Development Priorities

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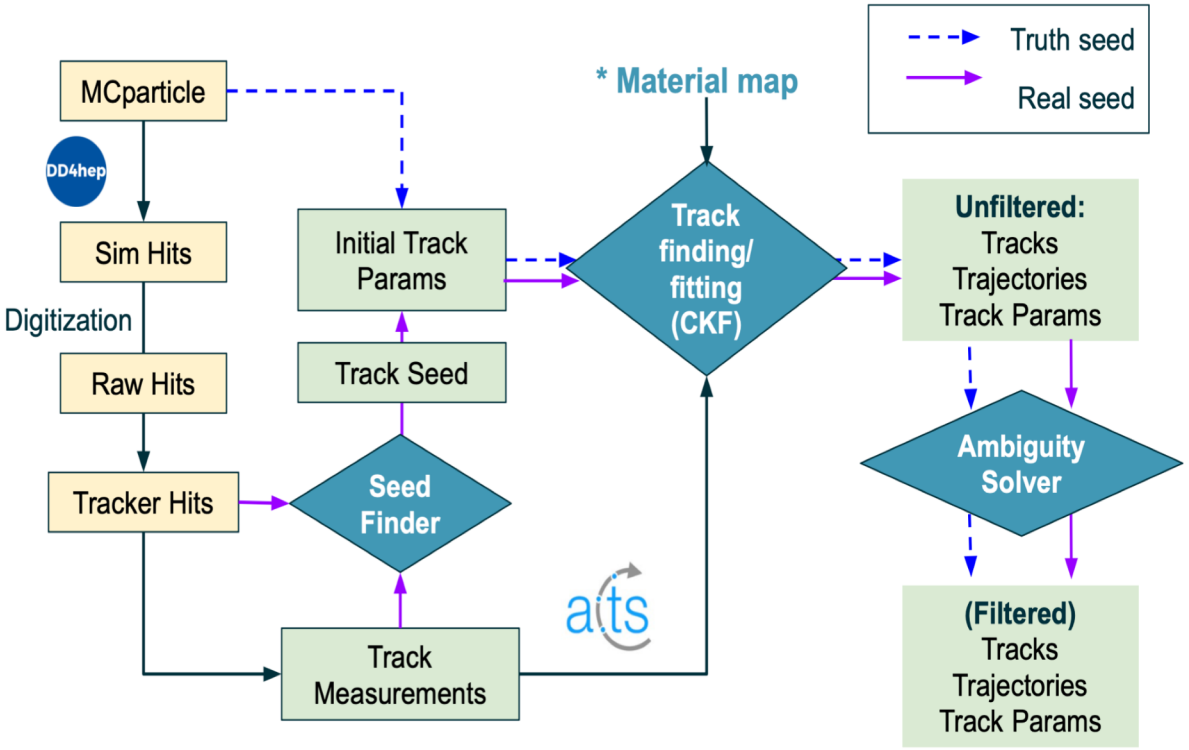
Reconstruction Framework and Algorithms

- **Charge**:
  - Development of a holistic and modular reconstruction for the integrated ePIC detector.
- **Priorities for 2025**:
  - Drive the **development of the reconstruction framework to meet ePIC needs**, e.g., on modularity or streaming data processing.
  - Host collaboration-wide discussions on all aspects of reconstruction, driving the **work toward holistic reconstruction**.
  - Enable reconstruction algorithms to **handle physics events with background**.
  - Collaborate with **PWGs** on **shared reconstruction priorities**, which currently include:
    - Secondary vertexing
    - Hadron identification
    - Particle flow algorithms for jet reconstruction
    - Event kinematics
  - Integrate continued development of **web-based event display** in reconstruction efforts.

Reconstruction Updates | Tracking and Vertexing

Thanks to Derek and Shujie for the slide!



Algorithms:

- The full chain of track reconstruction (seeding+CKF+ambiguity resolution) is set up in EICrecon.
- Primary vertexing ready, with analysis script included in benchmarks.
- 2nd vertexing development ongoing:
  - With ACTS::AdaptiveMultiVertexFinder, See Bishoy's talk
  - With KFParticle package
    - Stand-alone tests
    - Setup interface b/w EICrecon object and KFParticle
- Attempts to Insert pixel noise to silicon detector signals.

Performance:

- Improve 2D digitization for MPGD.
- Identify and label signal v.s. background particles, followup in next week's ePIC Software & Computing meeting.

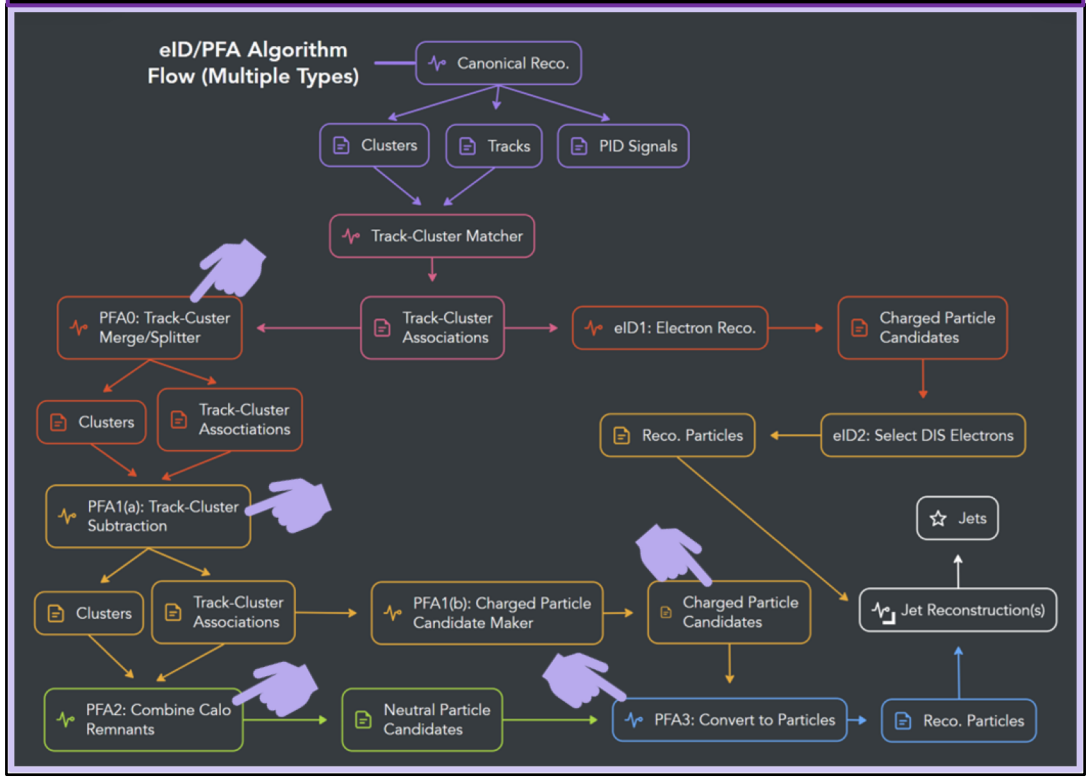
ACTS4NP workshop@LBNL, May 12-15:

- Tutorials and hands-on
- Geometry, data model
- AI/ML, GPU tracking…

Reconstruction Updates | Particle Flow and Jet Reconstruction

Thanks to Derek and Shujie for the slide!

Algorithmic flow of proposed PF baseline, components marked by purple hand, see also Discussions in Frascati.



- **Goal**: Implement baseline by first half of this year.
- Effort identified and tasks assigned.

Items on Critical Path	Status
PFA0: update merge/splitter	PR under review
PFA0(a): track-protocluster link	PR under review
PFA0(b): track-protocluster match promoter	To-Do
PFA1(a): track-cluster subtractor	PR ready*
PFA2: remnant combiner	Assigned
Charged/neutral candidates	PR drafted
PFA1(b): charged candidate maker	To-Do
PFA3: particle regression	To-Do

Items Not on Critical Path	Status
Track-cluster matcher	PR merged
Cross-calo topocluster maker	Closed*

From Report at ePIC General Meeting, May 2, 2025.

Reconstruction Updates | Hadron Identification and Event Kinematics

Thanks to Derek and Shujie for the slide!

- **RICH team making steady progress towards integrating IRT2.0 into EICrecon**:
  - Regular updates given by Brian Page in Recon WG meetings
  - **Right:** slide from Brian's most recent update
- **Select highlights from recent update**:
  - Unified RICH (Q/PF/D) plugin available for debugging
  - Initial IRT2.0 algorithm & factory interfaces in progress

Next steps [reordering the focus]

- Implement a single spherical mirror in QRICH
  - To confirm that IRT 2.0 (no sampling along the trajectory) works for dRICH gas radiator
- Confirm that using physical volumes (dd4hep implementation) rather than {logical volume & parent physical volume copies} in the geometry tree (pfRICH standalone code implementation) for sensitive volume elements (cell IDs) does not pose an issue for more complicated geometries (like dRICH sectors) with IRT algorithm
- Back to the "Next steps" items shown 2025/04/03 slides
  - pfRICH conical & pyramid mirrors implementation
  - Calibration pass (and calibration data import in EICrecon)
  - Standalone post-processing scripts -> integrate into IrtDebugging.cc plugin
  - Represent IRT 2.0 digitization as an intermediate plugin
  - Start thinking of a data model

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Kinematics (Charlotte Van Hulse, Rachel Montgomery): Establishing an initial dictionary of kinematics for physics processes and supporting physics analyses.

• **Overall status**: Finalizing cross check for the reconstruction of the SIDIS variables. Exclusive PWG has agreed upon two initial methods for t-reconstruction. Implementation started. More method added later.

• **Next Steps**: Following the plan described in the last ePIC Physics, Software & Computing Discussions.

From Report at ePIC General Meeting, May 2, 2025.