In-situ Meshing to Enable Advanced Analysis Workflows on Next Generation Platforms

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**Goal:** To enable in-situ meshing by integrating interoperable software components for advanced analysis workflows such as mesh sensitivity analysis, uncertainty quantification, and optimization.

**Software Architecture**

**CUBIT**
- Supports offline geometry creation and geometry import in multiple formats including ACIS
- Supports various geometry modification operations
- Supports boundary conditions via blocks, sidesets, & nodesets
- Exports geometry in STL format

**ATDM Apps**
- Build ATDM App input deck
- Specify the STL file path to read geometry
- Specify the meshing parameters such as mesh scheme, mesh size, number of process, threads per process, etc.
- Specify the solver parameters
- Specify analysis output format (default is Exodus)

**PARAVIEW**
- PARAVIEW is a data analysis and visualization application
- Uses qualitative and quantitative techniques to visualize solution field of LSO

**Acis**
- Supports various geometry modification operations
- Supports boundary conditions via blocks, sidesets, & nodesets
- Exports geometry in STL format

**STL**

**EXO**

**AERO**

**LSO**

**EMPIRE**

**CUBIT**

**PARAVIEW**
Conclusion:
Achieved in-situ meshing on a proxy ATDM app called LSO by integrating multiple components such as CUBIT/lib, CTH/Diatom, CAMAL/Sculpt, Trilinos/Panzer, Kokkos, and STK. This work should enable in-situ meshing in the ATDM Apps such as EMPIRE and AERO for advanced analysis workflows on the next generation platforms.