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Validation of Geant4 Releases with distributed resources

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In this paper we present the Geant4 validation and testing suite.

The application is used to test any new Geant4 release. The simulation of a particularly demanding use-case (High Energy Physics calorimeters) is tested with different physics parameters.

The suite is integrated with a job submission system that allows for the generation of high statistics data-sets on distributed resources. The analysis of the data is also integrated and tools to store and visualize the results are provided.

Summary

The simulation of calorimeters is particularly demanding: it challenges all aspects of physics simulation (tracking in magnetic field, electromagnetic and hadronic interactions). The Geant4 collaboration publishes a new version of Geant4 every year containing refinements of physics models and improvements in computing performance. In addition to the public releases, monthly development releases are used to monitor the developments of physics modeling.

To efficiently test all Geant4 versions a testing suite has been developed. A simplified version of HEP calorimeter has been implemented with Geant4. All LHC calorimeters materials and technologies have been implemented. The most important variables for calorimetric measurements are reconstructed and recorded for later analysis.

To increase the statistics being produced with this application, the testing suite has been recently extended to be run on distributed resources, being batch or GRID resources. Software is distributed to remote sites via a novel FUSE-based file system (CernVM-FS). The configuration of jobs, their submission, monitoring and collection of results is fully automated and integrated with GRID tools (DIANE/GANGA). Analysis of produced data is also performed in an automatic way and the relevant results are stored in a database. A simple web-interface (DRUPAL) has been developed to retrieve the data and produce interactively the plots (ROOT) to compare the physics performance between models or between versions of Geant4.

The testing suite is an example of the integration of different tools and technologies used in the HEP community that allows small Virtual Organizations to effectively use GRID resources.

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