Fully-coupled Algebraic Multigrid Preconditioning Performance for Finite Element Resistive Magnetohydrodynamics

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ABSTRACT

Scientific understanding through computational simulation of problems governed by the resistive magnetohydrodynamics (MHD) equations requires high resolution simulations and accurate and robust solution methods. Fully-coupled Newton-Krylov solution methods can be advantageous because of their robustness for complex multiphysics problems. However, they require the scalable solution of very large sparse linear systems. One approach that offers the potential of scalable solutions is a multilevel or multigrid approach. This study considers performance of a fully-coupled algebraic multigrid preconditioned Newton-Krylov approach [1, 2] in the context of unstructured finite element methods. Scaling studies for resistive MHD test cases, including up to 500,000 cores on an IBM Blue Gene/Q platform will be presented.

REFERENCES

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