

## Parallel mesh control tools for unstructured meshes

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In addition to the development of a parallel mesh interface, the ITAPS center is developing a set of services for unstructured mesh operations that operate on massively parallel computers. Example services include dynamic load balancing, mesh smoothing and mesh adaptation. During the development of these tools we discovered the need for additional base services to effectively support evolving mesh partitions that take advantage of local and/or neighborhood information to eliminate synchronization steps and reduce communications. The first base service builds on graph-based partitioning (Zoltan) to support operations to quickly construct partitions with larger numbers of parts and to quickly improve partitions to best meet multiple criteria. The second base service is a neighborhood aware message packing library that deals with the migrations of mesh entities between the parts within a partition. The paper will overview these base services and demonstrate their role in supporting massively parallel adaptive simulations on unstructured meshes.