Streaming calibiration discussion

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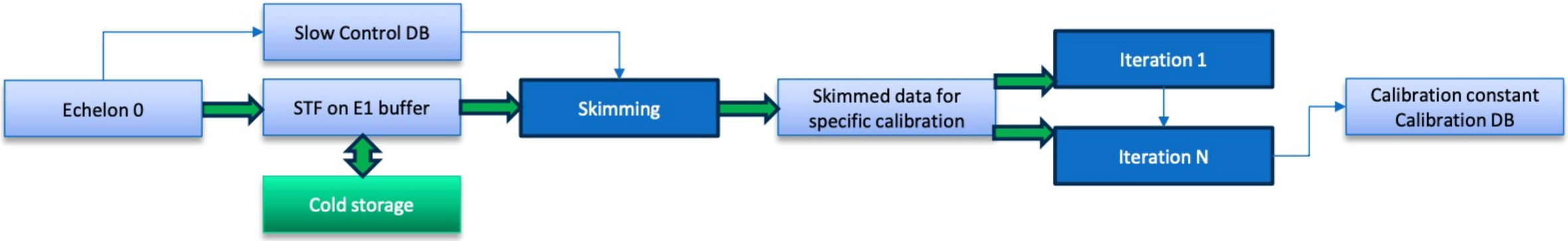
Moving steps for integration

- From Jin's notes:
  - A set of calibration would only initiate if QA identify a calibration drift
    - Calibration workflow starts with automated/shifter-driven QA check flagging issue
  - Another set of calibration would process ALL data
    - Example is calorimeter EM energy scale calibration which will use all pi0 and eta0 resonance data
    - Calibration workflow starts with arrival of super time frame (STF)



Workflow

From Carlos (SRO meeting October 28 (2025))

1) Add calibration module

Create a new module (e.g., EEEMCalCalibration) to load calibration constants (gain, offset, non-linearity) from a file

2) Integration into simulation chain

- In the processing script, include the calibration step between the hit formation and final energy reconstruction.
- Ensure the calibration constants are versioned and selectable (e.g., via configuration tag) so one can rerun with updated constants.

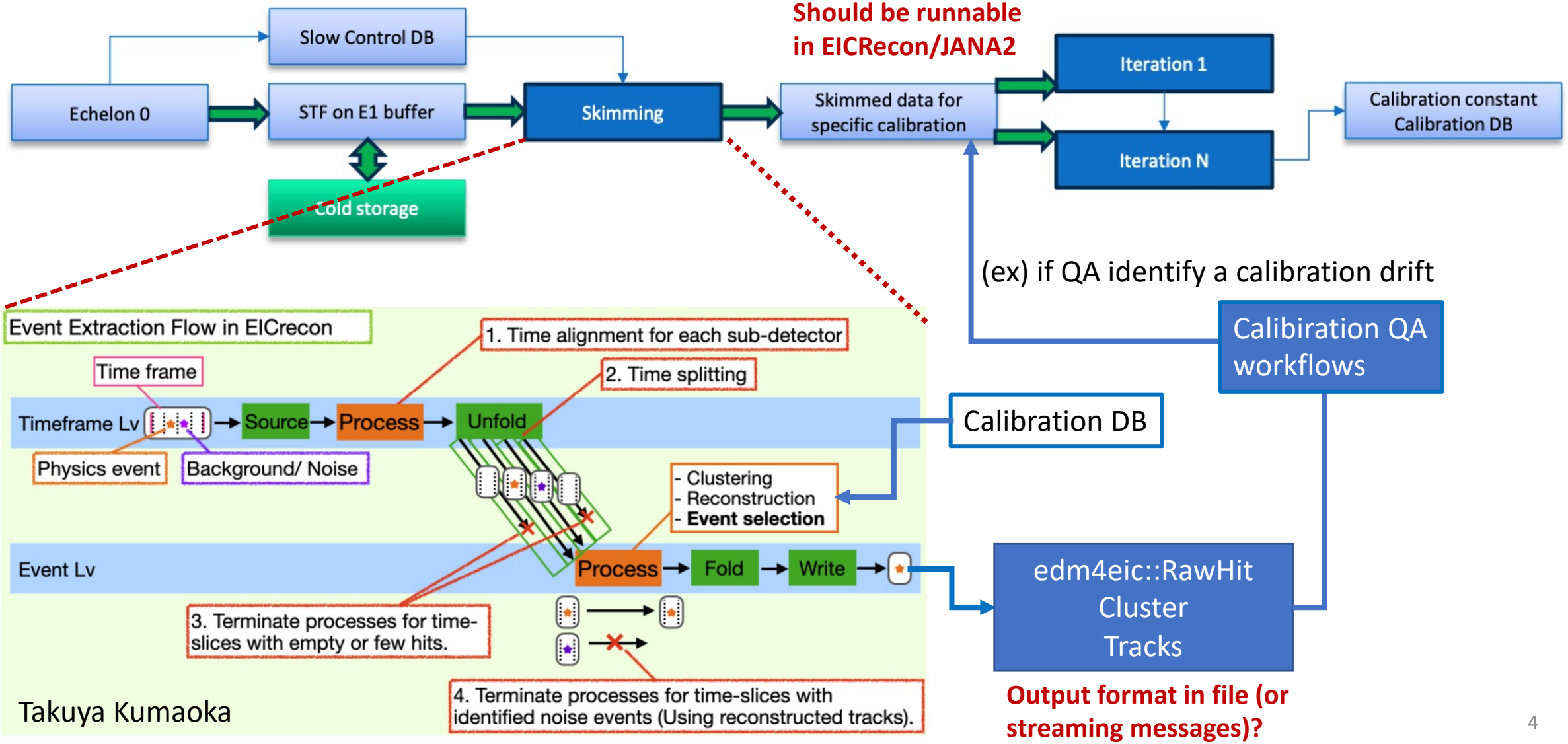
3)Validation & iteration

- Run simulation of full physics sample with calibration constants applied and compare reconstructed energy spectra vs truth.
- Iterate on constants (refine gain map, check non-uniformities) until performance is optimal

4) Deployment

- Save the final calibration constants into the simulation configuration folder (e.g., configurations/calibrations/EEEMCal/) and document the version, date, and method.
- Update the simulation workflow so that future physics runs use the latest calibration by default.

Moving steps for integration?



Takuya Kumaoka

backup

Alignment and Calibrations

- See Marco's slides at the workfest
  - https://indico.jlab.org/event/934/contributions/17235/attachments/13120/21143/EIC-SRO-Calibration-Jul25.pdf
- ePIC SRO DAQ aims for a rapid turnaround from data to full calibrated/reconstructed data
- Data reconstruction time scale driven by calibrations (2-3 weeks)
  - Collision/Calibration data statistics required
  - Interdependency of detector calibration.
- Recent presentation by Carlos about backword Ecal calibiation
  - https://indico.bnl.gov/event/30349/contributions/116031/attachments/65917/113231/EEEMCal_calibSRO.pdf
  - This would be good examples to develop the machinery of streaming calibration.

Working document for calibration workflow

Subsystem	Region	Pre-physics-operation calibrations (Cosmic, no-beam calibration, commissioning)	Steady State calibrations: aim to produce final reconstruction-ready calibration within few days of physics data taking in a continous process													Post-reconstruction calibrations (applied at analysis stages)
			Task	Human intervention ?	Data Needed	Dependecy	T0 + 12hr	T0 + 24hr	T0 + 36hr	T0 + 48hr	T0 + 60hr	T0 + 72hr	T0 + 84hr	T0 + 96hr	Monitoring	Computing resource	
MAPS	Barrel+Disk	Threshold Scan Fake rate scan/noisy pixel masking	(See Alignment)														
MPGD	Barrel+Disk	?	?														
bTOF, eTOF (ac-lgad)	Barrel/Forward	Bias voltage determination ASIC baseline, noise, threshold Clock sync Time walk calibration	Gain calibration TDC bin width determination Clock offset calibration Hit position dependency (intrinsic and c-by-c)	QA	High p tracks ~1hr of production data?	Tracking, pfRICH	Data Acc. Dependen	Dependen	Processin	Processing							
Central Detector Tracker Alignment		Initial alignment	Alignment Check/Update (if needed)	QA	Prodcution data		Processing										
pfRICH	Backward	Thresholds (noise dependent), dynamic range adjustments, timing offsets, synchronization Initial alignment	Alignment Check/Update (if needed) Time dependencies (Aerogel transparency, mirror reflectivity, Gas pressure)	?	Prodcution data		Data Acc.	Processing									
DIRC	Barrel	Laser data?	?	?													
dRICH	Forward	Bunch timing offset scan Threshold scan Noise masking	Track based alignment	?	High p tracks ~1hr of production data?	Tracking	Data Acc. Dependen	Processin	Processing								
bEMC	Backward	Cosmic and LED for the initial gain balancing	DIS Electron Pi0->gg events energy scale	QA	DIS electron Pi0 di-photon resonance ~1 day of production data	Tracking	Data Acc. Dependen	Data Acc.	Processin	Processing					LED		
AstroPix	Barrel																
ScifiPb	Barrel		SiPM gain		?												
fEMC	Forward		Pi0, eta->gg events energy scale		Pi0 di-photon resonance ~1 day of production data		Data Acc.	Data Acc.	Processin	Processing							
		IV Scan	Second iteration pi0 (if needed)	QA							Processing				LED		High energy cluster non-linearity
bHCAL	Backward	LED	?														
cHCAL	Barrel	MIP calibration Gain calibration	(See hadronic e-scale calib)														
fHCAL	Forward																
fHCAL insert	Forward																
Hadronic energy scale calibration		?	Set full calo stack energy scale for hadroinc shower and jets	?	High energy hadronic showers and jets	Tracking h-PID	Data Acc. Dependen	Data Acc. Dependen	Data Acc. Dependen	?	?	?	?	?			Final energy scale calibration (if needed)
low Q2 Tagger	Far Backward	Alignment?															
low Q2 Tagger (CAL)	Far Backward																
Pair Spec Tracker	Far Backward																
Par Spec Cal	Far Backward																
Direct Photon Cal	Far Backward																
B0 Tracking	Far Forward	Survey alignment/Cosmic	Alignment check		MIP		Processing										
B0 PbWO4	Far Forward	Survey alignment/Cosmic	SiPM gain		MIP/Gamma/Electrons		Processing								LED		
Roman (Pots)	Far Forward					Acc. BPM Potential use of vertex of central detector	Data Acc. Dependen	Processing									
Off Momentum	Far Forward	laser/survey alignment Low lumi running	beam position monitors/fill by fill correction		MIP rate distribution in RP		Data Acc. Dependen	Processing									
ZDC PbWO4	Far Forward	Survey alignment, timing delay	SiPM/APD gain, timing	QA	Photon		Processing								LED		
ZDC Sampling	Far Forward	Survey alignment, timing delay	SiPM gain	QA	Single neutron		Processing								LED		

https://docs.google.com/spreadsheets/u/1/d/e/2PACX-1vRkJT9ODHAjqJhR_nb2GxPgYvHEcawklMgC-u_Fi67shZXdMitENF4ashAbD8dlvS6TwHqXG3UtZvhY/pubhtml