Key4hep In-Person-Meeting Summary

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CERN-EP-SFT

FCC Physics Workshop January 15, 2025 CERN

Overview

- Two day event in the middle of December 2024
- Participants from DESY and CERN, long time Key4hep contributors
- Notes available via indico https://indico.cern.ch/event/1482624/



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Summary

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Technical Discussions



- PandoraPFA
- ACTS

Build System

- Currently Key4hep is build with spack
- At least for CERN/SFT long term support of spack and lcgcmake (or other build tool) not sustainable
- Synergy only if LCGStacks and Key4hep stacks are build and deployed with one tool
 - Recipes, build nodes, scripts, ...
- But other customers of Key4hep benefit from standalone build tools provided by key4hep-spack
- Will probably take final decision after spack version 1.0 is released

PandoraPFA and other Particle Flow

People

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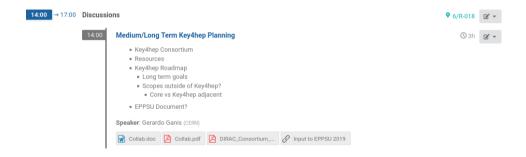
- expect to obtain well calibrated particle flow objects from Pandora
- want to obtain expertise in running Pandora, its monitoring and debug information
- It is better to develop new algorithms inside of PandoraSDK / LCContent to benefit from the monitoring available in Pandora
- A Gaudi-native k4GaudiPandora is under development
 - But that is not a requirement to start using Pandora, very little will change on that side
- Use github provided wiki to write notes about using Pandora
- Require (human) resources for further developments: EP RnD Phase 2, AIDAInnova++

ACTS: Tracking Software

Mostly open points, but some steps laid out

- Want to run track reconstruction for silicon, TPC, Drift Chamber, must have EDM4hep types at the end
- Track parametrisation difference between ACTS and EDM4hep
- How to integrate ACTS types into event store or EDM4hep
- Geometry integration simplification, coming in next ACTS version
 - ACTS is working with OpenDataDetector, but strong assumptions on Geometry in there
 - Annotate detector geometry
- Alternatively port MarlinTrk to GaudiTrk
- Need strong collaboration with ACTS authors and other users of Key4hep (MuonCollider) working on ACTS integration
- 1. Start with understanding how the OpenDataDetector and its reco work with Gaudi
- 2. Look into geometry
- 3. Integrate into EDM4hep, use transient event store in the mean time

Medium/Long Term Key4hep Planning



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Key4hep Consortium

- To strengthen the commitment of contributing institutes a consortium similar to what exists for XROOTD might be useful
- Distribute commitments: EDM4hep, DD4hep, k4fwcore, buildsystem, interfaces (Pandora, ACTS, Delphes, Marlin), k4geo (infrastructure, not detector models *per se*)?
- Or just a very lightweight structure not implying commitments
- Will try to discuss with Knowledge transfer group to get their input

EPPSU Document from Key4hep

- General agreement that submitting a document to the strategy update is sensible
- Make sure that necessity to support software is explicitly mentioned



We still don't have a logo.

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podio/EDM4hep Discussion



- MCParticle information?
- Missing datatypes?

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New Datatypes for EDM4hep

General in depth debate about integrating new datatypes

- 1. Think a bit longer about what is really needed
- 2. Propose alternatives
- 3. Integrate
- Currently DriftChamberDigi, Dual Readout hits
- Experimental Datatype support can break existing files if they are not stable
 - Solution via extensions?
 - Ignore issues with experimental collections?
- Avoid introducing new interfaces

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TrackerHit Types in EDM4hep

Drop Position3d member

- only used for visualization?
- Would allow better integration of DriftChamberHit
- Long Discussion about Drift Chamber wire angles
- ► How to relate RawHits?
 - Propose to use links

Backward Compatibility in podio and EDM4hep

- How much backward compatibility do we provide?
- Between major versions?
- Issue with Schema Evolution: need to compile separate library and dictionary for each old yaml file
 - Need to keep old yaml files schema v1, v2,...
 - Does this actually work with more than one jump?

Technical Discussions: Round 2



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Documentation

- Identified required changes to our documentation
- Better landing page
- Restructuring of content
- Missing content
- Improvements already started rolling in

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Analyses

Where do we draw the line between Key4hep and other analysis ecosystems?

- JetClustering, Flavourtagging, ...?
- Do we provide ntuple like file, or is this user responsibility?
- Identified pain points for analysers
 - C++ vs. Python
 - Python must be first class citizens in today's world
 - EDM4hep indices in raw EDM4hep data level to rebuild relations
 - RDataSource improves interfacing but is slow at the moment
 - Because we read the whole event
 - Can load lazily, but relationship building takes time
- ► Changing base array-of-structs to structs-of-arrays in podio would take considerable effort
- Provide utility functionality
 - Standardize on this

Summary

- Lots of open and fruitful discussions about a wide range of topics
- Support for core Key4hep is crucial to keep momentum going
- But we cannot provide everything, some expectation management is required

Thank you for your attention!