



# 1.08 Control/DAQ Status

Laura Newburgh

CMB-S4 Collaboration Meeting  
May 9-13, 2022

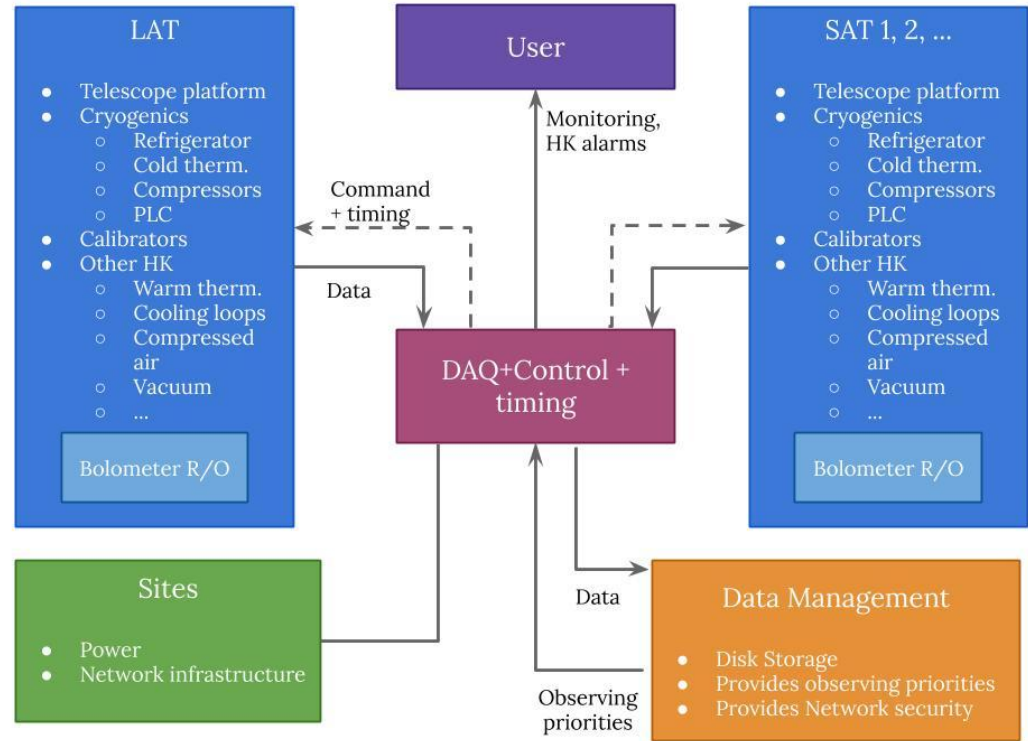


# Outline

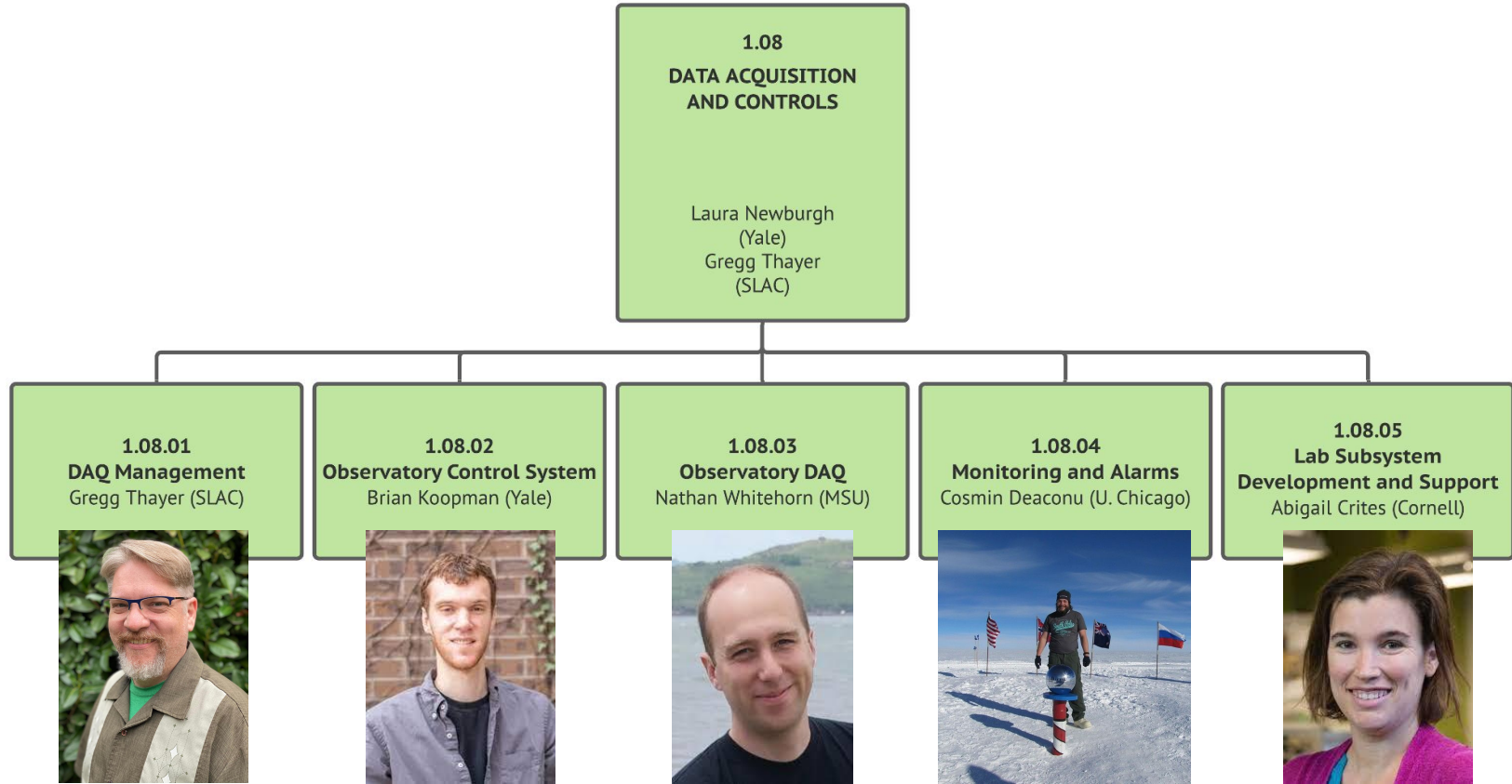
- Technical Highlights / Progress made in the last year
- Plans through FY22

# 1.08 Scope

- Acquire and aggregate high-speed data from detectors, slow data from housekeeping and meta-data into specified format, hand-off to data management
- Provide control framework for commanding equipment in the labs, and at the observatories
- Browser-based live and historical monitoring of 'housekeeping' data and meta-data
- Hierarchical, **non-safety** alarms system based on housekeeping data
- Provide observatory-wide timing and frequency references to readout and telescope control hardware
- Provide support for running DAQ and Controls systems in development labs



# 1.08 DAQ/Control Team



## 1.08.02 (Controls) Progress [Brian Koopman]

- Broad array of hardware agents available as a result of upcoming Simons deployment, most developed by non-DAQ experts:
  - Cryomech, Lakeshore (240, 336, 370, 372, 425), Bluefors, LabJack, Power supply, Agilent RF source, FTS, Meinberg M1000, Pfeiffer pressure gauges and turbo controller, function generator, Synaccess netbooter
- Broad array of hardware agents soon to be available as a result of upcoming Simons deployment:
  - HWP, chopper, wiregrid, holography, oscilloscope, RF source, LN2 monitor, iBootbar, UPS, flowmeter, Honeywell HMR2300 magnetometer
- Setting up to perform full end-to-end test, testing from realistic looking observing schedules with emulators for telescope+Smurfs+faked agents to data hand off to DM
  - Includes scheduling interface, OCS Agents, OCS Client library, data packaging
- Working to expand test coverage for hardware agents, facilitated by pytest device emulator fixture

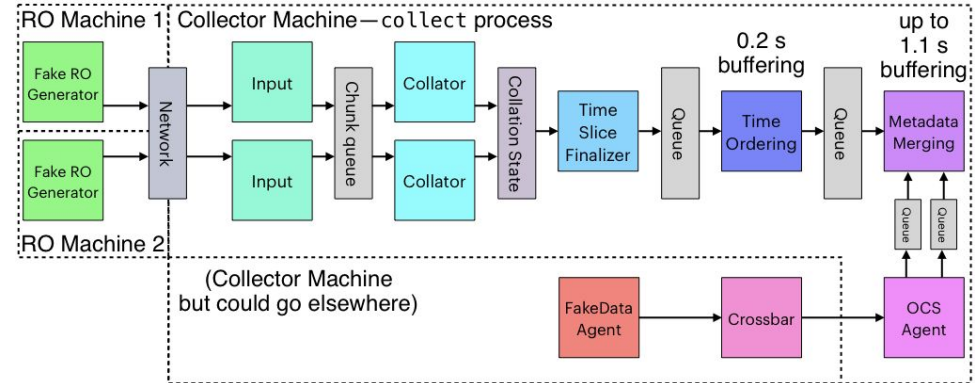
# 1.08.03 (Acquisition) Progress [Nathan Whitehorn]

- High-speed data collector prototype:
  - Accepts readout data via UDP from multiple readout machines
    - Currently, mock-up fake data generators due to lack of real equipment/specifications
  - Collates samples into coherent time slices which are output in time order
  - Can merge metadata published over crossbar/OCS by other DAQ components
  - **Operation demonstrated for 150,000 simulated detector channels read out at 400+ Hz**
  - Total latency depends on frequency of required metadata streams being published, but can be on the order of a few seconds

## Test Output (320 Hz)

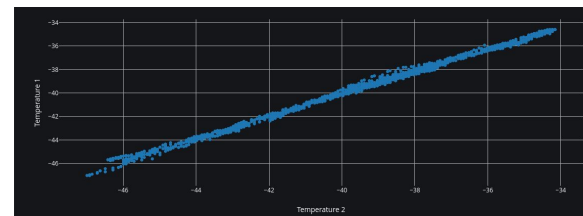
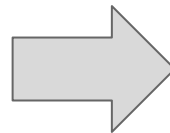
5785733 chunks received with 22603 syscalls  
Spent 58.7333 seconds receiving, 2.06992 seconds on other work  
5738129 chunks received with 22418 syscalls  
Spent 58.7323 seconds receiving, 2.07103 seconds on other work  
5753423 chunks received with 22477 syscalls  
Spent 58.7307 seconds receiving, 2.08458 seconds on other work  
5762715 chunks received with 22512 syscalls  
Spent 58.7492 seconds receiving, 2.06613 seconds on other work  
Acknowledged 23040000 packets using 45618 packets  
Processed 11588520 chunks in 181234 batches with 416834 insert calls  
Processed 11451480 chunks in 179094 batches with 412730 insert calls  
Time ordering processed 19200 slices and discarded 0 which were too late  
Total slice processing latency (s): 50%: 0.5051, 90%: 0.5092, 99%: 0.5101, max: 0.5141  
23040000 chunks collated  
Formed 19200 complete slices  
Made 17239 finalization sweeps

## Test Setup Schematic

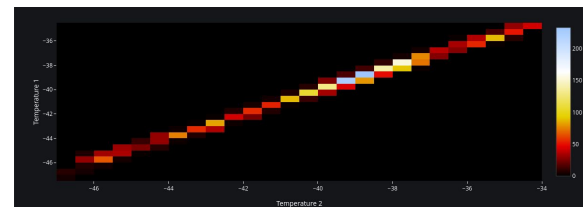


## 1.08.04 (Monitoring) Progress [Cosmin Deaconu]

- “Interposcatter” - interactively plot time-dependent variables against each other
  - Grafana, the selected housekeeping monitoring solution, mostly supports time series.
  - Proof-of-concept Grafana plugin implemented, supporting scatter plots and histograms
  - Boring example (two temperatures):



or



- Experimental support for JSON output for .g3 Frames
  - Uses same serialization framework as binary files, so supports any type of data
  - Eventual goal is to facilitate web-monitoring of non-housekeeping-like data

## 1.08.05 (Labs and Integration) Progress [Abby]

- 'Newly' appointed L3 : main job is to ensure the software works in the labs, and thus to ensure smooth transition to operations.
- Also includes development of software for reading in data (to be coordinated with DM)
- AND ALSO lots of unglamorous but essential tasks like documentation, training, feedback, agent status tracking, repository cat-herding
  - Currently working on lab installation at Cornell as a test case
  - Defining training and documentation tasks



# Plans for 2022

- Finish each 'end' of the fast-cadence data
  - frame definition in
  - file format definition out (for both fast cadence data and housekeeping data)
- SO repo is undergoing some re-structuring to make it easier to work across SO-S4
- Once file format is established, develop data access software