

Title: Solving n-body Problem Using HPX

Author: Adrian Serio, Hartmut Kaiser

Date: 1-6-12

Abstract:

The n-body problem, i.e. the prediction of the motion of a group of objects that interact with each other under the influence of a force, is a well-known method that continues to present a computational challenge to scientist in a broad range of application areas, like astrophysics or computational biology. Existing codes are usually scaling-challenged, as they do not scale well enough, causing overly long runtimes for real-world problem sizes.

We present the results of our work to implement a simple N-body algorithm, which does not take into account any cutoff distances, using a message driven, inherently asynchronous approach based on the HPX (High-Performance ParalleX) library. The utilization of fine-grained parallelism resulting from a task-queue based work scheduling allows us to break global barriers intrinsic to known implementations, and to improve the scalability of the resulting codes. We present a comparative analysis of strong scaling results for the analyzed use case, which shows we achieve better strong scaling results than equivalent existing solutions.