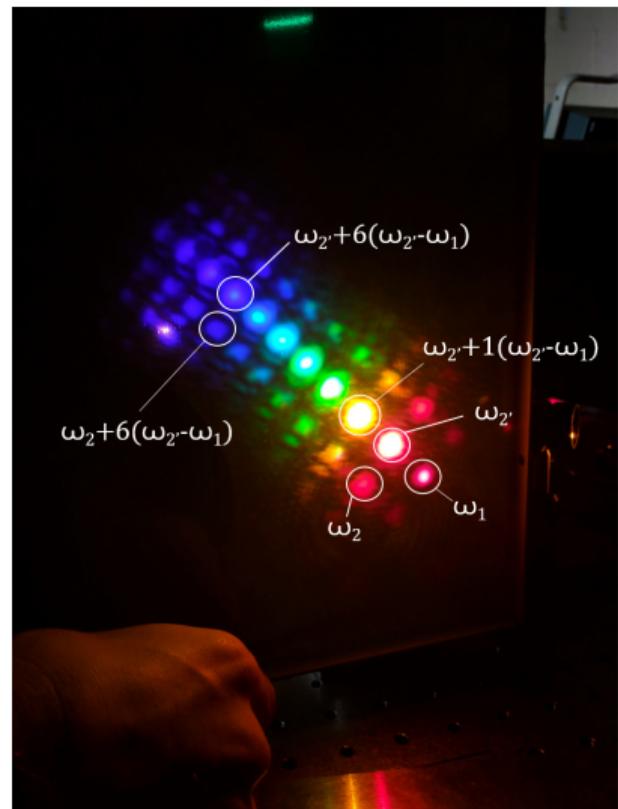
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Source:

[10.1021/acs.analchem.0c01662](https://doi.org/10.1021/acs.analchem.0c01662)



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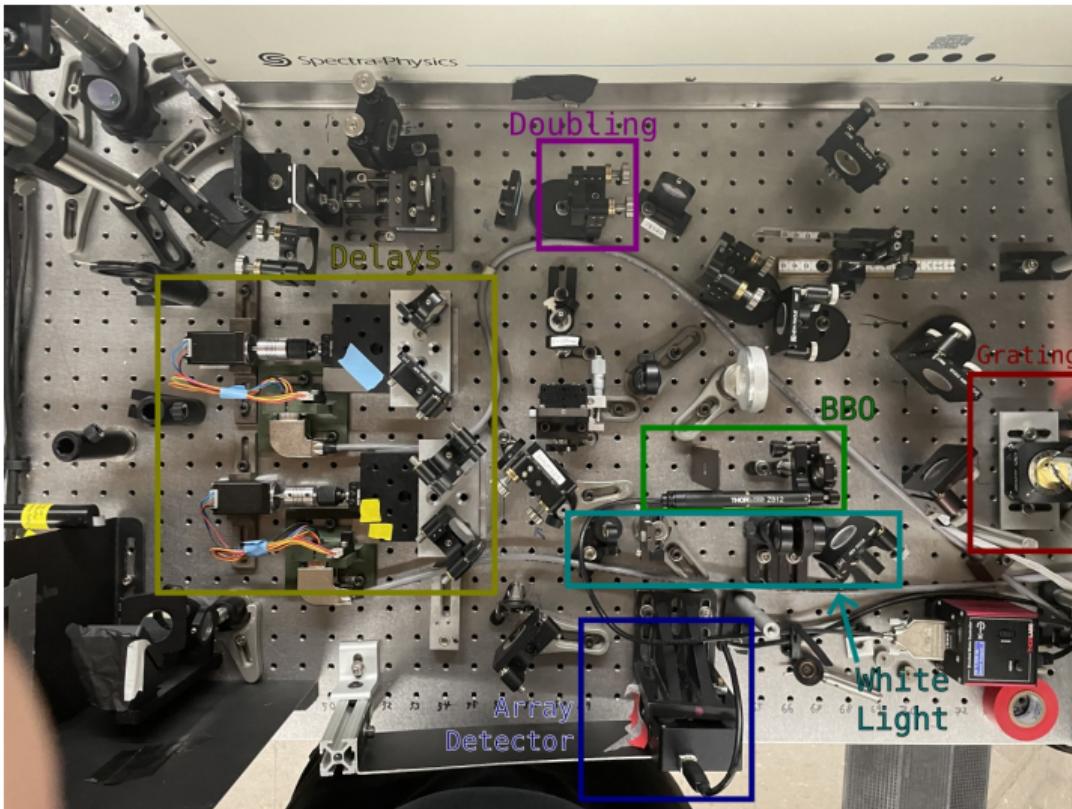
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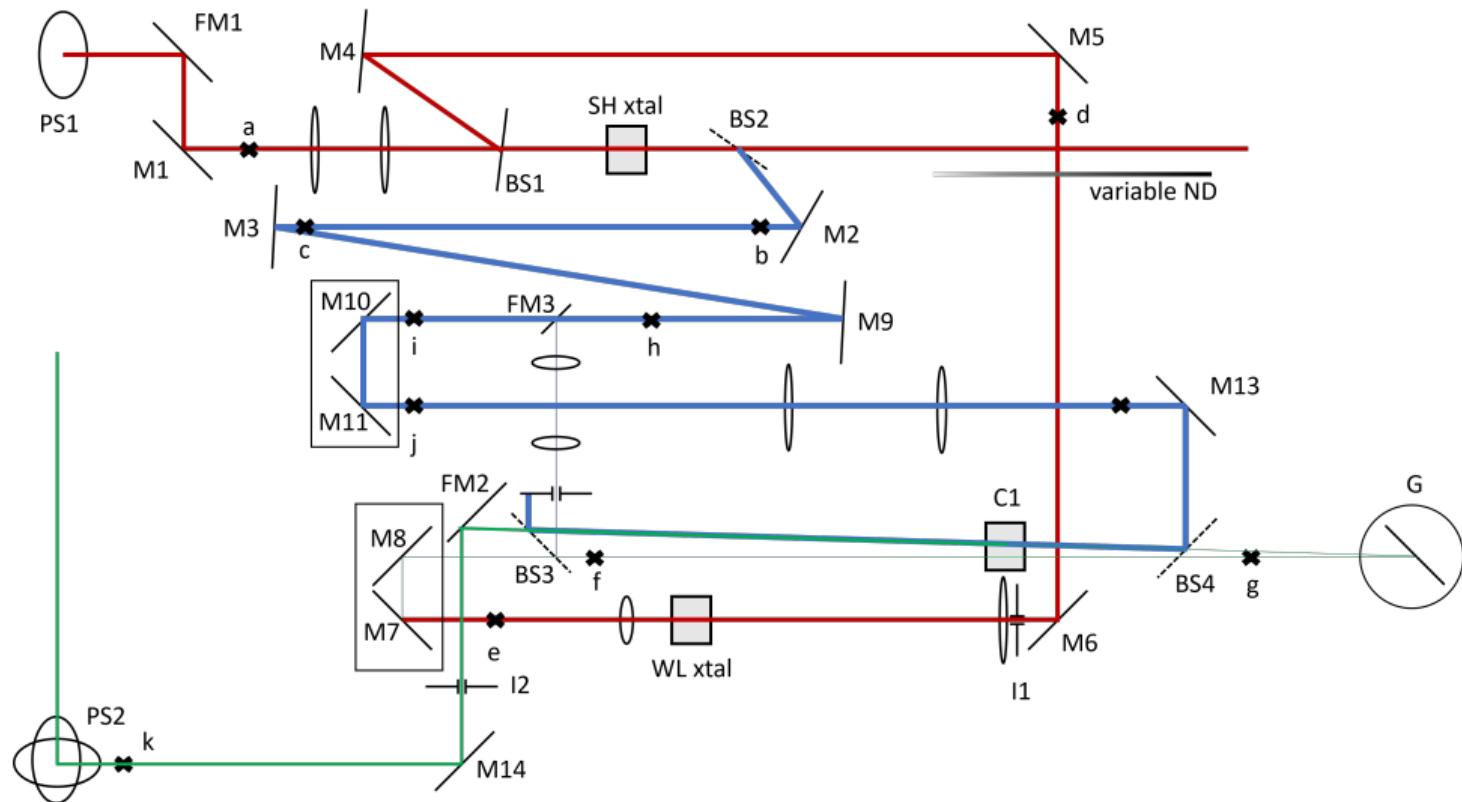
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A single application which does:

- ▶ Direct hardware communication
- ▶ Engineering tasks to prepare for experiments
- ▶ Experimental orchestration
- ▶ Graphical User Interface
- ▶ Data recording
- ▶ Data work-up



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Problems:

- ▶ Systems are tightly coupled
- ▶ All hardware “speak” different “languages”
- ▶ Adding or changing hardware is arduous
- ▶ Often limited to one instrument/experiment
- ▶ Bugs unrelated to measurement cause measurement to stop

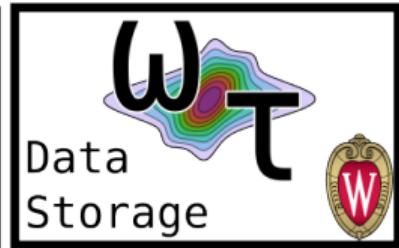


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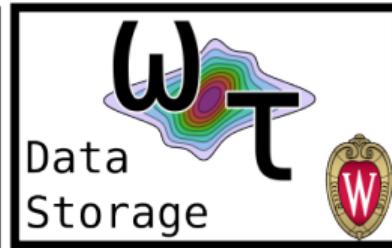
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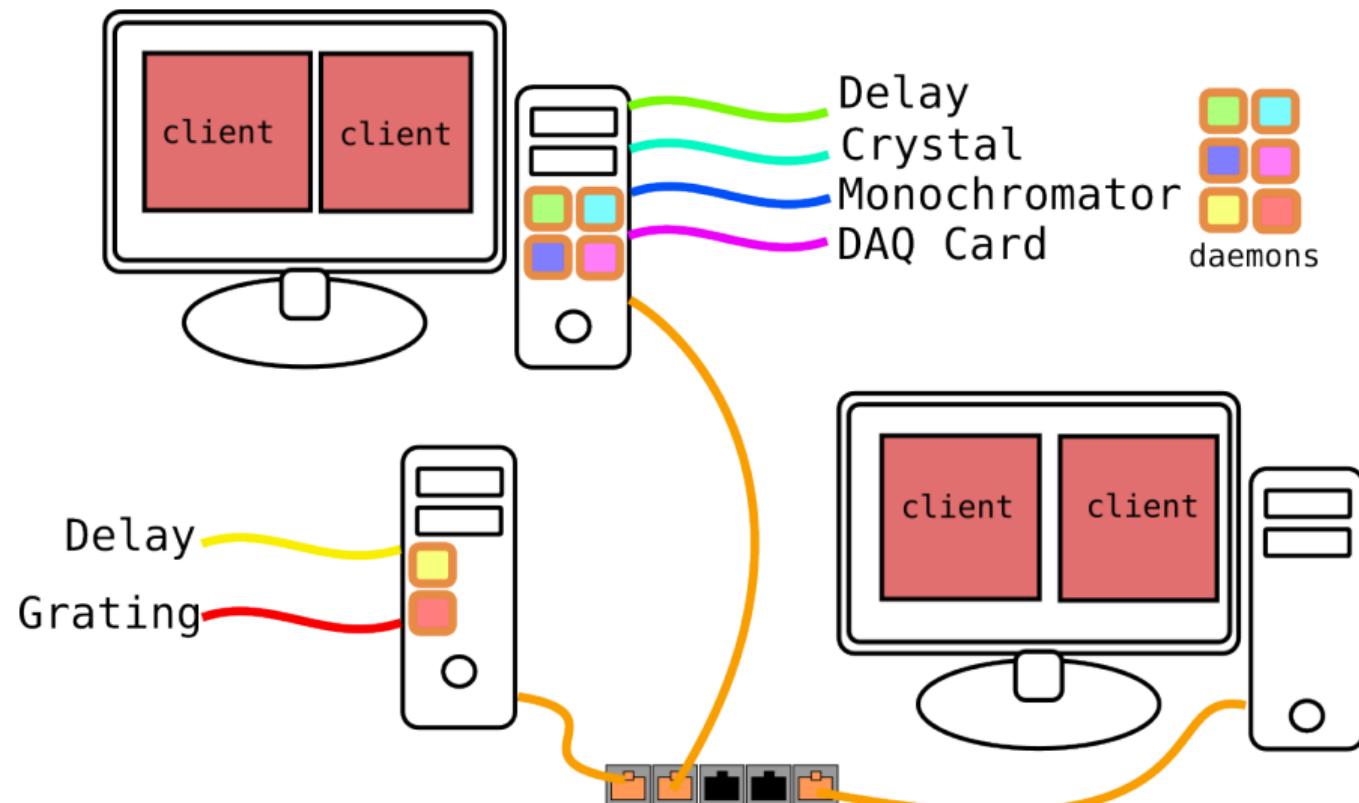
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Daemon: small background application which performs a single task

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Each yaq daemon provides a protocol:

- ▶ Self Describing
- ▶ Built on Apache Avro Remote Procedure Call
- ▶ Shared Traits for similar functionality



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We provide a generic client written for Python: yaqc

yaqc dynamically generates python methods from the protocol

Simple Python scripts are an easy entry to using yaq



Modular Approach: yaqc-qtpy

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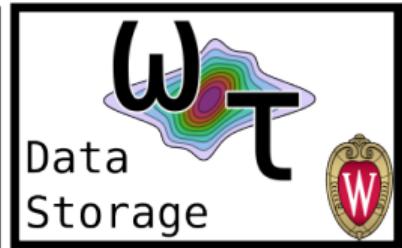
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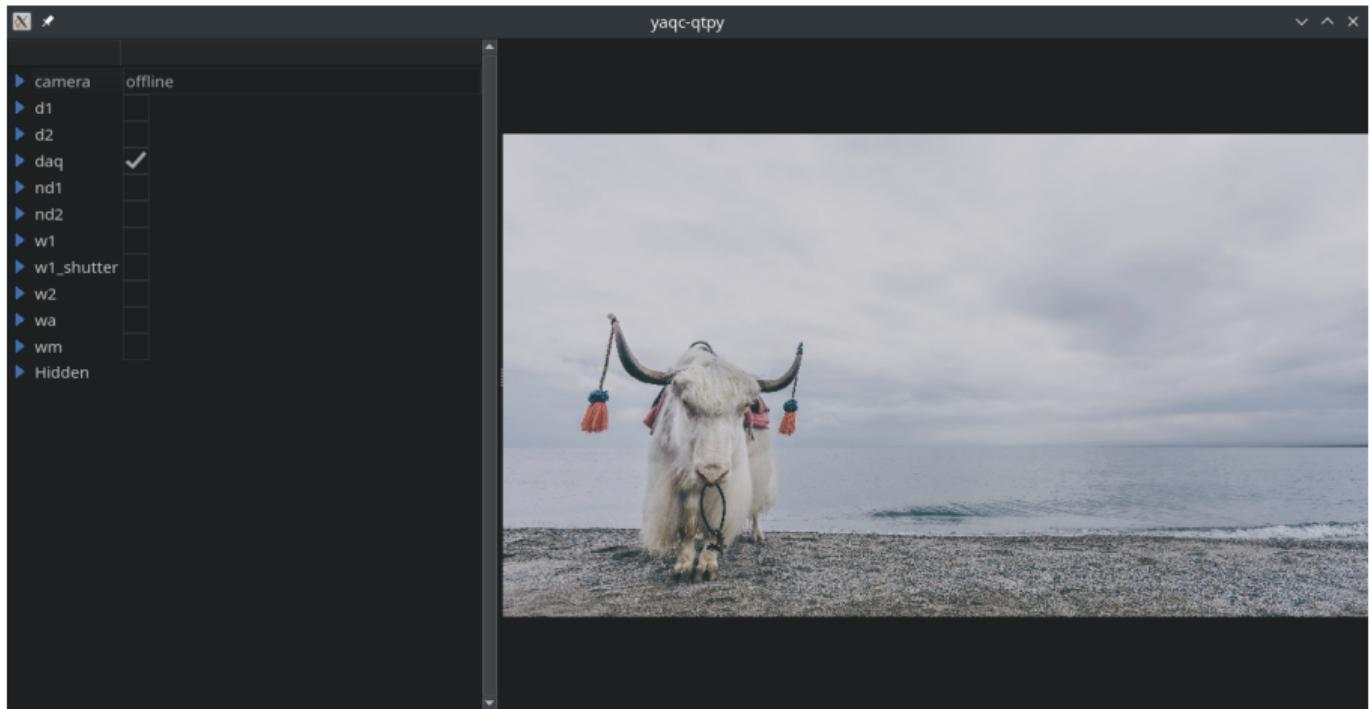
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The screenshot shows a sidebar interface for managing acquisition parameters. On the left, a tree view lists components: camera, d1, d2, and daq. Under d1, there are three sub-components: host:port, destination, and position. Under daq, there is one sub-component: host:port. To the right of the tree view, there are two sections for d1 and daq, each containing input fields and dropdown menus. The d1 section has fields for host:port (127.0.0.1:38401), destination (10.000000), and position (10.000000). The daq section has a host:port field (127.0.0.1:38999). Each section includes a "view advanced menu" button at the bottom.

Component	Sub-Component	Value	Unit
d1	host:port	127.0.0.1:38401	
	destination	10.000000	ps
	position	10.000000	ps
daq	host:port	127.0.0.1:38999	

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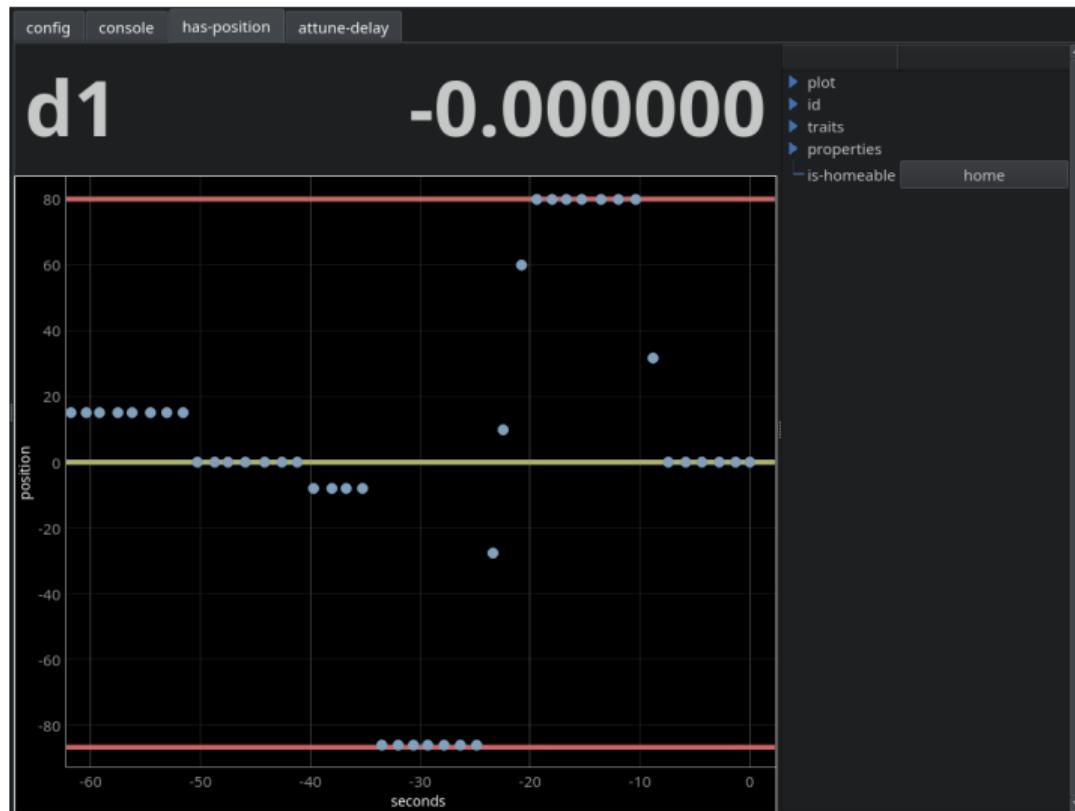
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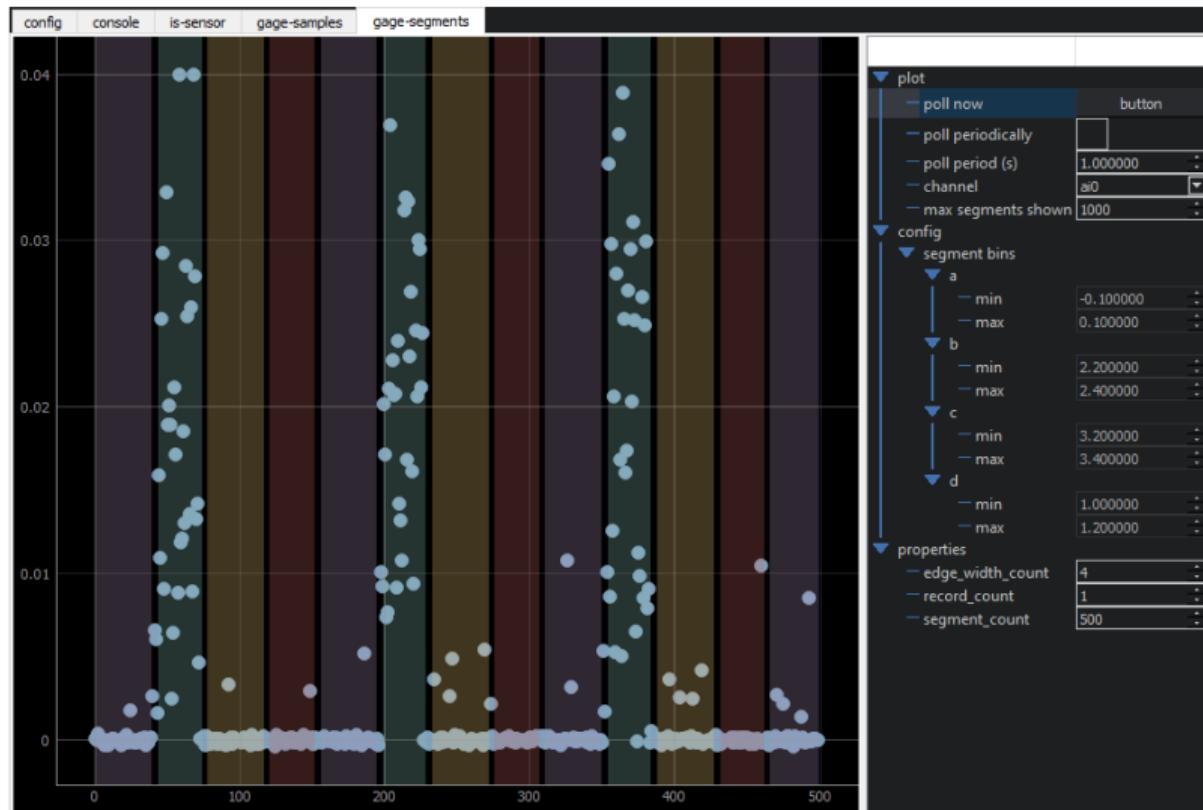
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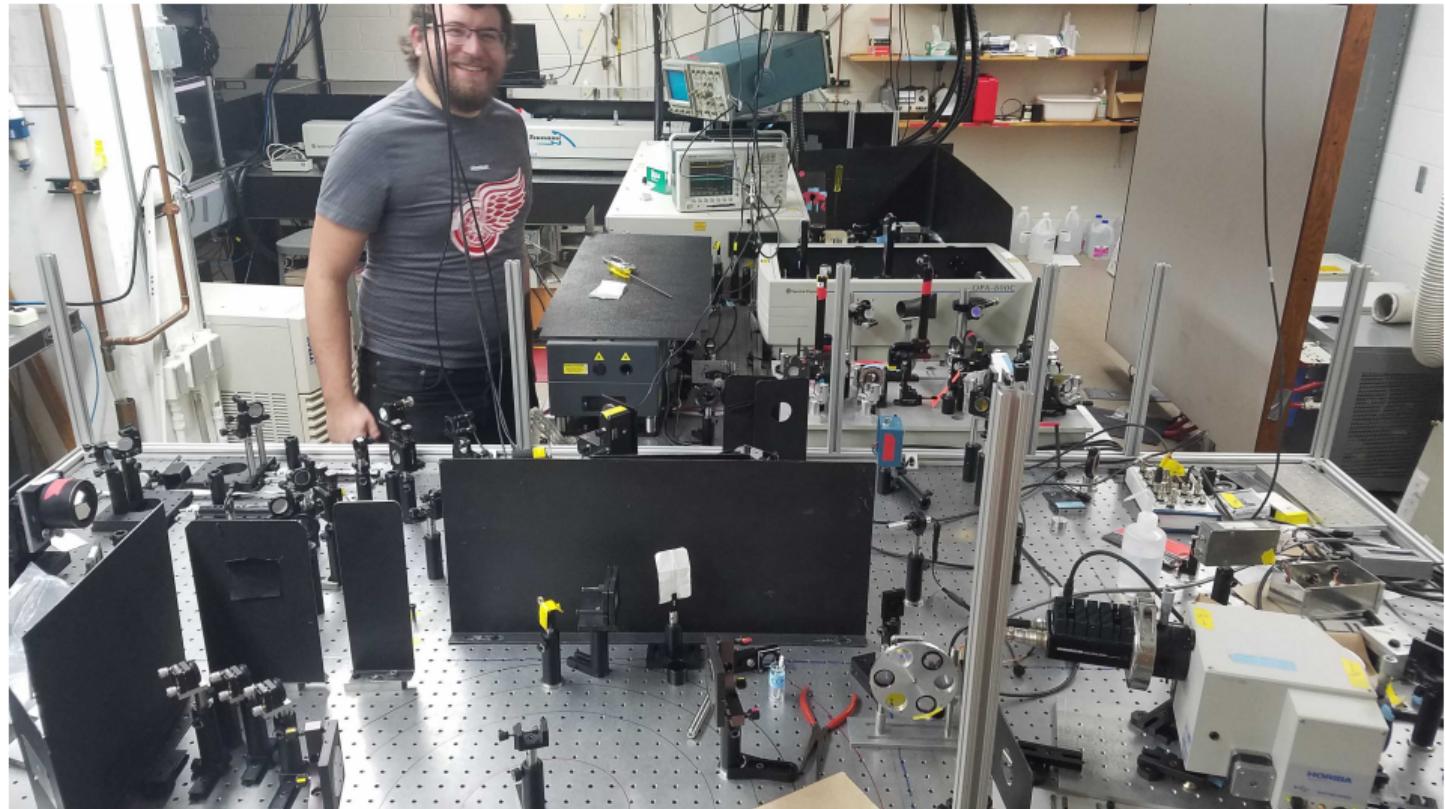
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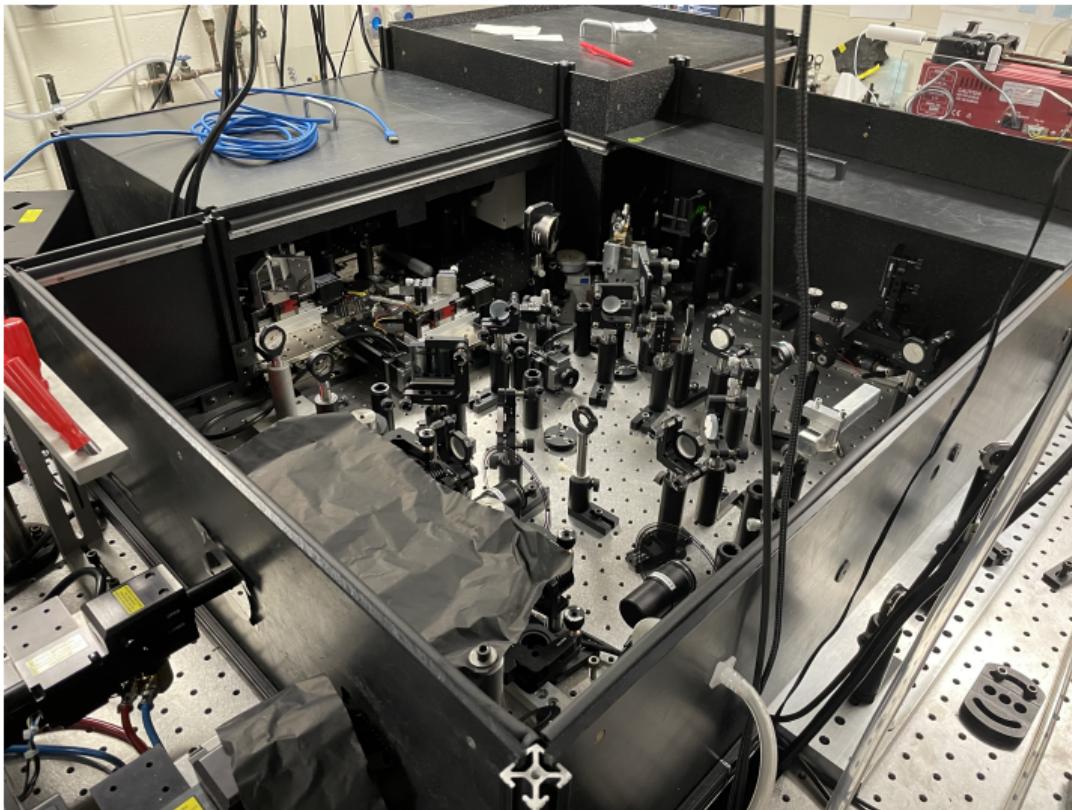
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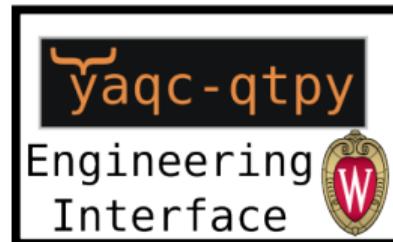
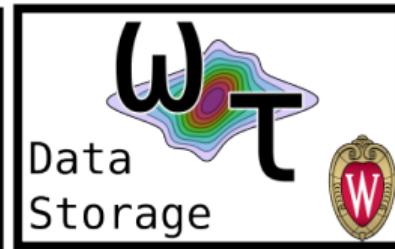
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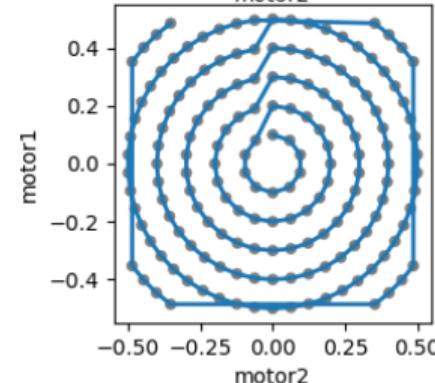
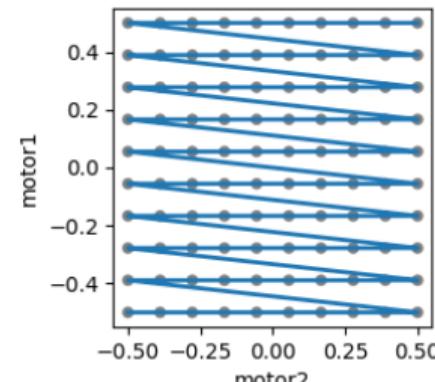
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Steps for collecting a single point:

- ▶ set motors to correct positions
- ▶ wait for motion to complete
- ▶ trigger reading of sensors
- ▶ wait for sensors complete measurement
- ▶ read sensors and motors
- ▶ save data



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Translate yaq into something that Bluesky can use.

bluesky / yaqc-bluesky (Public)

Code Issues 9 Pull requests 1 Discussions Actions Wiki Security Insights

master 1 branch 10 tags Go to file Add file Code

untag update which versions of python blu... 9a25ea6 9 days ago 145 commits

.github/workflows update which versions of python bluesky-git i... 9 days ago

binder refactor with one class per trait (#12) 2 years ago

tests Fixes for cameras and mappings (#77) 6 months ago

yaqc_bluesky stop forcing measure at sensor connect time ... 3 months ago

.gitignore Commit from cookiecutter 3 years ago

.pre-commit-config.y... no busy in read (#52) 2 years ago

CHANGELOG.md stop forcing measure at sensor connect time ... 3 months ago

LICENSE flit (#16) 2 years ago

README.md v2021.1.0 2 years ago

bluesky_protocols.nv test against bluesky protocols 14 months ago

About

A bluesky interface to the yaq instrument control framework.

yaq.fyi/

bluesky yaq

Readme

BSD-3-Clause license

6 stars

3 watching

3 forks

Releases 9

2022.4.1 (Latest) on Apr 26

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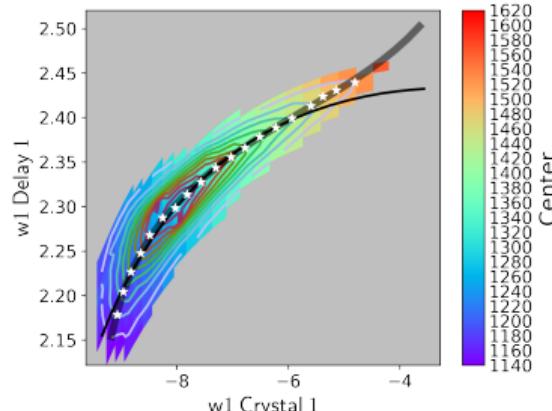
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- ▶ Versions of built-in plans
 - ▶ Units support
 - ▶ “Constants”
- ▶ Plans for performing tuning operations



Modular Approach: WrightTools

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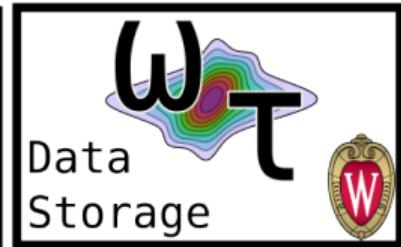
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bluesky / bluesky-queueserver Public Edit Pins Unwatch 6 Fork 16 Starred 7

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main 1 branch 17 tags Go to file Add file Code

dmgav REL: v0.0.17 ✓ b074de3 7 days ago 1,489 commits

.github yml formating 17 days ago

bluesky_queueserver TST: generate new list of plans and devices 13 days ago

docs DOC: add missing 'executing_task' manager ... 7 days ago

.codecov.yml INT: run cookiecutter 3 years ago

.coveragerc CI: don't include tests and docs in coverage 2 years ago

.flake8 ENH: removed code for HTTP server 14 months ago

.gitattributes INT: run cookiecutter 3 years ago

.gitignore Add http server tests (4 for now) 2 years ago

AUTHORS.rst Fix Labraroty; sync LICENSE with bluesky/bl... 2 years ago

CONTRIBUTING.rst Update linting command in CONTRIBUTING.rst 2 years ago

LICENSE DOC: installation instructions 16 months ago

About

Server for queueing plans

[blueskyproject.io/bluesky-queueserver/](#)

hacktoberfest bluesky bluesky-queueserver bluesky-webclient hacktoberfest2021

Readme BSD-3-Clause license

7 stars 6 watching 16 forks

Releases

Release v0.0.17 Latest 7 days ago

Modular Approach: Experimental GUI

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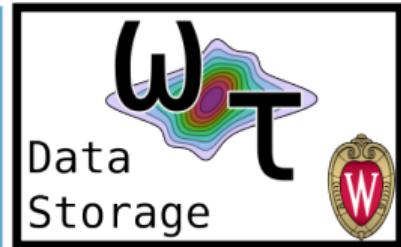
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bluesky-cmds 2022.7.0+fix_issues_39_40

00:05:55

Index	Type	Status	Description	REMOVE	LOAD
2	run_intensity	queued	[[{"daq": "w1", "delay_2": 3.0, "npts": 31, "spectrometer": {"device": "wm", "method": "static", "center": 200.0}}]		
1	run_intensity	queued	[[{"daq": "w1", "delay_2": 3.0, "npts": 31, "spectrometer": {"device": "wm", "method": "track"}}]		
0	run_intensity	queued	[[{"daq": "w1", "delay_2": 3.0, "npts": 31, "spectrometer": {"device": "wm", "method": "scan", "width": -350.0, "npts": 33}}]		
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	run_intensity	completed	[[{"daq": "w1", "crystal_1": 3.0, "npts": 31, "spectrometer": {"device": "wm", "method": "zero"}}]		
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	grid_scan_wp	completed	[[{"daq": "d0", "d0": -1.0, "d1": 0.61, "ps": "d2", "d2": -1.0, "ps": "d1", "d1": 0, "ps": "d0", "ps": "d1", "npts": 25}]]		
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	grid_scan_wp	completed	[[{"daq": "w1", "d0": -1.0, "d1": 0.11, "ps": "d2", "d2": 0, "ps": "d1", "d1": 0, "ps": "d0", "ps": "d1", "npts": 25}]]		
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	count	completed	[[{"daq": "w1"}]]		
	count	completed	[[{"daq": "w1"}]]		

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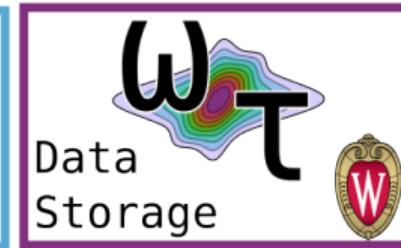
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- ▶ Kent Meyer
- ▶ Peter Cruz Parrilla
- ▶ Ryan McDonnell
- ▶ James Harris
- ▶ (and more...)

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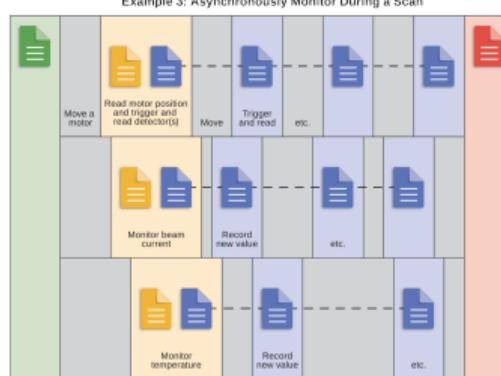
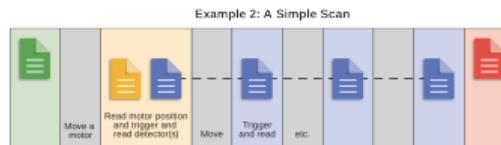
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Run Start: Metadata about this run, including everything we know in advance: time, type of experiment, sample info., etc.

Event Descriptor: Metadata about the readings in the event (units, precision, etc.) and the relevant hardware

Event: Readings and timestamps

Run Stop: Additional metadata known at the end: what time it completed and its exit status (success, aborted, failed)

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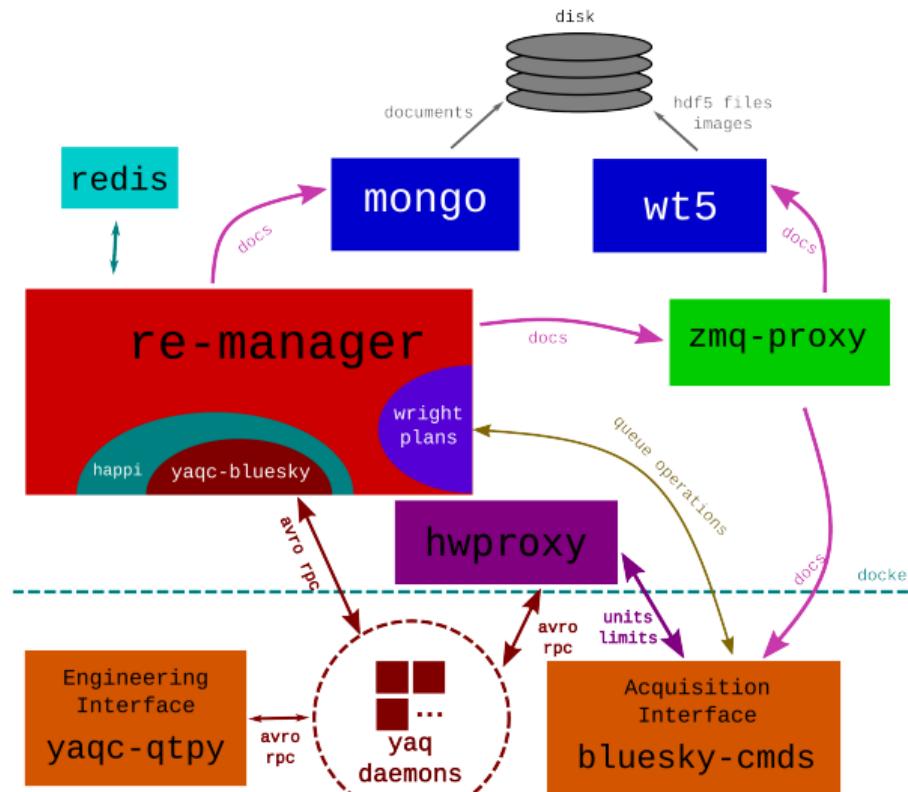
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