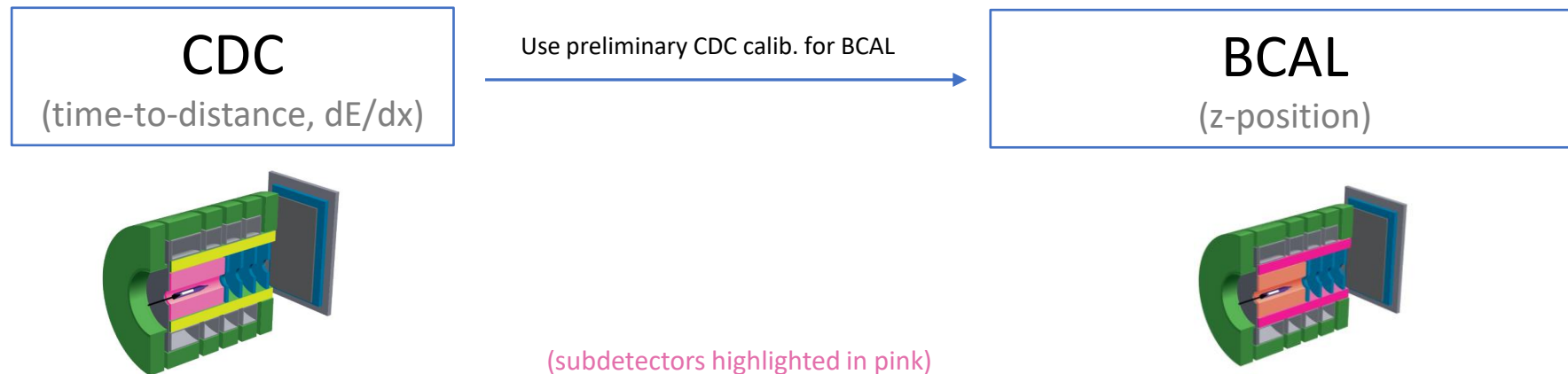# Jon Zarling

Calibration Workflows with Cylc

10/8/2024

Calibration Motivation

- Often, calibrations need to be done sequentially

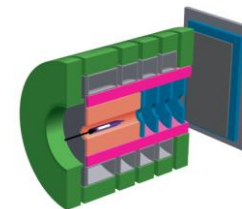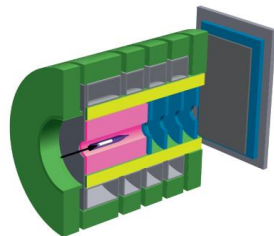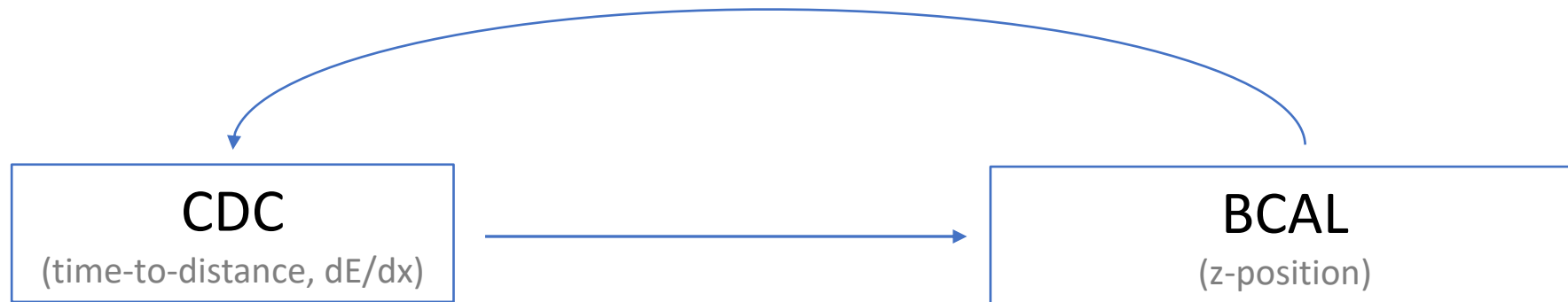- Simple example: tracking → EM calorimeters @ Hall D

CDC
(time-to-distance, dE/dx)

Use preliminary CDC calib. for BCAL

BCAL
(z-position)

(subdetectors highlighted in pink)

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Calibration Motivation

Will iterating over multiple subsystems improve calibrations?

Global Calibration Loop
(NEW!)

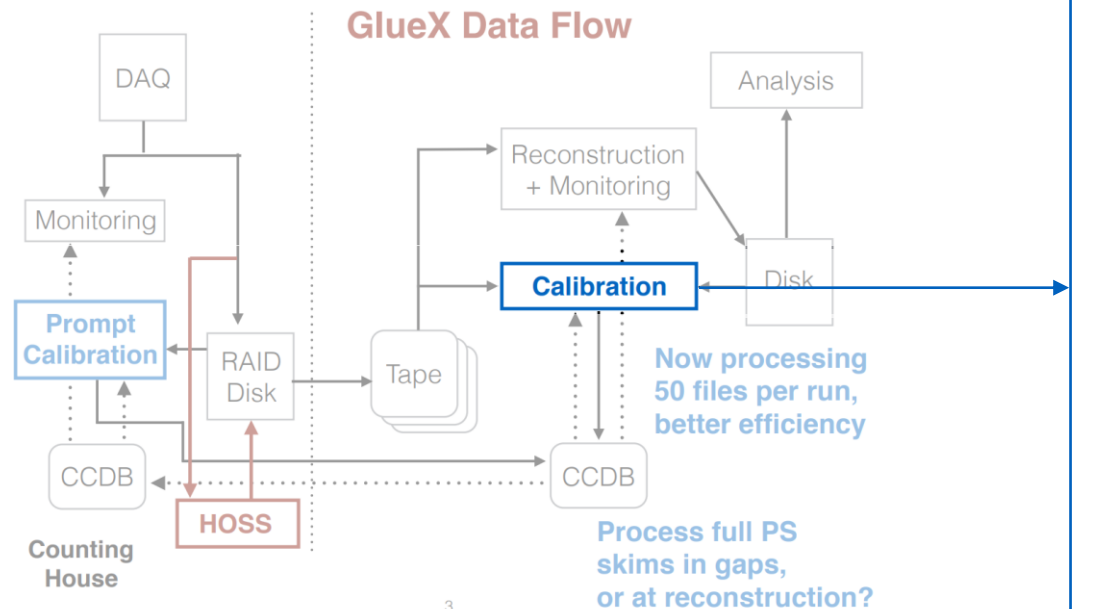| CDC	BCAL
(time-to-distance, dE/dx)	(z-position)

(subdetectors highlighted in pink)

Calibration Motivation, cont.

Usually situation is more complex.
Motivation to use cylc (pronounced "silk")

GlueX Data Flow

Now processing 50 files per run, better efficiency

Process full PS skims in gaps, or at reconstruction?

Run-dependent Calibrations

Calibration	Person
Overall Timing (first pass)	Sean Dobbs
Overall Timing (post-ST updates)	Sean Dobbs
CDC wire gains	Naomi Jarvis
CDC overall gains	Naomi Jarvis
CDC dE/dx	Naomi Jarvis
CDC time-to-distance	Naomi Jarvis
PS/PSC Timing	Olga Cortes
TAGH timewalks	Olga Cortes
TAGM timewalks	Sean Dobbs/Richard Jones
TOF	Beni Zihlmann
DIRC	Justin Stevens

Overall Calibrations

Calibration	Person	Status
BCAL channel timing	Mark Dalton	
BCAL attenuation length/gain ratio	Mark Dalton	
BCAL z-position	Mark Dalton	
BCAL gains/non-linearities	Karthik Suresh	
FCAL gains/non-linearities	Colin Gleason	
FCAL timing	Colin Gleason	
SC Timewalks	Rupesh Dotel	Done
SC Propagation Time	Rupesh Dotel	

Case Study: CDC Time-to-Distance (TTOD)
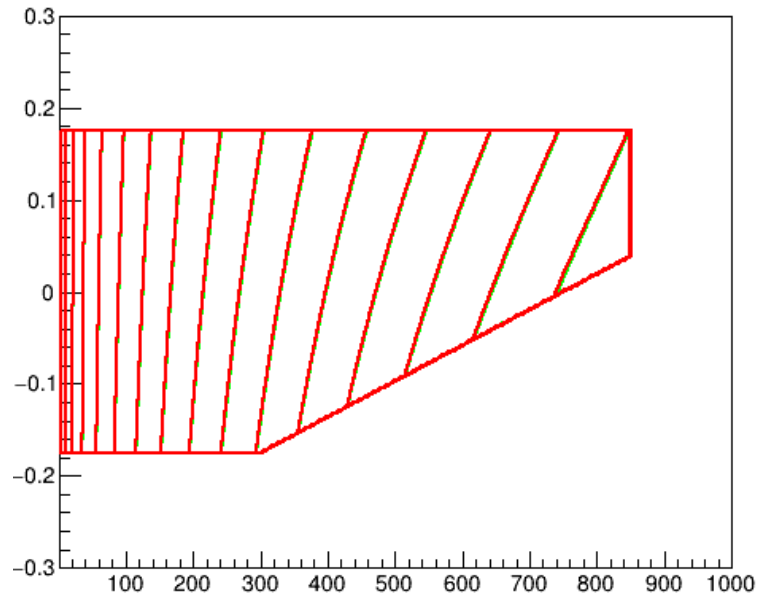
Sometimes procedure need to iterate/converge, too

Converged when red totally lies on top of green

Red: 0th iteration (pre-calib)
Green: 1st iteration

Red: 1st iteration
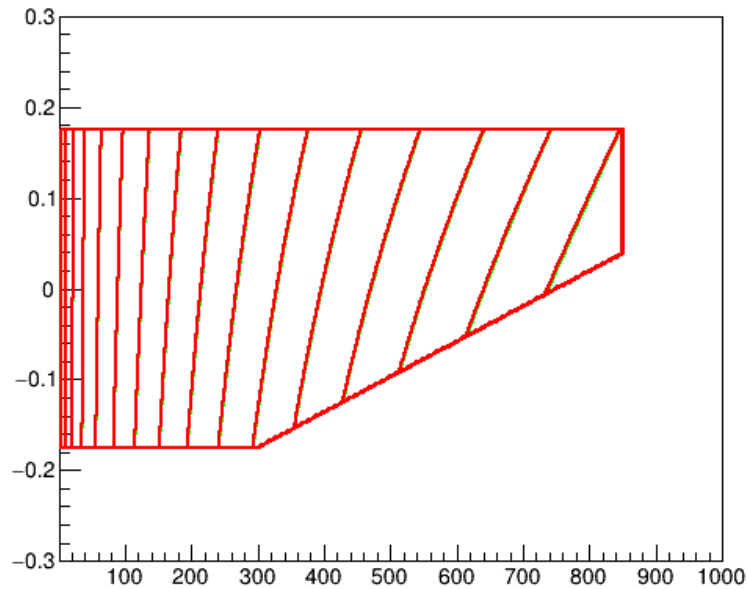Green: 2nd iteration
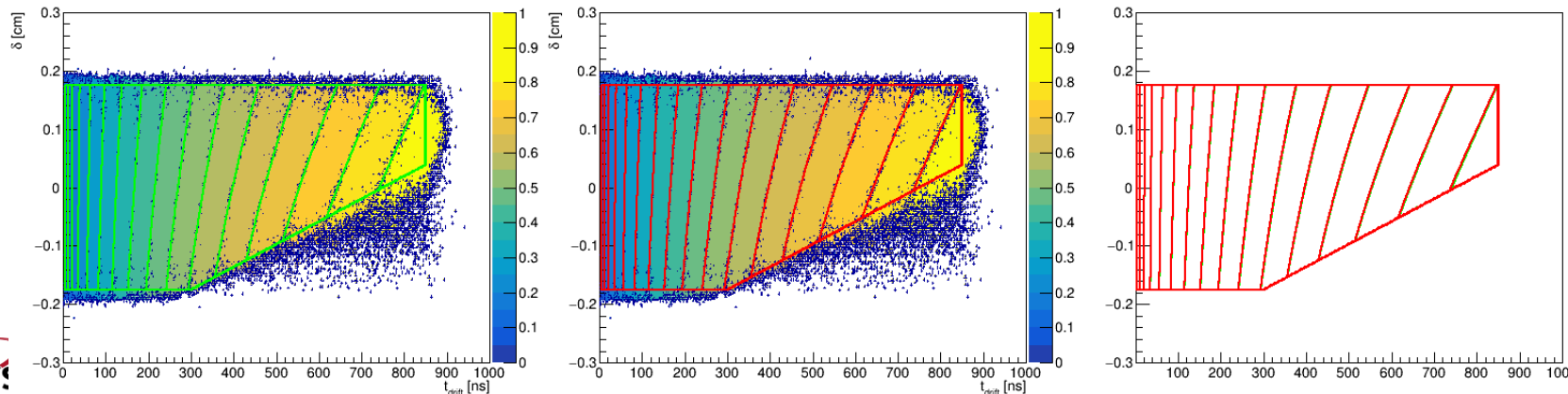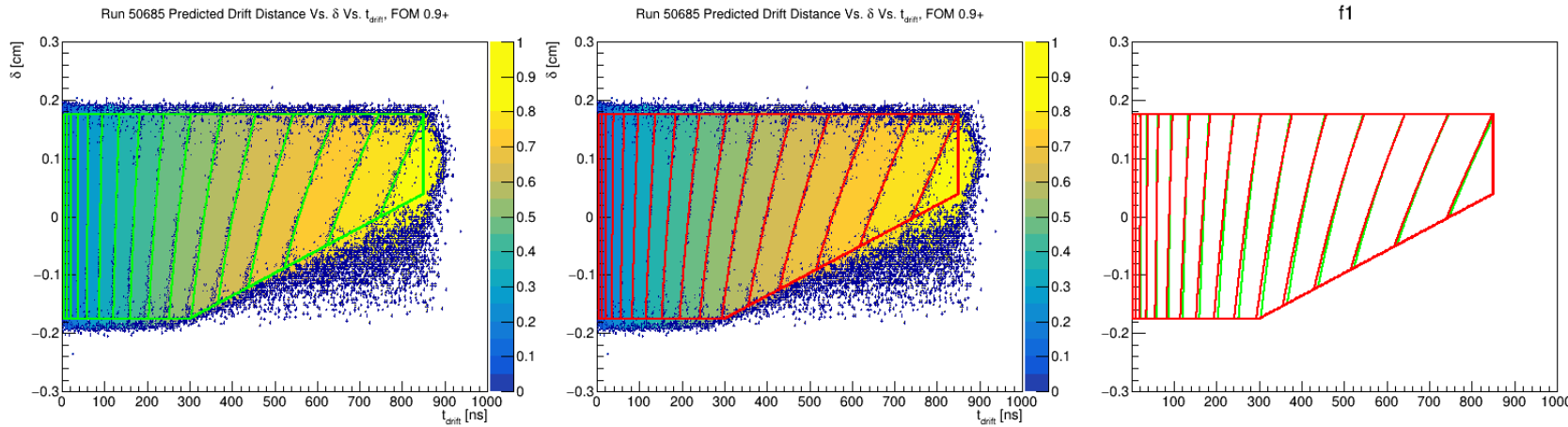
Case Study: CDC Time-to-Distance (TTOD)

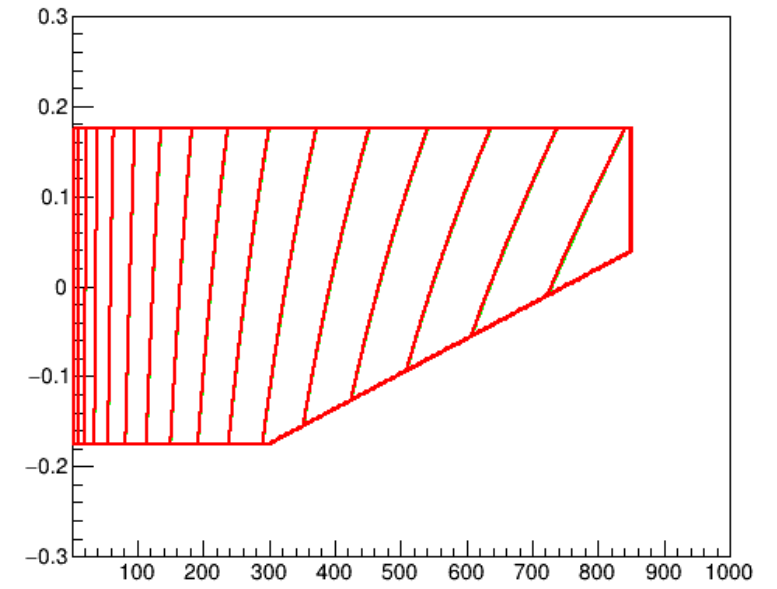Here: converged when red totally lies on top of green

Red: 1st iteration
Green: 2nd iteration

Red: 2nd iteration
Green: 3rd iteration

Red: 7th iteration
Green: 8th iteration

Resolution reduced by ~ 7%
(1st to 8th iteration)
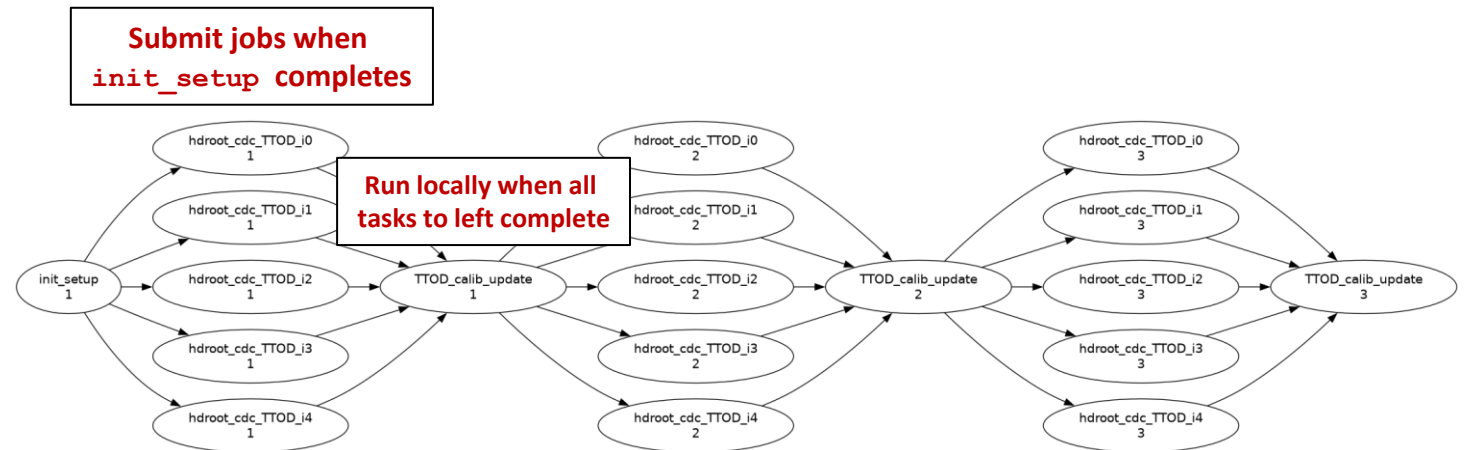
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Calibration Workflows with cylc

(pronounced "silk")

Punchline: I did all this from a single terminal command!

```
> cylc vip gx_ttod
```

Workflows can be written as [graphs]

- Runs 20 jobs per iteration

- Then repeat ×8 iterations

- Read/write ccdb (local copy)

- Automatically resubmits failed jobs
  (but only if I asked it to)

Submit jobs when `init_setup` completes

Run locally when all tasks to left complete

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(developed, primarily used for weather & climate science)

Calibration Workflows with cylc

Terminal interface (interactive!):

```
> cylc tui
```


Mouse click in terminal to expand

Compare to swif2

(also has cool GUI version)

Maybe One Day?

An online dashboard for calibrations in process

- Multiple users can access, monitor, modify, etc.

- Different users can have different privilege levels
  - Person A: global control
  - Person B: can start/stop/modify jobs related to their subdetector
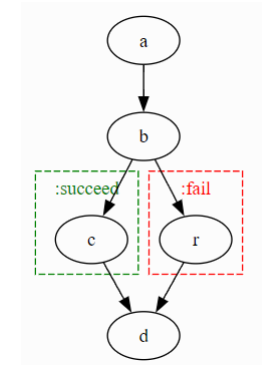 - Person C: can look at monitoring plots
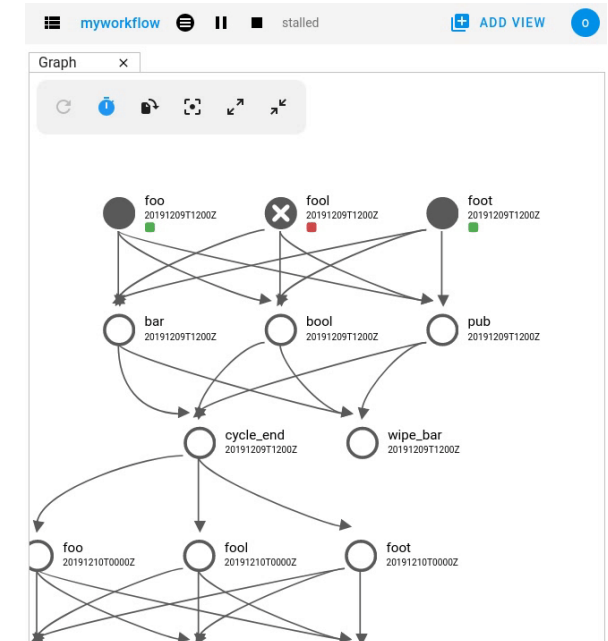
Further inspiration

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Other Nifty Features

- Supports job submission to remote machines

- Workflows can support:
  o Trigger startup: on regular clock cycle
  o Trigger startup: on file appearance
  o Branching logic
  o Workflows nested in other workflows

- Local database to store/query workflow info maintained

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Summary

- Cylc seems like a great multipurpose tool https://cylc.github.io/
  - Functionality of swif2 (+more)

- Here: use for calibration workflows
  - A few more details here:

- Potential for other use cases
  - MCWrapper offloading from OSG?
  - Hydra?

- Plan to put examples on wiki, github
  - Let me know if there's interest in starting sooner

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Backup: Full Workflow Graph