Key4HEP: Turnkey Software Stack

André Sailer

CERN-EP-LCD

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Motivation for a Common Software Stack

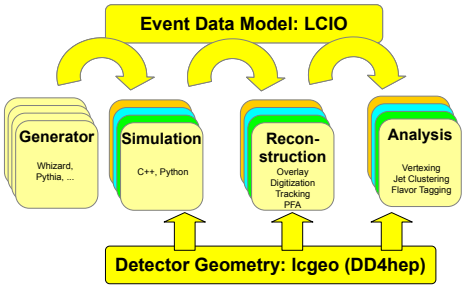
- Future detector studies critically rely on well-maintained software stacks to model detector concepts and to understand a detector's limitations and physics reach
- Possibility of diverging activities resulted in Future-Collider-Software Workshop held in Bologna from June 12–13 **https://agenda.infn.it/event/19047/**
  - Attended by members of FCC, ILC, CEPC, SCT, CLIC, LHC communities
  - **Agreement to create common event data model and common turnkey software stack**

The Vision for the Turnkey Software Stack

The turnkey stack connects and extends the individual packages towards a complete data processing framework

- easy to use: for librarians, developers, users
  - easy to deploy
  - easy to extend
  - easy to set up
- full of functionality
- plenty of examples for simulation and reconstruction of detectors

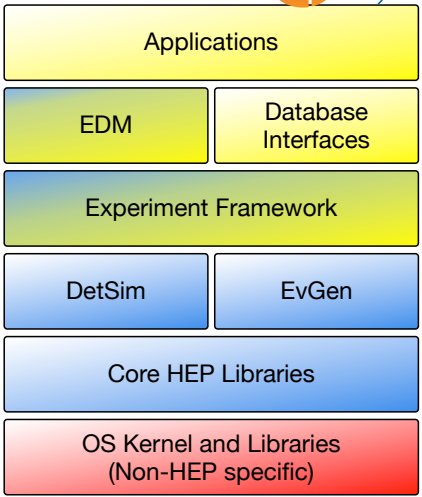
Major ingredients: Event Data Model, Geometry Information, Framework



Key4HEP: Turnkey Software Stack

Sharing as many common components reduces overhead for all users

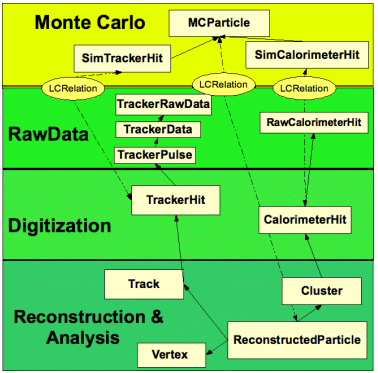
- Usual core libraries (ROOT, Geant4, . . .)
- Framework (Gaudi)
- Interfaces to tracking and reconstruction libraries



EventDataModel: EDM4HEP and podio

Use a common event data model to allow high degree of integration

- Using `podio` to manage the EDM and easily change the persistency layer
- Create *adapters* to migrate the existing data to the new EDM
- Goal is to have first concrete version in 3–6 months

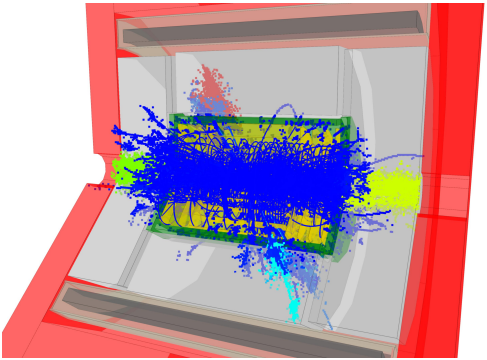


First meeting few days ago: **https://indico.cern.ch/event/832559/**

CLIC Reconstruction

CLIC reconstruction based on iLCSoft (which is also used by ILD, CEPC, LC-TPC, Calice)

1. Background Overlay
2. Digitisation
3. Track pattern recognition with `ConformalTracking`
4. Particle Flow Clustering with PANDORAPFA
5. *PFO selection* for background rejection
6. Jet Clustering using the FASTJET library
7. Flavour Tagging with LCFIPLUS



Reconstructed 3TeV ttbar event **before** and after background rejection

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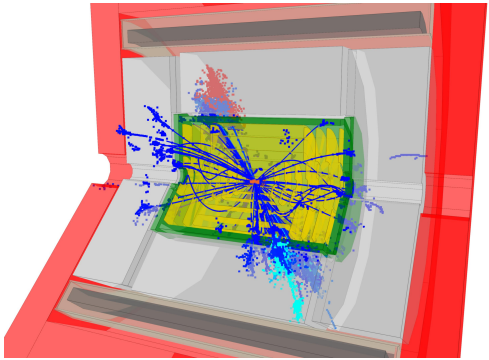

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Adiabatic Changes

- While transitioning to Key4HEP, need to be able to keep running the reconstruction
- Switch components one by one, validate changes
  - Move from `lcio` to EDM4HEP
  - Move framework from Marlin to Gaudi: wrap existing processors (Prototype: **https://github.com/andresailer/GMP**)
  - Replace Wrapped processors with native Gaudi algorithms