Feedback in the use of MUMPS in EDF codes

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EDF guarantees the technical and economic capabilities of its electricity production means, from the conception to the end of operational life. The safety and availability requirements infer the need to verify the correct operation, maintenance and replacements conditions of machines through numerical simulation. The analysis of real behaviour and the risks associated with industrial structures requires knowledge over a full range of physical models: thermomechanics with *Code_Aster*, material structure with Crescendo, electromagnetics with Code_Carmel, hydrodynamics with TELEMAC system etc.

Often, EDF has opted for developing or co-developping its in-house codes. Thanks to this choice, we often remain free to choose their basic components. One of these components is particulary crucial for the time consumption and memory requirement of our codes: the sparse linear system management.

The decision to use MUMPS as our direct solver for a number of applications, such as structural mechanics, has been taken some 11 years ago. When it is possible, considering the quality requirements for our industrially used softwares, it could be well worth to entrust this crucial algorithmic step to external packages, such as MUMPS and PETSc.

This talk gives some feedback in terms of performance, robustness and flexibility in the daily use of these powerful products in our studies. It also aims to highlight the recent use of block low-rank sparse factorization and 64-bit integer activation in this context.