High Performance Computing Towards Solving a Multi-Dimensional Conduction Heat Transfer Problem on a Linux Cluster Using PVM

An investigation has been conducted regarding the capability of clustered personal computers to improve the performance of executing software simulations for solving engineering problems. A Parallel Fortran program using the Jacobi Iteration method was developed and executed using the Parallel Virtual Machine software package. This software permits a heterogeneous collection of Unix and/or NT computers connected together by a network to be used as a single large parallel computer. Therefore, large computational problems can be solved more cost effectively by using the combined power and memory of many computers. This is typical of engineering problems requiring significant computing power for problems that are much larger in size. An experiment at Alabama A&M University was done to determine the temperature distribution inside a medium of size 1.0 m x 1.0 m using the finite difference method. A Fortran program was developed and executed on Microsoft Developer Studio® software to solve for the temperature of each point inside the medium, and Tecplot® was used to generate a visual image of the temperature distribution using contours and lines. This parallel experiment explores an order of magnitude larger medium, which would require significantly more time and iterations to solve serially. The temperature data was collected and visualized using the same Tecplot® software and more images were produced.

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