

Lattice Boltzmann simulations on multi-GPU cluster

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ABSTRACT

Lattice Boltzmann method (LBM) as an explicit numerical scheme, which requires only neighboring operations, is very suitable for parallel or graphic processing unit (GPU) computations. There are several strategies to further improve the GPU performance, such as reducing the data transaction between host and device, and using efficient memory management, such as shared memory. Another way is adopting different streaming strategy to optimize the data transfer between the GPU global and shared memory. On the other hand, multi-GPU computation can certainly elevate the performance. This can be achieved by using multi GPUs on a single node through OpenMP or POSIX thread. Alternatively, for cross node GPU computations, MPI on cluster of GPUs can be employed, which is adopted here. Several test simulations will be presented to demonstrate the effectiveness of LBM simulations of GPU cluster.