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Adaptative track scheduling to optimize concurrency and vectorization in GeantV

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The *GeantV* project aims to R&D new particle transport techniques to maximize parallelism on multiple levels, profiting from the use of both SIMD instructions and co-processors for the CPU-intensive calculations specific to this type of applications. In our approach, vectors of tracks belonging to multiple events and matching different locality criteria must be gathered and dispatched to algorithms having vector signatures. While the transport propagates tracks and changes their individual states, geometry locality becomes harder to maintain. The scheduling policy has to be changed to maintain efficient vectors while keeping an optimal level of concurrency. The model has complex dynamics requiring tuning the thresholds to switch between the normal regime and special modes, i.e. prioritizing events to allow flushing memory, adding new events in the transport pipeline to boost locality, dynamically adjusting the particle vector size or switching between vectorized to single track mode when vectorization causes only overhead. This work covers a comprehensive study for optimizing these parameters to make the behavior of the scheduler self-adapting, presenting the most recent results.

Authors: GHEATA, Andrei (CERN); Mr CARMINATI, Federico (CERN); BITZES, Georgios (University of Athens (GR)); LIMA, Guilherme (FermiLab (US)); DE FINE LICHT, Johannes Christof (University of Copenhagen (DK)); APOSTOLAKIS, John (CERN); DUHEM, Laurent (INTEL); BANDIERAMONTE, Marilena (University of Catania and INAF); NOVAK, Mihaly (CERN); SHADURA, Oksana (National Technical Univ. of Ukraine "Kyiv Polytechnic Institute); CANAL, Philippe (Fermi National Accelerator Lab. (US)); SEHGAL, Raman (Bhabha Atomic Research Centre (IN)); Dr BRUN, Rene (CERN); WENZEL, Sandro Christian (CERN); JUN, Soon Yung (Fermi National Accelerator Lab. (US)); ELVIRA, Victor Daniel (Fermi National Accelerator Lab. (US))

Presenter: GHEATA, Andrei (CERN)

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