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Developments in the ATLAS Tracking Software ahead of LHC Run 2

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After a hugely successful first run, the Large Hadron Collider (LHC) is currently in a shut-down period, during which essential maintenance and upgrades are being performed on the accelerator. The ATLAS experiment, one of the four large LHC experiments has also used this period for consolidation and further developments of the detector and of its software framework, ahead of the new challenges that will be brought by the increased centre-of-mass energy and instantaneous luminosity in the next run period. This is of particular relevance for the ATLAS Tracking software, responsible for reconstructing the trajectory of charged particles through the detector, which faces a steep increase in CPU consumption due to the additional combinatorics of the high-multiplicity environment. The steps taken to mitigate this increase and stay within the available computing resources while maintaining the excellent performance of the tracking software in terms of the information provided to the physics analyses will be presented. Particular focus will be given to changes to the Event Data Model, replacement of the maths library, and adoption of a new persistent output format. The resulting CPU profiling results will be discussed, as well as the performance of the algorithms for physics processes under the expected conditions for the next LHC run.

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