Co-Array Fortran Performance and Potential: An NPB Experimental Study

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Abstract

Co-array Fortran (CAF) is an emerging model for scalable, global address space parallel programming that consists of a small set of extensions to the Fortran 90 programming language. Compared to MPI, the widely-used message-passing programming model, CAF's global address space programming model simplifies the development of single-program-multiple-data parallel programs by shifting the burden for choreographing and optimizing communication from developers to compilers. This paper describes an open-source, portable, and retargetable CAF compiler under development at Rice University that is well-suited for today's high-performance clusters. Our compiler translates CAF into Fortran 90 plus calls to one-sided communication primitives. Preliminary experiments comparing CAF and MPI versions of several of the NAS parallel benchmarks on an Itanium 2 cluster with a Myrinet 2000 interconnect show that our CAF compiler delivers performance that is roughly equal to or, in many cases, better than that of programs parallelized using MPI, even though our compiler presently lacks support for global optimization of communication.