1157-68-617 **Tianshi Xu*** (xuxx1180@umn.edu), **Vasilis Kalantzis**, **Geoffrey Dillon**, **Yuanzhe Xi**, **Ruipeng Li** and **Yousef Saad**. *Recent Development of Generalized Multilevel Low-Rank Preconditioning and Solution Package.*

This talk summarizes the recent development and implementation of GeMSLR (Generalized Multilevel Schur complement Low-Rank), a distributed-memory preconditioner for the solution of large and sparse (non)Hermitian linear systems of equations. The GeMSLR preconditioner is purely algebraic and is based on a multilevel reordering of the original set of equations/variables. At each given level, GeMSLR decouples the solution of the current linear system into one associated with the interior variables and another associated with the interface ones. The first subproblem is block-diagonal and can be solved in parallel by applying some form of ILU preconditioning. The recursive nature of the preconditioner appears on the second subproblem where the Schur complement system is preconditioned by the interface coupling matrix. Low-rank correction terms can be added at each level to further enhance robustness, and these are applied using the Woodbury formula. The user can increase the accuracy of the low-rank correction terms if the convergence is not satisfactory. GeMSLR is implemented in MPI and has been tested on E5-2680v3 processors. We demonstrate the potential of GeMSLR by presenting numerical tests performed on several 2D and 3D problems, and both strong and weak scaling is discussed. (Received February 04, 2020)