

Porting HEP Parameterized Calorimeter Simulation Code to GPUs

Monday, 17 May 2021 18:30 (30 minutes)

The High Energy Physics (HEP) experiments, such as those at the Large Hadron Collider (LHC), traditionally consume large amounts of CPU cycles for detector simulations and data analysis, but rarely use compute accelerators such as GPUs. As the LHC is upgraded to allow for higher luminosity, resulting in much higher data rates, purely relying on CPUs may not provide enough computing power to support the simulation and data analysis needs. As a proof of concept, we investigate the feasibility of porting a HEP parameterized calorimeter simulation code to GPUs. We have chosen to use FastCaloSim, the ATLAS fast parametrized calorimeter simulation. While FastCaloSim is sufficiently fast such that it does not impose a bottleneck in detector simulations overall, significant speed-ups in the processing of large samples can be achieved from GPU parallelization at both the particle (intra-event) and event levels; this is especially beneficial in conditions expected at the high-luminosity LHC, where an immense number of per-event particle multiplicities will result from the many simultaneous proton-proton collisions. We report our experience with porting FastCaloSim to NVIDIA GPUs using CUDA. A preliminary Kokkos implementation of FastCaloSim for portability to other parallel architectures is also described.

Primary authors: Dr LEGGETT, Charles (Lawrence Berkeley National Lab (US)); DONG, Zhihua (Brookhaven National Laboratory); LIN, Meifeng (Brookhaven National Laboratory (US)); GRAY, Heather (UC Berkeley/LBNL); PASCUZZI, Vincent (Lawrence Berkeley National Lab. (US)); YU, Kwangmin (Brookhaven National Laboratory)

Presenter: Dr LEGGETT, Charles (Lawrence Berkeley National Lab (US))

Session Classification: Monday PM plenaries

Track Classification: Offline Computing