PETSc TAO

Portable, Extensible Toolkit for Scientific Computation / Toolkit for Advanced Optimization
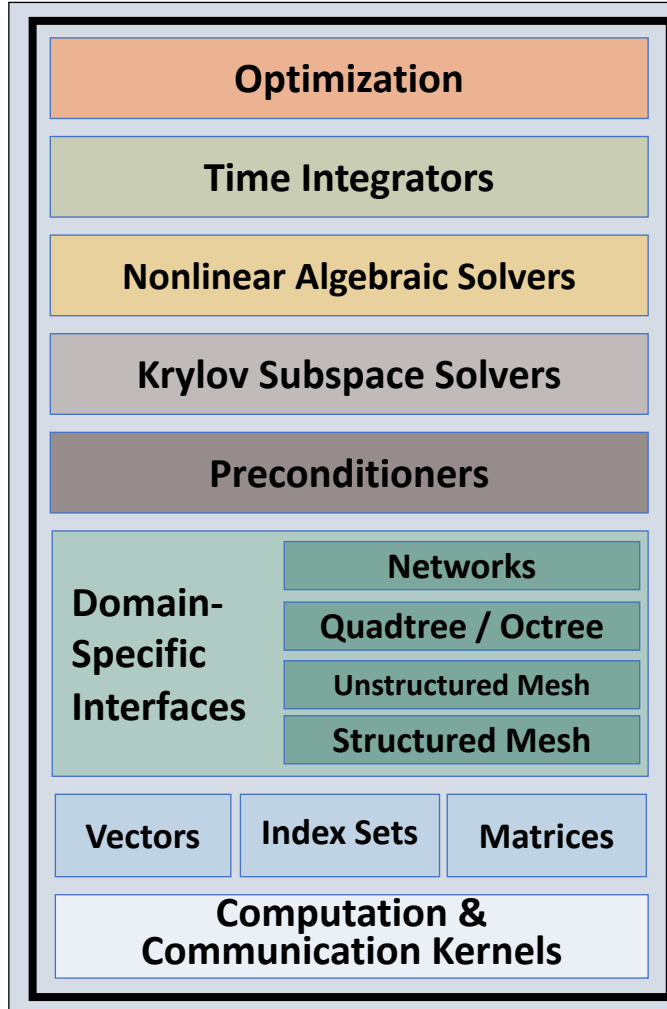
Scalable algebraic solvers for PDEs. Encapsulate parallelism in high-level objects. Active & supported user community. Full API from Fortran, C/C++, Python.

- Optimization
- Time Integrators
- Nonlinear Algebraic Solvers
- Krylov Subspace Solvers
- Preconditioners
- Domain-Specific Interfaces
  - Networks
  - Quadtree / Octree
  - Unstructured Mesh
  - Structured Mesh
- Vectors
- Index Sets
- Matrices
- Computation & Communication Kernels

- **Easy customization and composability of solvers <u>at runtime</u>**
  - Enables optimality via flexible combinations of physics, algorithmics, architectures
  - Try new algorithms by composing new/existing algorithms (multilevel, domain decomposition, splitting, etc.)
- **Portability & performance**
  - Largest DOE machines, also clusters, laptops
  - Thousands of users worldwide

Argonne NATIONAL LABORATORY
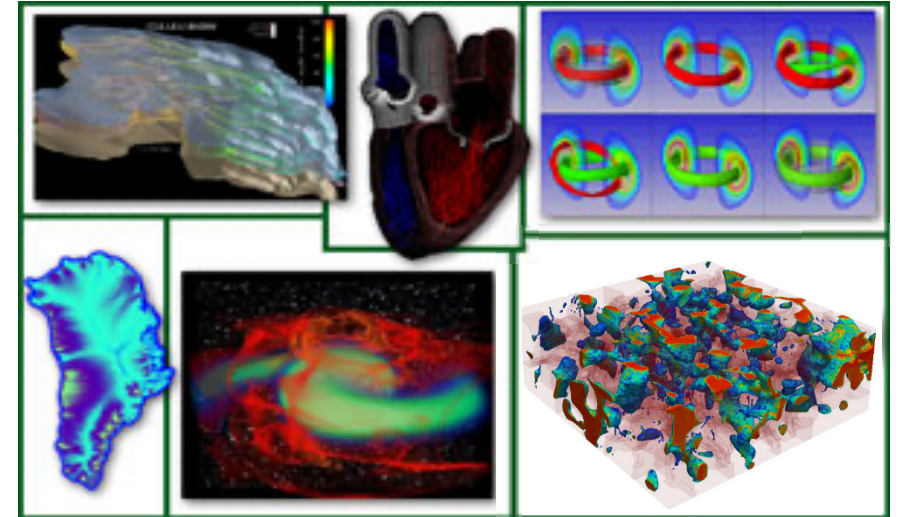
PETSc provides the backbone of diverse scientific applications.

clockwise from upper left: hydrology, cardiology, fusion, multiphase steel, relativistic matter, ice sheet modeling

R&D 100

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https://www.mcs.anl.gov/petsc