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The STAR "Plug and Play" Event Generator Framework

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The STAR experiment pursues a broad range of physics topics in pp, pA and AA collisions produced by the Relativistic Heavy Ion Collider (RHIC). Such a diverse experimental program demands a simulation framework capable of supporting an equally diverse set of event generators, and a flexible event record capable of storing the (common) particle-wise and (varied) event-wise information provided by the external generators. With planning underway for the next round of upgrades to exploit ep and eA collisions from the electron-ion collider (or eRHIC), these demands on the simulation infrastructure will only increase and requires a versatile framework.

STAR has developed a new event-generator framework based on the best practices in the community (a survey of existing approach had been made and the "best of all worlds"kept in mind in our design). It provides a common set of base classes which establish the interface between event generators and the simulation and handles most of the bookkeeping associated with a simulation run. This streamlines the process of integrating and configuring an event generator within our software chain. Developers implement two classes: the interface for their event generator, and their event record. They only need to loop over all particles in their event and push them out into the event record. The framework is responsible for vertex assignment, stacking the particles out for simulation, and event persistency. Events from multiple generators can be merged together seamlessly, with an event record which is capable of tracing each particle back to its parent generator.

We present our work and approach in detail and illustrate its usefulness by providing examples of event generators implemented within the STAR framework covering for very diverse physics topics. We will also discuss support for event filtering, allowing users to prune the event record of particles which are outside of our acceptance, and/or abort events prior to the more computationally expensive digitization and reconstruction phases. Event filtering has been supported in the previous framework and showed to save enormous amount of resources –the approach within the new framework is a generalization of filtering.

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