

THE SANDIA MESH DATABASE (MDB)

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There have been many efforts to standardize the interfaces to well-known problems in computational science; some of the better known of these are sparse linear algebra solvers (Petsc, etc.) and message passing on parallel computers (MPI). The Terascale Simulation Tools and Technologies project[1], sponsored by DOE's SciDAC program, is developing an interface to finite element mesh data; the goal of this effort is to enable applications to quickly integrate advanced meshing and discretization tools, similar to applications' use of Petsc and the like. The Sandia Mesh Database project is developing an implementation of the TSTT mesh interface specification; this paper will describe that effort.

MDB is designed to allow storage and manipulation of very large meshes. This done by utilizing indirect addressing of mesh entities using "entity handles". MDB also focuses heavily on accessing mesh entities and data defined on those entities in large blocks. Constructs like mesh sets, used to represent arbitrary groupings of entities, and mesh ranges, for contiguous sets of entity handles, are exposed by MDB.

In this paper we will describe our experience integrating MDB into several codes, including the CUBIT mesh generation toolkit[2] and the VERDE mesh verification code[3]. Metrics will be given for storage, access and manipulation of data in/from MDB. We will demonstrate advanced capabilities enabled by MDB, including importing and exporting various mesh formats from a common tool, mesh skinning, and storage and retrieval of application-specific data through a common mesh interface.

- [1] The Terascale Simulation Tools and Technology (TSTT) Center, <http://www.tstt-scidac.org/>.
- [2] T. D. Blacker et al., 'CUBIT mesh generation environment, Vol. 1: User's manual', SAND94-1100, Sandia National Laboratories, Albuquerque, New Mexico, May 1994.
- [3] The Verde (Verification of Discrete Elements) tool, http://endo.sandia.gov/cubit/verde_release_2.5b.txt.

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