

# Key4hep In-Person-Meeting Summary

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FCC Physics Workshop

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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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# Technical Discussions

10:00 → 12:00 Discussions: Discussion

4/S-056 

10:00 **Technical Discussions**

2h 

- Build system? Spack, lcgmake? Mixture?
- PandoraPFA
- ACTS

# Build System

- ▶ Currently Key4hep is build with spack
- ▶ At least for CERN/SFT long term support of spack and lcgmake (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
  - ▶ 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

14:00 → 17:00 Discussions

6/R-018 

14:00

## Medium/Long Term Key4hep Planning

3h 

- Key4hep Consortium
- Resources
- Key4hep Roadmap
  - Long term goals
  - Scopes outside of Key4hep?
    - Core vs Key4hep adjacent
- EPPSU Document?

**Speaker:** Gerardo Ganis (CERN)



Collab.doc



Collab.pdf



DIRAC\_Consortium\_...



Input to EPPSU 2019



# 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

# Logo

We still don't have a logo.

# podio/EDM4hep Discussion

09:00 → 12:00 Discussions: Discussion

4/S-030 

09:00 **podio/EDM4hep Discussion**

3h 

- EDM4hep decision making for datatypes?
- Experimental Datatypes
- MCParticle information?
- Missing datatypes?

# 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

# 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

14:00 → 17:00 Discussions: Discussion

14:00

## Technical Discussion

- Documentation
  - Onboarding
- Validation
- FCCAnalyses
- iLCDirac
- DD4hep

📍 13/3-005  ▾

🕒 3h  ▾



# Documentation

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

# 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!