Path Towards Holistic Reconstruction: Release Targets

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ePIC software and computing weekly meeting
Aug 7, 2024

Workfest Recap | Summary

Holistic Reco

- Identify what we need for *holistic* reconstruction
- Composed of:
  - > Overview session summarizing where reconstruction currently is
  - > Open discussion session to discuss where and how to get to holistic reconstruction
- Will also help identify development priorities for remainder of 2024 and into 2025

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Electron ID

- Catalyze work on next-steps for the electron-finder
- Small working session for focused discussion and co-working

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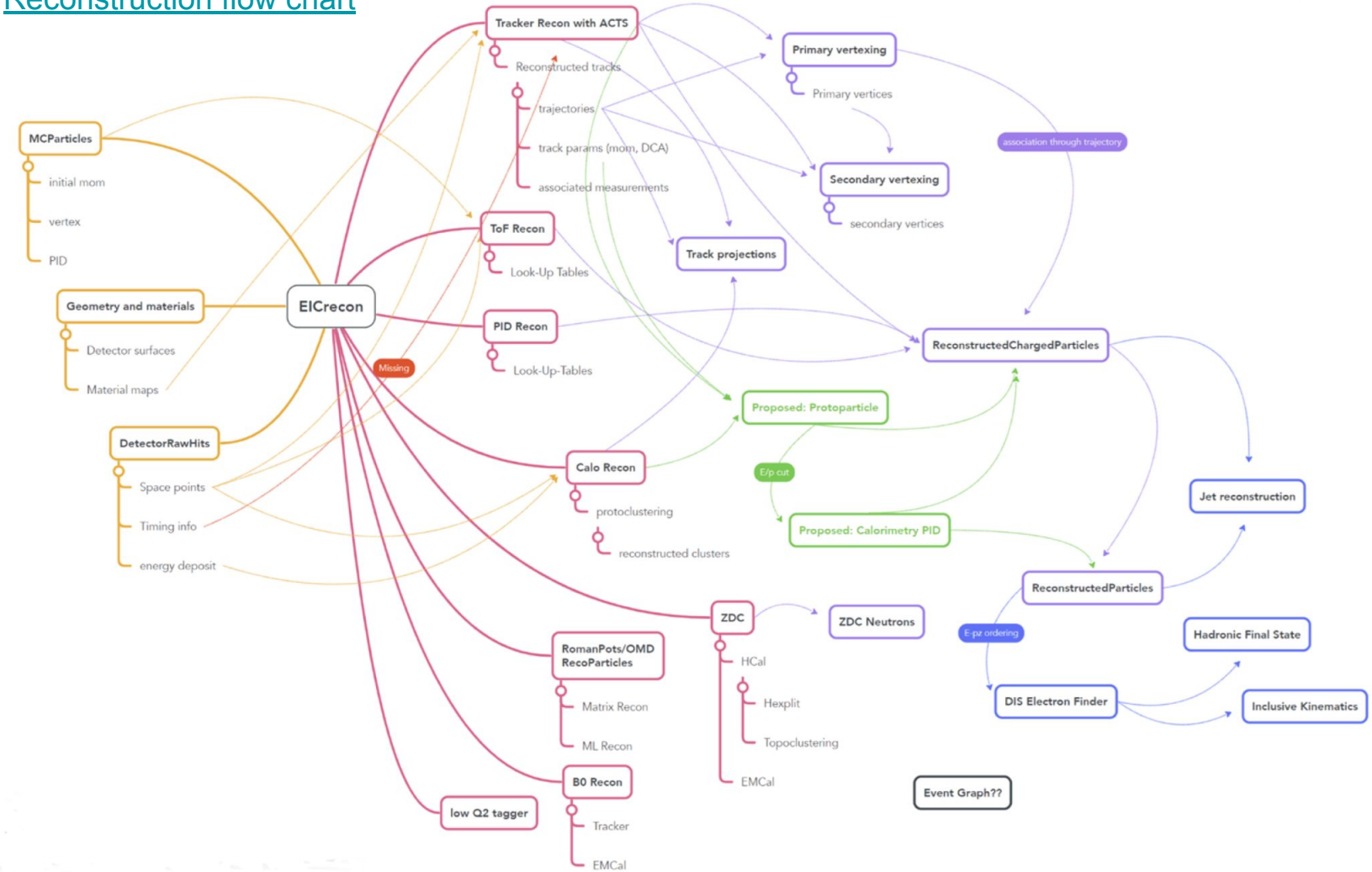
PID Software

- Report software status
- Talk on PID experience and analysis at BELLE-II

- Reconstruction flow chart



Workfest Recap | Summary

Workfest Links:

- Indico page
- Live Notes
  - (Also available on indico page)
- Workfest Summary Talk
- Umberto's BELLE-II PID Summary

Workfest Content:

- Status updates from reco. components
- Forward-focused open discussion
- The BELLE-II PID experience
- Working sessions (i.e. more discussion)

- **Outcome: very successful!!**
  - 20+ attendees
  - Lots of good discussion! Both in terms of:
    - Clarifying things (e.g. what goes into Reconstructed Charged Particles)
    - And planning (e.g. how should we evolve the e-finder)
  - Identified several things to follow up on in near-term reco meetings (e.g. IRT V2.0 and the TOF software)
  - And identified several action items (next slide)

Enhancement

- Secondary vertexing with ACTS (N. Schmidt)

- E-finder modularization (T. Kutz, T Protzman)
- Refactor particle flow algorithm PFAlpha (D. Anderson)

- Topo-clusters impact study (D. Anderson)

Sept 2024

Late 2024

2025

New Feature

- Track-Cluster Merge/Splitter (D. Anderson)
- Secondary vertexing with KFParticle (TBD)

- Particle/track to vertex relation and distance (X. Dong, M. Rongrong, B. Schmookler)

- hpDIRC pointing resolution study including AstroPix (W. Deconinck)
- Include noise in tracker hits (B. Liang-Gilman, M. Funatsu, S. Li)
- Track-cluster matching algorithm
- Track-cluster pair/proto-particle type
- Calorimeter-based PID (D. Kalinkin)
- Tracking with time info (TBD)
- Tracker hits charge sharing/clustering (B. Liang-Gilman, M. Funatsu, S. Li)

backups

Workfest Recap | Action Items

PID

- ~~**Bug Fix:** make mass & PDG consistent in Reco. Charged Particles **[easy] [09.2024]**~~
- ~~**Performance Study:** repeat hpDIRC pointing resolution study **[easy] [09.2024]**~~
- **Performance Study:** do hpDIRC pointing resolution study including AstroPix **[doable] [10.2024]**

Key: [XX.YYYY] = target campaign
- **[easy]** definitely doable by target campaign
- **[doable]** reasonably doable by target campaign (with some effort)
- **[hard]** very challenging to get done by target campaign

PID

- **New feature:** update PID lookup table with resolution from track projection. **[easy] [09.2024] — up to the DSC**
- **Performance Study:** check the current PID distribution in reconstructed events against the lookup table assumptions **[easy] [09.2024] — up to the DSC**
- **New feature:** develop a combined PID likelihood (e.g. following the BELLE II example) **[hard] [2025] – hold off**

Workfest Recap | Action Items

Tracking and Vertexing

- **Performance Study:** secondary vertexing with ACTS **[easy] [09.2024]**
- **New Feature:** secondary vertexing with KFParticles **[doable] [11.2024]**
- **New Feature:** particle/track to vertex relation and distance **[easy] [09.2024]**
- **New Feature:** tracker hits charge sharing/clustering, add noise. **[hard] [01.2025]**
- **New Feature:** use timing info in reconstruction **[hard] [2025]**

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Lepton/Flow Common Package

- **New Feature:** track-cluster pair/proto-particle type **[doable] [09.2024]**
- **New Feature:** track-cluster matching algorithm **[doable] [09.2024]**

Lepton ID Package

- **New Feature:** update Electron Reconstruction to use new type **[doable] [11.2024]**
- **New Feature:** integrate cluster-shapes into Electron Reconstruction **[doable] [10.2024] (WIP Dmitry)**

Workfest Recap | Action Items

Flow Package

- **New Feature:** finish Track-Cluster Merge/Splitter **[easy] [09.2024]**
- **New Feature:** update Track-Cluster Merge/Splitter to use new type **[easy] [10.2024]**

Flow Package (Cont.)

- **New Feature:** refactor PFAlpha (work-in-progress, PR#1186) to
  - (1) use new type, and
  - (2) be split into 3 algorithms (arbitration – hadronic subtraction, combining leftovers – and then regression)
  - **[doable] [11.2024]**

- **Performance Study:** check impact of 1st using topo-clusters and then doing track-matching vs. just using track matching **[hard] [01.2025]**

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