

SAWs: Scientific Application Web server

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Portable, Extensible Toolkit for Scientific Computation (PETSc)

- **User support:** Graphic visualization tool for
 1. Gather and present multiple layers of solver information in meaningful and easily understood formats
 2. Assist user to select, customize and assemble the desired hierarchical and nested solvers (all of the choice at the various levels)
 3. Interact with the long simulation in real time (on extreme-scale computers?)



SAWs: Scientific Application Web server

Preconditioner (PC) options
prefix: fieldsplit_1_mg_levels_0

-pc type: sor

- pc use: sor
- pc sor c: none
- pc sor d: jacobi
- pc sor i: pbjacobi
- pc sor l: bjacobi
- pc sor l: sor
- pc sor s: lu
- pc sor s: shell
- pc sor l: mg
- pc sor l: eisenstat
- pc sor l: ilu
- pc sor l: icc
- pc sor l: cholesky
- pc sor l: asm
- pc sor l: gasm
- pc sor l: ksp

Diagram: A 2x2 block matrix with green blocks on the diagonal and yellow blocks off-diagonal. An arrow points to a 2x2 grid of yellow blocks, representing field splitting.

Diagram: A graph showing nodes for preconditioners: gmres, fieldsplit, cg, mg, undefined, sor, gmres, bjacobi, preonly, ilu.

```
Hong@hzhangmac /Users/Hong/soft/petsc/src/snes/examples/tutorials (barry/saws-options)
$ ./ex19 -saws_root ${PETSC_DIR}/saws -saws_options -ksp_type fgmres -pc_type fieldsplit -pc_fieldsplit_b
lock_size 2 -pc_fieldsplit_0_fields 0,1,2 -pc_fieldsplit_1_fields 0 -fieldsplit_0_ksp_type gmres -fieldsp
lit_0_pc_type bjacobi -fieldsplit_1_ksp_type cg -fieldsplit_1_pc_type mg
lid velocity = 0.0625, prandtl # = 1, grashof # = 1
```

- turn any C, C++, or Fortran scientific or engineering application code into a webserver
- user can examine and modify the state of the simulation with any browser from anywhere
- operating with PETSc, user can view and interact with real-time (parallel) simulations

PETSc Linear Solver Selection

[~petsc/saws/pcoptions.html](http://petsc/saws/pcoptions.html)

- web interface to facilitate design composable hierarchically nested solvers
- viewing the resulting algorithms and command options

PETSc Linear Solver Selection

Display: Command Options Tree Matrix

$$\begin{bmatrix} [A_{0,0}] & & * & * \\ * & [A_{0,1,0}] & * & * \\ * & * & [A_{0,1,1}] & * \\ * & & * & [A_{0,2}] \end{bmatrix}$$

Your Solver Options:

Root Solver Options (Matrix is symmetric, positive definite, block structured)
KSP fgmres
PC fieldsplit (block structured)
Fieldsplit Type multiplicative
Fieldsplit Blocks 3

Fieldsplit 0 Options (Matrix is symmetric, positive definite, block structured)
KSP bcgs
PC bjacobi
Bjacobi Blocks 2

Bjacobi Solver Options
KSP preonly
PC ilu

Fieldsplit 1 Options (Matrix is symmetric, positive definite, block structured)
KSP fgmres
PC fieldsplit (block structured)
Fieldsplit Type multiplicative
Fieldsplit Blocks 2

Fieldsplit 0 Options (Matrix is symmetric, positive definite, block structured)
KSP cg (symm, positive definite)
PC icc

Fieldsplit 1 Options (Matrix is symmetric, positive definite, block structured)
KSP preonly
PC ilu

Command Line Options:

```
-pc_type fieldsplit
-ksp_type fgmres
-pc_fieldsplit_type multiplicative
-pc_fieldsplit_blocks 3
-fieldsplit_0_pc_type bjacobi
-fieldsplit_0_ksp_type bcgs
-fieldsplit_0_pc_bjacobi_blocks 2
-fieldsplit_0_sub_pc_type ilu
-fieldsplit_0_sub_ksp_type preonly
-fieldsplit_1_pc_type fieldsplit
-fieldsplit_1_ksp_type fgmres
-fieldsplit_1_pc_fieldsplit_type multiplicative
-fieldsplit_1_pc_fieldsplit_blocks 2
-fieldsplit_1_fieldsplit_0_pc_type icc
-fieldsplit_1_fieldsplit_0_ksp_type cg
-fieldsplit_1_fieldsplit_1_pc_type lu
-fieldsplit_1_fieldsplit_1_ksp_type preonly
-fieldsplit_2_pc_type mg
-fieldsplit_2_ksp_type fgmres
-fieldsplit_2_pc_mg_type multiplicative
-fieldsplit_2_pc_mg_levels 2
-fieldsplit_2_mg_levels_0_pc_type redundant
-fieldsplit_2_mg_levels_0_ksp_type preonly
-fieldsplit_2_mg_levels_0_pc_redundant_number 2
-fieldsplit_2_mg_levels_0_redundant_pc_type lu
-fieldsplit_2_mg_levels_0_redundant_ksp_type preonly
-fieldsplit_2_mg_levels_1_pc_type sor
-fieldsplit_2_mg_levels_1_ksp_type chebyshev
```

