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Accommodating researcher and end-user interest inside an all-purpose open-source software: the example of code_aster

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Nowadays, numerical studies in implicit mechanics involve larger and larger models to simulate, with better accuracy, more and more complex phenomenon, related for instance to the lifespan of a structure especially in the nuclear sector. Though important improvements have been made in the recent years, many applications remain unreachable, especially at the structural scale or the full-scale of civil engineering buildings.

The R&D department of French utility Électricité de France has been developing for more than 25 years a Finite Element Analysis (FEA) software dedicated to implicit structural mechanics and released under the GNU GPL license, **code_aster**. As such, it faces several challenges among which the move to High Performance Computing (HPC), as well as the management of an open-source community.

Regarding HPC, on the one hand, EDF R&D must ensure that, in the years to come, **code_aster** engages on the road towards massively scalable software; on the other hand, it should make sure that current needs in studies' performance are met by perfecting the current state of parallelism in the code. This talk presents how these objectives are being tackled in an ever-evolving package such as **code_aster**. In a first part, the presentation deals with present capability of the software and an example of a non-linear contact simulation illustrates current performance. Then, recent results obtained with a domain division approach are discussed. Numerical examples include academic problems and industrial simulations. A 500 millions degrees of freedom (dofs) cube was successfully solved in linear elasticity using 700 cores while the analysis of a 40 million dofs pump equipment subjected to pressure took less than 5 minutes to complete.

EDF R&D released **code_aster** as free software in 2001 and has gained significant feedback in the management of an open-source community. The talk will also address the emergence of such of community, dealing with the efforts to grow it and attract co-developers, reflecting back on the whole history.

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