

Abstract

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The apeNEXT project

This paper presents the apeNEXT machine to the lattice quantum chromodynamics (LQCD) community. apeNEXT, like the other APE projects, is a three-dimensional torus of chips. Each chip contains a 64-bit arithmetic unit. Furthermore, each contains 7 bi-directional communication links: 6 links are used for nearest neighbour communication on the torus, while the 7-th link is used for high speed I/O communications with a front-end PC via a PCI board. Each chip is endowed with its own DDR memory. The apeNEXT board has 16 nodes. The paper discusses the apeNEXT software's compilation chain. The coding languages for apeNEXT are TAO's C language. Optimization takes place at the assembly code level by a software called "sofan" and instruction scheduling takes place by a software called "shaker". Benchmarks result are reported: Application of the Wilson-Dirac operator on a spinor leads to a sustained performance of 55%, while with the product of two SU(3) matrices, the efficiency goes as high as 65%.