The GENESIS distributed-memory benchmarks. Part 1: Methodology and general relativity benchmark with results for the SUPRENUM computer

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TITLE	The GENESIS distributed-memory benchmarks. Part 1: Methodology and general relativity benchmark with results for the SUPRENUM computer
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ABSTRACT	This is the first of a series of papers on the Genesis distributed-memory benchmarks, which were developed under the European ESPRIT research program. The benchmarks provide a standard reference Fortran77 uniprocessor version, a distributed memory. MIMD version, and in some cases a Fortran90 version suitable for SIMD computers. The problems selected all have a scientific origin (mostly from physics or theoretical chemistry), and range from synthetic code fragments designed to measure the basic hardware properties of the computer (especially communication and synchronisation overheads), through commonly used library subroutines, to full application codes. This first paper defines the methodology to be used to analyse the benchmark results, and gives an example of a fully analysed application benchmark from General Relativity (GR1). First, suitable absolute performance metrics are carefully defined, then the performance analysis treats the execution time and absolute performance as functions of at least two variables, namely the problem size and the number of proecssors. The theoretical predictions are compared with, or fitted to, the measured results, and then used to predict (with due caution) how the performance might scale for larger problems and more processors than were actually available during the benchmarking. Benchmark measurements are given primarily for the German SUPRENUM computer, but also for the IBM 3083J, Convex C210 and a Parsys Supernode with 32 T800-20 transputers.
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