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Fast detector simulation and the GeantV project

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Particle transport Monte Carlo simulation has a fundamental role in High Energy and Nuclear Physics (HENP) experiments. It enables an experiment's designers to predict its measurement potential, and to disentangle detector effects from the physics signal.
High-energy physics detector simulation is increasingly relied upon due to the increasing complexity of the experimental setups, which scales with the number of sub-detectors and analysed channels.
The first LHC run and the corresponding arrival of the GRID era boosted the production of such simulations to an unprecedented scale, with each experiment simulating billions of events using full detailed simulation. This revealed both the power of the state of the art physics embedded in current detailed simulation models, as well as important shortcoming of throughput with respect to the increasing demands of simulated data samples.

The talk will review the ongoing efforts of the community to develop fast detector simulation applications, which tend to cluster into
frameworks. This trend justifies the R&D of more generic solutions to either improve the performance of the traditional simulation tools by
integrating fast simulation components, or make use of modern computing techniques allowing to increase the throughput. The second part will
describe how this is being addressed by the GeantV framework, the current status, lessons and challenges faced by the project.

Author: GHEATA, Andrei (CERN)

Presenter: GHEATA, Andrei (CERN)

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