Parallel Unstructured Mesh Infrastructure

Parallel management and adaptation of unstructured meshes. Interoperable components to support the development of unstructured mesh simulation workflows

Core functionality

— Distributed, conformant mesh with entity migration, remote read only copies, fields and their operations
— Link to the geometry and attributes
— Mesh adaptation (straight and curved), mesh motion
— Multi-criteria partition improvement
— Distributed mesh support for Particle In Cell methods

Designed for integration into existing codes

— xSDK package; installs with Slack
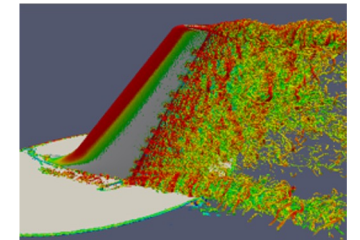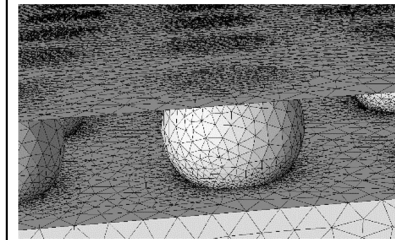— Permissive license enables integration with open and closed-source codes

In-memory integrations developed

— MFEM: High order FE framework
— PetraM: Adaptive RF fusion
— PHASTA: FE for turbulent flows
— FUN3D: FV CFD
— Proteus: Multiphase FE
— ACE3P: High order FE for EM
— M3D-C1: FE based MHD
— Nektar++: High order FE for flow
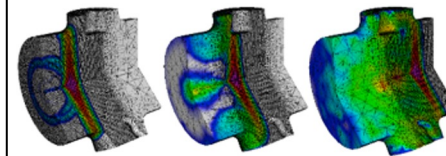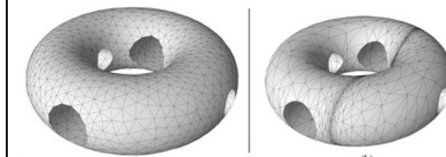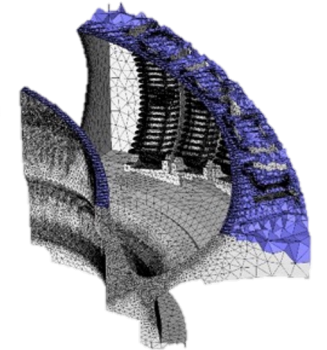— Albany/Trilinos: Multi-physics FE

Applications with billions of elements: flip-chip (L), flow control (R)

Mesh adaptation for evolving features

Anisotropic adaptation for curved meshes

RF antenna and plasma surface in vessel.

Source Code: github.com/SCOREC/core
User Guide: scorec.rpi.edu/pumi/PUMI.pdf
Paper: scorec.rpi.edu/REPORTS/2014-9.pdf

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