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Towards a Simplified (Fast) Simulation Infrastructure in ATLAS

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To increase the number of Monte Carlo simulated events that can be produced with the limited CPU resources available, the ATLAS experiment at CERN uses a variety of fast simulation tools in addition to the detailed simulation of the detector response with Geant4. The tools are deployed in a heterogeneous simulation infrastructure known as the Integrated Simulation Framework (ISF), which was originally developed over a decade ago. While ISF allows for a flexible combination of simulation tools, it has accumulated a significant level of complexity over the last few years and is becoming increasingly difficult to maintain by the collaboration. In addition, the complex particle routing algorithms implemented by ISF have been found to cause a measurable overhead in the simulation time. At the same time, recent advances in Geant4 may allow a complete replacement of ISF by outsourcing its entire functionality as a particle stack dispatcher to the Geant4 toolkit.

This talk presents a first implementation of FastCaloSimV2 as a Geant4 fast simulation model. FastCaloSimV2 provides a fast parametric simulation of the ATLAS calorimeter and is part of the state-of-the-art fast simulation tool AtlFast3. Its integration into Geant4 will serve as a reference for the integration of other simulators, which is expected to significantly streamline the simulation infrastructure of the ATLAS experiment in the coming years.

Significance

ATLAS aims to use >90% of fast simulation samples in the coming years, such that improvements in fast simulation accuracy are crucial for the success of the ATLAS physics programme. In order to maintain the growing fast and full simulation infrastructure of the experiment, a major refactoring of the infrastructure will be required in the coming years. This talk presents the integration of FastCaloSimV2, one of the major fast simulation tools used in the collaboration, as a Geant4 fast simulation model, which will serve as a reference for the integration of other simulators.

References

Experiment context, if any

ATLAS

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