

# Implementing a High-Performance Computing Center

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## Abstract

The impact of high-performance computing on the scientific community has grown considerably in the last several years. As a way of exploring this fascinating field, we will design and implement two small-scale computer clusters, one of which uses a more traditional CPU-based paradigm, and another which makes use of graphical processing units. We will benchmark both systems, and write programs to run on them that make use of popular parallel programming platforms (specifically MPI and CUDA). We will record the processing times of programs on both systems in order to measure speedup and compare to ideal speedup as a measure of efficiency. The data collected from both computer clusters will be used to model the performance of a larger-scale system, and we will include a discussion of other scientific applications that could be facilitated by high-performance computing systems like the ones tested as a part of our sure project.