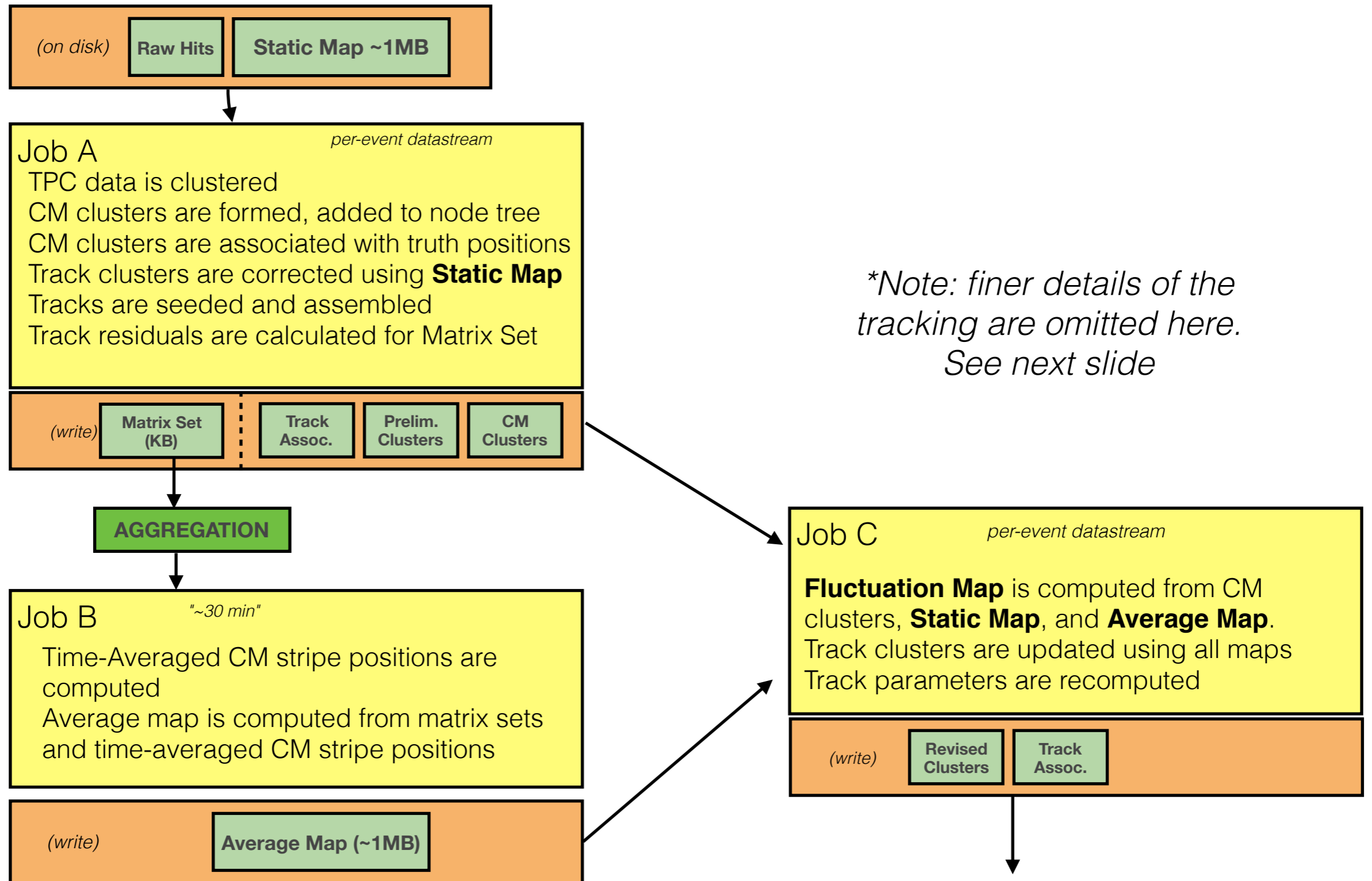


TPC Distortions -- Status and intent for S&C

Ross Corliss on behalf of the group*

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Workflow Overview*

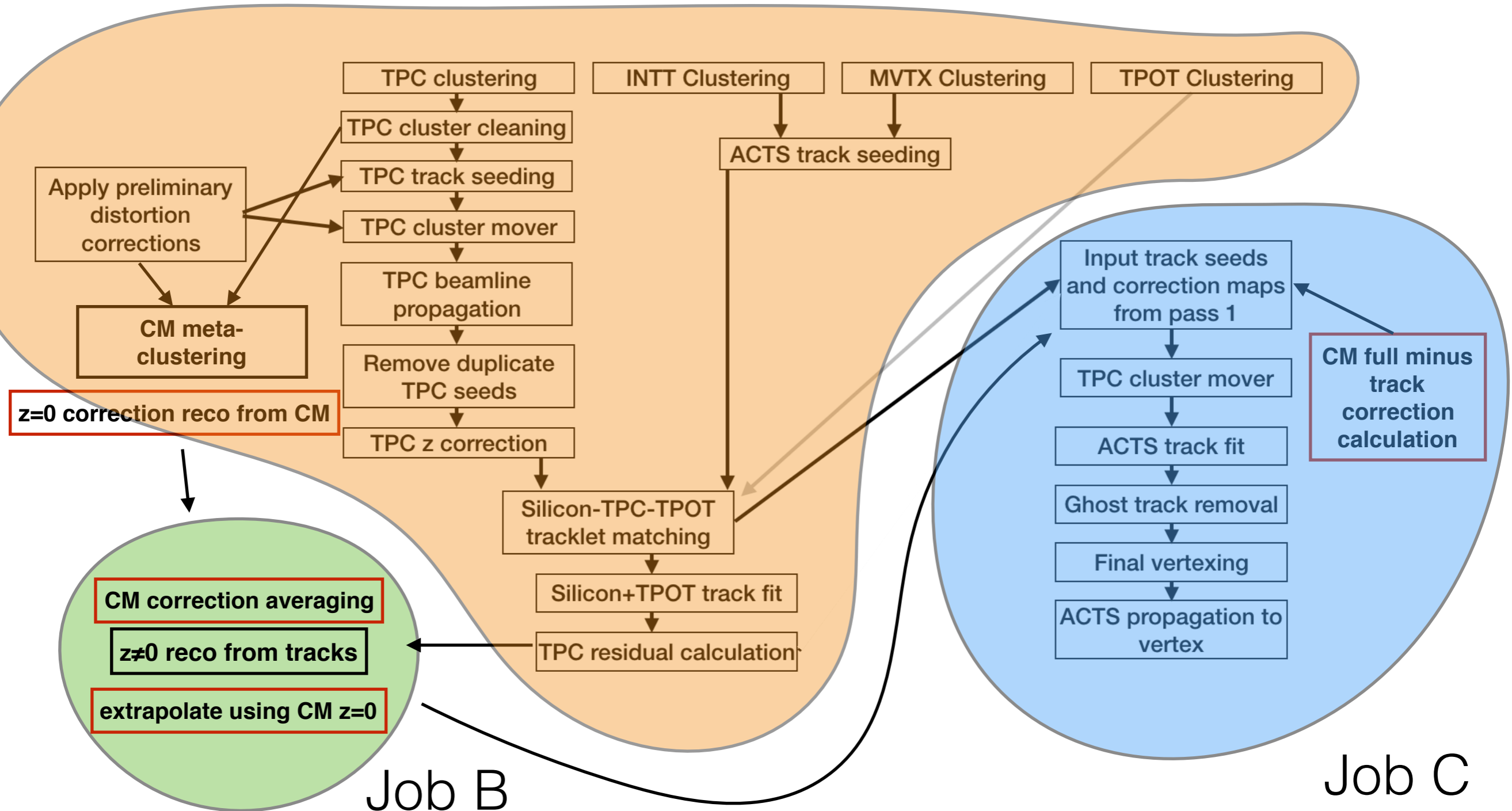


**Note: finer details of the tracking are omitted here. See next slide*

DST ready for physics analysis

Tracking Integration Details

Job A



Punch List for S&C

- Done: (ACTS transformation) Utility that converts cluster to global 3D coord
- Done: Cluster to Source Link converter.
- Need (Ross): Improve utility to take in 2D CM fluctuation correction and apply 3D correction to global point.
- Need (Tony): Utility that will put ACTS source links on surfaces (move TPC cluster mover into utility class, but no reason to interact with the original cluster much. Should retain raw clusters, modify on the fly where needed).
- Need (Ross): Modify Distortion Correction method to apply sets of corrections in series. Apply desired corrections in correct series in each instance
- Need (Hugo): Make 2D Correction Hist from CM residuals (which exists on node tree)
- Need(Hugo): Use 2D correction hist to extrapolate track correction map
- Need(Hugo): Code to sum the 2D CM correction hists, or aggregate the residuals.
- Need (Ross): Code to subtract CM average from CM residual.
- Want (Evgeny): Corrected padplane geometry with real gaps

Workflow in Place for S&C Review

- Job A
 - During initial TPC clustering of raw events:
 - identify CM clusters and add these to the nodetree CM cluster node
 - apply static distortion correction to all track clusters of interest (with the assumption these clusters are in-time)
 - move those track clusters to ACTS surfaces
 - proceed with tracking
 - During CM meta-clustering
 - apply static distortion correction to all CM candidate clusters
 - assemble meta-clusters from adjacent padrows
 - match clusters to most likely CM stripe
 - add these associations to the nodetree
- Aggregation for Job B
 - Sum TPC residual matrices
 - Average CM cluster positions for each truth CM stripe

Workflow in Place for S&C Review

- Job B
 - Average the CM cluster positions for each truth CM stripe
 - Convert CM average position to correction map
 - Extract average distortion from TPC residuals in TPOT region
 - Extrapolate average distortions to no-TPOT regions with CM averages
- Job C
 - Apply static+average corrections in sequence to CM clusters
 - Extract fluctuation correction from CM residuals
 - Apply static+average+fluctuation corrects in sequence to track clusters and transport to ACTS surfaces
 - Re-extract track fit parameters

Potential Issues for S&C Review

- Job 'L': (Using Directed Laser for Static Corrections)
 - **Not part of our proposed MDC2 deliverables, but:**
 - Default TPC clustering does not work for near-tangential laser crossings
 - Naive extraction produces many obvious artifacts
 - Working to improve this
 - Actual mapping (laser steering, DAQ triggering, angle/path record) not defined.
- Job 'D': (Using Digital Current for Charge Corrections)
 - **Not part of our proposed MDC2 deliverables, but:**
 - Workflow exists, but not integrated into Fun4All (getting closer)
- Data Structures
 - CM flashes are envisioned to be special event structures: TPC only, few timebins. These do not exist yet
 - Mechanism to keep fluctuation correction persistent and update when new CM data present is not yet defined
 - Data structures for digital current do not exist yet.
 - Handling of IBF and Gain maps still ~hardcoded.

Roadmap and Workforce Notes

- Spring 22:
 - Complete implementation of distortion calibration workflow in Fun4All (optimization will continue beyond this)
 - Study special datasets/selections
- Summer 22:
 - Develop TPC alignment software
 - Study drift speed calibration
 - Develop QA of calibration
 - *Add GEM Calibrations, CM intensity maps and other measured quantities as available*
- Fall 22:
 - Complete definition of Direct Laser run pattern
 - Complete integration of CM flash into trigger
 - Complete integration of Digital Current into Fun4All framework
- Winter 22 (when TPC services are available):
 - Perform the Direct Laser runs.
 - Exercise the CM flash with or without beam
- Workforce: Evgeny (*and TPC hardware*), Hugo (*and TPOT and tracking*), Ross (*and TPC hardware*), Tony (*and tracking*)
 - Everyone has multiple responsibilities.
 - More coders are **urgently** welcome. Many granular tasks are available. Now is the time to develop expertise in the software.