

Software & Computing R&D in 2021

- Online Filter prototype
- HDF5 as a data format
- Multithreading and alternative architectures
- FairRoot vs Gaudi
- Conditions DB, Calib&Align
- Computing system prototype and a mock-up test

THIS LIST DOES NOT INCLUDE THE CURRENT DEVELOPMENTS OF SPDROOT!

Online Filter prototype

Goal: to demonstrate that the Online Filter is capable to handle the SPD data rate

- Simulation of the continuous data stream
- MC simulation for ML training and validation
- ML algorithms for fast track reconstruction, primary vertex reconstruction
- python → C++
- Event unscrambling
- Software trigger criteria
- ML monitoring

HDF5 as a data format

Goal: to evaluate HDF5 as an intermediate data format for the SPD

- ROOT is a good format for the current approaches to the data analysis using ROOT
- Less good for the computing system
- Less good for the Python data analysis ecosystem
- Attempts to use HDF5 in FairRoot and Gaudi/Key4HEP (via Podio) were made already

Multithreading and alternative architectures

Goal: to improve the SPD algorithms and software to be able running at multicore machines and GPU and/or FPGA coprocessors

- Online Filter
- Simulation
- Reconstruction
- Core framework

FairRoot vs Gaudi

Goal: to evaluate Gaudi/Key4HEP as an SPD software framework

	Gaudi/Key4HEP	FairRoot
Multithreading and alternative architectures	++	+
Support	+++ (HSF, ATLAS, LHCb, FCC)	+ (FAIR, NICA, ALICE?)
Use in real experiments	+++ (ATLAS, BESIII, LHCb)	-/+ (BM@N)

Conditions DB, Calib&Align

Goal: to develop a solution to handle geometry, conditions and calibration data

- The Database (10 PB/year ~ $O(100000)$ running jobs)
- Geometry description
- Alignment
- Run info and conditions
- Calibration procedure and constants
- Integration to the computing system

Computing system prototype and a mock-up test

Goal: to demonstrate that the computing system is capable to handle the SPD data rate

- Information system
- Data management
- Task management
- Working prototype and a mock-up test of ~1 PB scale (from the online filter to reco to data analysis) — end of the year?