

The out-of-core challenge for large-scale problems

Jennifer Scott (Rutherford Appleton Laboratory)
joint work with
John Reid (Rutherford Appleton Laboratory)

A key strength of the mathematical software library HSL and one for which it is internationally renowned is its collection of packages for the direct solution of sparse linear systems of equations. Direct methods are popular for their robustness and efficiency. Their main weakness is that the memory they require usually increases rapidly with problem size. One way of attempting to overcome this limitation is to use a solver that is able to hold its data structures on disk, that is, an out-of-core solver. We have designed and developed a new multifrontal solver called HSL_MA77. It relies on direct-access files to hold the original matrix, its factorization, and the bulk of its intermediate data. An important feature of the package is that all input and output to disk is performed through a set of Fortran subroutines that manage a virtual memory system so that actual i/o occurs only when really necessary. We describe this memory management system and highlight other key features of HSL_MA77. Numerical results are included for a range of practical problems.