DEVELOPMENTS IN FCCANALYSES

Status for June 2023

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FCC Software Meeting

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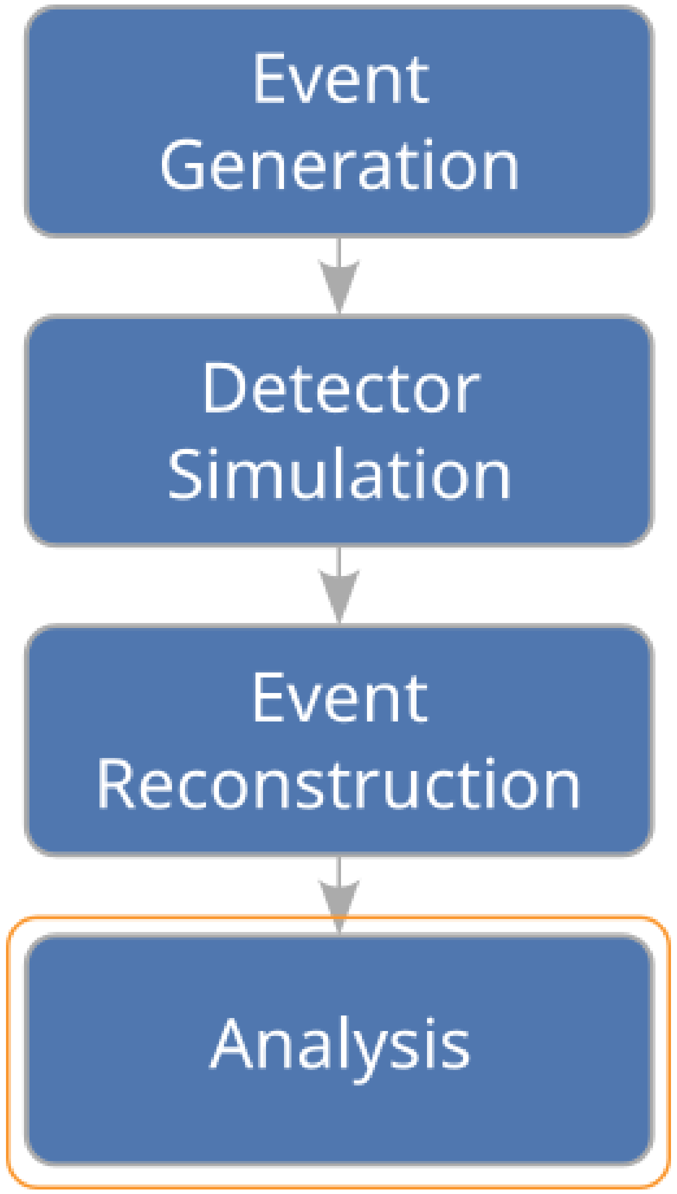
FCCANALYSES SCOPE

Goal of the framework is to aid the user in obtaining the desired physics results from the reconstructed objects

Framework requirements:

- Efficiency — Make quick turn-around possible
- Flexibility — Allow heavy customization
- Ease of use — Should not be hard to start using
- Scalable — Handling of large datasets



KEY4HEP STATUS

Stable Key4hep stack:

- `/cvmfs/sw.hsf.org/spackages7/key4hep-stack/2023-04-08/x86_64-centos7-gcc11.2.0-opt/urwcv/setup.sh`
- Overview of Key4hep developments by Juan at EP R&D Software Working Group Meeting
  - EDM4hep Python bindings
  - podio: RNTuple backend on the way
  - Key4hep Validation
- Overview of Generators at Key4hep by Gerri at ECFA Higgs Factories: 2nd Topical Meeting on Generators
- Next FCC Physics Performance Meeting tomorrow

k4Geo

- FCCDetectors → k4geo migration has started!
  - PR#276 Noble Liquid ECAL barrel detector builder + documentation
    - Merged
  - PR#271 ARC (PID) barrel + endcap detector builders, compact file, examples, tests, documentation
    - Under review (well advanced, will likely be merged very soon)
  - PR#273 Detailed version of the vertex detector builder, embryo for full IDEA detector compact file, examples
    - Under review
  - Full Noble Liquid based concept compact migration starting
- To be addressed
  - Dual readout crystal ECAL
  - Dual readout fiber HCAL
  - Drift Chamber

FCCANALYSES STATUS

Merged PRs:

- FCCAnalyses #292: Fixed handling of empty outputDir
- Podio #412: Collection ID is now 32 bit hash
- Podio #427: Improved podio-dump

Issues:

- #291: Branch names for relations now easier to read

Upcoming

- k4FWCore #100: Podio Frame IO for Gaudi steering files
- WIP EDM4hepSource:
  Allows high level access to EDM4hep objects in ROOT RDataFrame

DATAMODEL EXPLORER

Simple JavaScript application to explore event MC tree: dmX

DOCUMENTATION & PLATFORMS

There are several sources of documentation

- FCC Tutorials: https://hep-fcc.github.io/fcc-tutorials/
  - Focused on providing a tutorial on a specific topic
- Code reference: https://hep-fcc.github.io/FCCAnalyses/doc/latest/index.html
  - Provides details about implementation of individual analyzers
- Manual pages:
  - Info about commands directly in the terminal: `man fccanalysis`
- FCCAnalyses website, FCCSW website

Please test Key4hep nightlies stack

- Three OSes supported: CentOS 7, AlmaLinux 9 and Ubuntu 22.04

BACKUP

FCCANALYSES VS. COFFEA/COFFEA-CASA

- Provides similar set of features to FCCAnalyses
- Dataframe in coffea, Orchestration in coffea-casa
- User interface purely pythonic
- Integrated into python package ecosystem
- FCCAnalysis purpose build for FCC
- Integration with SWAN and Dask

FCCANALYSES BATCH SUBMISSIONS

- FCCAnalyses allows users to submit their jobs onto HTCondor
- It bootstraps itself with use of scripts in subprocesses
- Framework creates two files
  - Shell script with `fccanalysis` command
  - Condor configuration file
- There is also possibility to add user provided Condor parameters
- Condor environment now isolated from machine where the submission was done
- Revised tracking across chunks/stages done with the variable in the ROOT file

SUB-COMMAND ROUTING

- There are three ways to run the analysis
  - `fccanalysis run my_analysis.py`
  - `python config/FCCAnalysesRun.py my_analysis.py`
    - Can this way be dropped?
  - `python my_analysis.py`
- Removed reliance on try/catch for sub-command routing

CODE FORMATTING

- Currently, there is wide range of styles used
- End goal: Make the analyzers better organized
  - They are building blocks of the analysis
- Created CI to check every commit
- LLVM Style selected based on popularity
- Only changed lines are checked

UPDATED VERTEXING

- Vertexing done with the help of code from Franco B.
- Introduces dependency on Delphes
- Introduces new analyzers: `SmearedTracksdNdx`, `SmearedTracksTOF`
- Simplifies Delphes–EDM4hep unit gymnastic
- Adds examples for B_S to D_S K

BUILDING OF FCCANALYSES

- FCCAnalyses is a package in the Key4hep stack
- Advanced users can work directly on their forks
  - Allows to keep the analysis ''cutting edge''
  - Requires discipline
- Added helper sub-command: `fccanalysis build`
- Current distribution mechanisms:
  - Using released version in Key4hep stack
  - Separate git repository + stable Key4hep stack
  - Separate git repository + nightlies stack

KEY4HEP STACK PIN

- FCCAnalyses is developed on top of Key4hep stack
- Sometimes depends on specific version of the package
- Added helper sub-command: `fccanalysis pin`
- Will pin the analysis to a specific version of the Key4hep stack
  - There is no patch mechanism in the Key4hep stack