Abstract

Computational fluid dynamics (CFD) is widely used by the scientific computing community to solve various fluid flow problems. High performance computing (HPC) enable faster CFD simulations with higher solution accuracies. Many CFD applications are run on multicore and multiprocessor platforms and are being increasingly ported to run on computational accelerators such as graphical processing units (GPUs) to increase the performance. The increase of computational power is necessary to allow faster computing, which in turn increases the power consumption. The issue of the power consumption has to be addressed, particularly in applications such as CFD, where the simulations may need to be executed iteratively for a large number of times, each iteration taking a large amount of time, in order to obtain appropriately accurate results. Poweraware computing is concerned with devising energy efficient methods. Techniques such as Dynamic voltage and frequency scaling (DVFS) and offlining can be used to reduce power consumption and increase the energy efficiency of applications. In this paper, we present a combination of these techniques and apply to CFD applications running on
heterogeneous architectures. We reduce the overall power consumption with a small performance loss. Precisely, for DVFS, we save 4% to 23.5% of energy with a performance loss of 0.6% to 9.8%. Similarly, for online-offline mode, we save 22% of energy with a performance loss of 0.3%.

References


Index Terms

Computer Science  Control Systems

Keywords

Power-aware, DVFS, online-offline, Energy Efficiency, HPC, CFD