# Algebraic multigrid-based preconditioning for Newton-Krylov methods for implicit continuum plasma simulations

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## ABSTRACT

The numerical simulation of continuum models for highly nonlinear multiple-time-scale plasma physics systems can be extremely challenging. A promising solution approach for these systems employs implicit, or implicit/explicit, time-integration and preconditioned Newton-Krylov methods. Although Newton-Krylov methods are robust, the scalable and efficient solution of the generated large-scale sparse linear systems is critical. This talk considers the scaling and performance of algebraic multigrid-based preconditioners for stabilized FEM discretization on unstructured meshes. The preconditioners are based on both a fully-coupled graph-based aggregation method applied to the nonzero block structure of the Jacobian matrix [1-3] and approximate block decomposition/Schur complement techniques [4] for large-scale, transient plasma simulations. Studies are presented for scaling and performance for both CPU (IBM Blue Gene/Q and Intel Xeon) and manycore (Intel Xeon Phi Knights Landing) platforms.

## REFERENCES

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