

LBL Updates

July, 2022

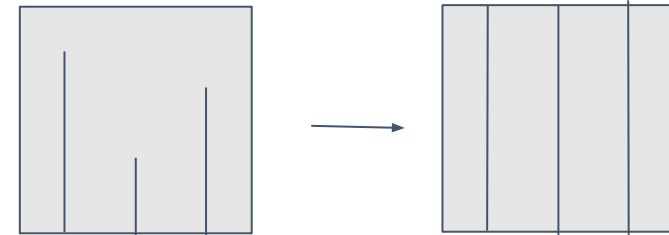
Topics

- multi-GPU trisolve on Perlmutter(NVIDIA) & Crusher(AMD)
 - ROCSHMEM/NVSHMEM status
- U-solve improvements: Cori GPU w/ new data structure
- Factor and Solve Perlmutter CPU performance
- 3D GPU trisolve optimizations
- Plan for GPU porting other computations for preconditioning
 - Tianyi starts 7/12/22
 - CPU time is currently relatively small (<10%), but is necessary for GPU-resident preconditioning/GMRES
- Q&A

One-Sided Progress

- foMPI (CPU one-sided) on Perlmutter: lack support of required libraries: libdmapp
 - working with foMPI team
- multi-GPU U solve on the new data structure

U-solve improvements w/ new data structure



- 1/8 Cori GPU node (using 1 GPU)
- There are 40 CPU cores and 8 GPUs (natural comparison is a 5:1 ratio)

U solve

	Flop cnt	CPU 1 core	CPU 5 core	cuda-v100 OLD code	cuda-v100 NEW code
		time	time	time	time
s1_mat_0_126936	1.06E+08	5.92E-02	1.87E-02	1.59E-01	2.19E-02
s1_mat_0_253872	4.21E+08	1.96E-01	4.88E-02	3.70E-01	5.87E-02
s1_mat_0_507744	1.64E+09	7.65E-01	1.85E-01	1.37E+00	1.21E-01

L+U solve

	Flop cnt	CPU 1 core	CPU 5 core	cuda-v100 NEW code
		time	time	time
s1_mat_0_126936	2.12E+08	1.08E-01	3.50E-02	3.70E-02
s1_mat_0_253872	8.43E+08	3.70E-01	9.20E-02	8.40E-02
s1_mat_0_507744	3.28E+09	1.40E+00	3.35E-01	2.13E-01

Factor and Solve Perlmutter CPU performance

- 1 Perlmutter CPU node with 128 cores
- flat MPI

		1x1 MPI	2x2 MPI	4x4 MPI	8x8 MPI	8x16 MPI
s1_mat_0_126936	fact	3.439	1.185	0.752	0.576	0.556
	solve	0.07	0.033	0.021	0.018	0.025
s1_mat_0_253872	fact	21.911	6.876	3.057	1.75	1.755
	solve	0.243	0.101	0.05	0.045	0.056
s1_mat_0_507744	fact	163.182	47.195	18.125	9.517	na
	solve	0.904	0.335	0.152	0.155	na