

Community driven common tracking software - the ACTS project

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The reconstruction of particle trajectories is one of the most complex and CPU intensive tasks of event reconstruction at current LHC experiments. The growing particle multiplicity stemming from an increasing number of instantaneous collisions as foreseen for the upcoming high luminosity upgrade of the LHC (HL-LHC) and future hadron collider studies will intensify this problem significantly. In addition, the HL-LHC will see a factor 10 in data rates to be processed and written on disk. The well performing track reconstruction programs of the current LHC experiments have successfully served event processing of several billions of events. However, parts of software concepts and code base stem from the pre LHC era and need to undergo significant modernization. This includes most prominently the preparation for concurrent code execution. Such disruptive changes to the software structure are almost impossible to be done within the existing software stacks of the experiments, as they need to maintain their day-to-day performance.

ACTS (A Common Tracking Software) has been created in 2016 in order to serve as a detector independent development platform for track reconstruction by

and for the community. It has been initiated by the need of ATLAS to develop a modern track reconstruction setup for the HL-LHC and to serve at the same as the backbone of the FCC-hh event reconstruction. It is an open source toolkit initially based on code and concepts of the ATLAS track reconstruction software, and has attracted an increasing number of both developers and clients from the HEP community. Software development of common modules to be used by several experiments has been identified by the HEP Software Foundation (HSF) as one of the necessary steps towards maintaining and managing the future computing challenges. This has been recently published in the community white paper released in 2017. Consequently, ACTS has been embedded into the HSF structure. The open access policy of ACTS allows and encourages contributions from across and outside the field, including inputs from the growing research sector of machine learning or e.g. as a supported HSF project for the Google Summer of

Code 2018. We present the structure and concepts of ACTS, the modern open source workflow including extensive unit testing, and benchmark performance examples for some of the main ACTS clients.

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