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eHDG: An Exponentially Convergent Iterative Solver for HDG Discretizations of Hyperbolic Partial Differential Equations.

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We present a scalable and efficient iterative solver for high-order hybridized discontinuous Galerkin (HDG) discretizations of hyperbolic partial differential equations. It an interplay between domain decomposition methods and HDG discretizations. In particular, the method is a fixed-point approach that requires only independent element-by-element local solves in each iteration. As such, it is well-suited for current and future computing systems with massive concurrencies. We rigorously show that the proposed method is exponentially convergent in the number of iterations for transport and linearized shallow water equations. Furthermore, the convergence is independent of the solution order. Various 2D and 3D numerical results for steady and time-dependent problems are presented to verify our theoretical findings.