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Multithreaded simulation for ATLAS: challenges and validation strategy

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Estimations of the CPU resources that will be needed to produce simulated data for the future runs of the ATLAS experiment at the LHC indicate a compelling need to speed-up the process to reduce the computational time required. While different fast simulation projects are ongoing (FastCaloSim, FastChain, etc.), full Geant4 based simulation will still be heavily used and is expected to consume the biggest portion of the total estimated processing time. In order to run effectively on modern architectures and profit from multi-core designs, a migration of the Athena framework to a multi-threading processing model has been performed in the last years. A multi-threaded simulation based on AthenaMT and Geant4MT enables substantial decreases in the memory footprint of jobs, largely from shared geometry and cross-sections tables. This approach scales better with respect to the multi-processing approach (AthenaMP) especially on the architectures that are foreseen to be used in the next LHC runs. In this paper we will report about the status of the multithreaded simulation in ATLAS, focusing on the different challenges of its validation process. We will demonstrate the different tools and strategies that have been used for debugging multi-threaded runs versus the corresponding sequential ones, in order to have a fully reproducible and consistent simulation result.

Consider for promotion

No

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