2) Machine used: AMD Opteron 6272 processor (CIMS crunchy 1 server)

Peak FLOPs: 11282 * 10^6 Ops/sec

Peak Flop achieved: 8050 * 10^6 Ops/sec

Percentage of peak flop achieved: 71%

Blocking

Dimension	Time	Gflop/s	GB/s	Error
32	1.111085	1.800067	28.801070	0.000000e+00
64	1.288167	1.552717	24.843474	0.000000e+00
96	1.276897	1.567293	25.076695	0.000000e+00
128	1.309249	1.528115	24.449834	0.000000e+00
160	1.351171	1.485408	23.766527	0.000000e+00
192	1.343554	1.496122	23.937950	0.000000e+00
224	1.359887	1.471164	23.538630	0.000000e+00
256	1.393265	1.444999	23.119984	0.000000e+00
288	1.384917	1.448882	23.182109	0.000000e+00
320	1.394406	1.456976	23.311623	0.000000e+00
352	1.387439	1.446012	23.136195	0.000000e+00
384	1.426249	1.429226	22.867616	0.000000e+00
416	1.416002	1.423554	22.776869	0.000000e+00
448	1.523117	1.416812	22.668984	0.000000e+00
480	1.576513	1.402995	22.447923	0.000000e+00
512	2.171721	0.988840	15.821433	0.000000e+00
544	1.629615	1.383056	22.128898	0.000000e+00
576	1.647975	1.391548	22.264769	0.000000e+00
608	1.622884	1.384915	22.158643	0.000000e+00
640	1.511284	1.387663	22.202601	0.000000e+00
672	1.756708	1.381969	22.111502	0.000000e+00
704	1.506402	1.389724	22.235580	0.000000e+00
736	1.816653	1.316778	21.068455	0.000000e+00
768	2.337235	1.162874	18.605976	0.000000e+00
800	1.528520	1.339858	21.437728	0.000000e+00
832	1.686655	1.365853	21.853640	0.000000e+00
864	1.932677	1.334879	21.358062	0.000000e+00
896	2.171183	1.325219	21.203499	0.000000e+00
928	2.391518	1.336689	21.387023	0.000000e+00
960	2.784374	1.271002	20.336028	0.000000e+00
992	3.055884	1.277786	20.444574	0.000000e+00
1024	3.445790	0.623220	9.971514	0.000000e+00
1056	2.049101	1.149366	18.389857	0.000000e+00
1088	2.245126	1.147297	18.356759	0.000000e+00
1120	2.554193	1.100096	17.601530	0.000000e+00
1152	2.723205	1.122812	17.964991	0.000000e+00
1184	3.008654	1.103349	17.653582	0.000000e+00
1216	3.302542	1.088886	17.422173	0.000000e+00
1248	3.530578	1.101103	17.617647	0.000000e+00
1280	6.529396	0.642372	10.277958	0.000000e+00
1312	4.023004	1.122745	17.963915	0.000000e+00
1344	4.661007	1.041713	16.667407	0.000000e+00
1376	4.776625	1.090848	17.453565	0.000000e+00
1408	5.514332	1.012383	16.198134	0.000000e+00
1440	5.459499	1.093867	17.501878	0.000000e+00
1472	6.471152	0.985761	15.772182	0.000000e+00
1504	6.376209	1.067114	17.073831	0.000000e+00
1536	11.821526	0.613098	9.809573	0.000000e+00
1568	7.264063	1.061423	16.982770	0.000000e+00
1600	8.779782	0.933053	14.928845	0.000000e+00
1632	8.337493	1.042689	16.683030	0.000000e+00
1664	10.353000	0.890069	14.241107	0.000000e+00
1696	9.502356	1.026777	16.428436	0.000000e+00
1728	11.894417	0.867597	13.881553	0.000000e+00
1760	10.704022	1.018641	16.298250	0.000000e+00
1792	18.971496	0.606656	9.706494	0.000000e+00
1824	12.157295	0.998315	15.973038	0.000000e+00
1856	15.760051	0.811346	12.981541	0.000000e+00
1888	13.732402	0.980143	15.682289	0.000000e+00
1920	18.559352	0.762730	12.203681	0.000000e+00

Blocking with Parallelization

Dimension	Time	Gflop/s	GB/s	Error
32	0.987947	2.024428	32.390843	0.000000e+00
64	0.273581	7.311026	116.976411	0.000000e+00
96	0.309483	6.466495	103.463914	0.000000e+00
128	0.244258	8.190849	131.053587	0.000000e+00
160	0.265960	7.546389	120.742221	0.000000e+00
192	0.239505	8.392825	134.285196	0.000000e+00
224	0.255186	7.839834	125.437349	0.000000e+00
256	0.249994	8.053267	128.852265	0.000000e+00
288	0.254360	7.888738	126.219811	0.000000e+00
320	0.252097	8.058860	128.941761	0.000000e+00
352	0.257503	7.791198	124.659173	0.000000e+00
384	0.263471	7.736848	123.789573	0.000000e+00
416	0.270566	7.450144	119.202307	0.000000e+00
448	0.286740	7.525867	120.413878	0.000000e+00
480	0.308533	7.168897	114.702344	0.000000e+00
512	0.490754	4.375885	70.014159	0.000000e+00
544	0.313811	7.182181	114.914898	0.000000e+00
576	0.317266	7.228122	115.649950	0.000000e+00
608	0.321659	6.987380	111.798081	0.000000e+00
640	0.297293	7.054157	112.866512	0.000000e+00
672	0.340649	7.126729	114.027657	0.000000e+00
704	0.294844	7.100305	113.604879	0.000000e+00
736	0.360010	6.644614	106.313830	0.000000e+00
768	0.455787	5.963112	95.409787	0.000000e+00
800	0.299449	6.839217	109.427477	0.000000e+00
832	0.337816	6.819452	109.111234	0.000000e+00
864	0.380809	6.774768	108.396289	0.000000e+00
896	0.444035	6.479873	103.677965	0.000000e+00
928	0.474675	6.734529	107.752460	0.000000e+00
960	0.556633	6.357764	101.724219	0.000000e+00
992	0.618418	6.314121	101.025935	0.000000e+00
1024	0.713076	3.011578	48.185249	0.000000e+00
1056	0.426041	5.528032	88.448514	0.000000e+00
1088	0.474524	5.428239	86.851818	0.000000e+00
1120	0.547231	5.134679	82.154857	0.000000e+00
1152	0.583727	5.238150	83.810403	0.000000e+00
1184	0.640907	5.179525	82.872405	0.000000e+00
1216	0.685466	5.246202	83.939237	0.000000e+00
1248	0.754580	5.151912	82.430592	0.000000e+00
1280	1.308357	3.205781	51.292489	0.000000e+00
1312	0.868296	5.201921	83.230741	0.000000e+00
1344	0.942280	5.152853	82.445652	0.000000e+00
1376	1.015679	5.130138	82.082203	0.000000e+00
1408	1.159885	4.813080	77.009285	0.000000e+00
1440	1.148449	5.200029	83.200467	0.000000e+00
1472	1.235557	5.162863	82.605813	0.000000e+00
1504	1.308328	5.200642	83.210267	0.000000e+00
1536	2.519319	2.876871	46.029941	0.000000e+00
1568	1.578578	4.884296	78.148740	0.000000e+00
1600	1.597055	5.129442	82.071074	0.000000e+00
1632	1.684211	5.161714	82.587426	0.000000e+00
1664	2.180748	4.225562	67.608993	0.000000e+00
1696	1.941068	5.026513	80.424203	0.000000e+00
1728	2.096697	4.921818	78.749089	0.000000e+00
1760	2.178783	5.004422	80.070758	0.000000e+00
1792	3.893438	2.956043	47.296691	0.000000e+00
1824	2.531180	4.794921	76.718739	0.000000e+00
1856	2.505002	5.104530	81.672484	0.000000e+00
1888	2.585784	5.205275	83.284400	0.000000e+00
1920	3.747557	3.777335	60.437353	0.000000e+00

4) Gauss-Seidel Timings for N=1000 and 10000, 100 iterations and 32 threads

N=1000

```
[mg5610@crunchy1 homework2]$ ./gs2D-omp 1000 100 32
Iteration: 0. Residual: 1.119450
Iteration: 10. Residual: 1.055155
Iteration: 20. Residual: 1.052698
Iteration: 30. Residual: 1.050800
Iteration: 40. Residual: 1.049186
Iteration: 50. Residual: 1.047757
Iteration: 60. Residual: 1.046462
Iteration: 70. Residual: 1.045268
Iteration: 80. Residual: 1.044155
Iteration: 90. Residual: 1.043109
Time elapsed: 0.871304
```

N=10000

```
[mg5610@crunchy1 homework2]$ ./gs2D-omp 10000 100 32
Iteration: 0. Residual: 1.118176
Iteration: 10. Residual: 1.054247
Iteration: 20. Residual: 1.053955
Iteration: 30. Residual: 1.053765
Iteration: 40. Residual: 1.053604
Iteration: 50. Residual: 1.053461
Iteration: 60. Residual: 1.053331
Iteration: 70. Residual: 1.053212
Iteration: 80. Residual: 1.053101
Iteration: 90. Residual: 1.052996
Time elapsed: 18.664698
```

Jacobi Timings for N=1000 and 10000, 100 iterations and 32 threads

N=1000

```
[mg5610@crunchy1 homework2]$ ./jacobi2D-omp 1000 100 32
Iteration: 0. Residual: 0.999125
Iteration: 10. Residual: 0.995618
Iteration: 20. Residual: 0.993622
Iteration: 30. Residual: 0.992061
Iteration: 40. Residual: 0.990735
Iteration: 50. Residual: 0.989562
Iteration: 60. Residual: 0.988498
Iteration: 70. Residual: 0.987518
Iteration: 80. Residual: 0.986605
Iteration: 90. Residual: 0.985746
Time elapsed: 0.152056
```

N =10000

```
[mg5610@crunchy1 homework2]$ ./jacobi2D-omp 10000 100 32
Iteration: 0. Residual: 0.999912
Iteration: 10. Residual: 0.999562
Iteration: 20. Residual: 0.999362
Iteration: 30. Residual: 0.999206
Iteration: 40. Residual: 0.999074
^[[B^[[BIteration: 50. Residual: 0.998956
Iteration: 60. Residual: 0.998850
Iteration: 70. Residual: 0.998752
Iteration: 80. Residual: 0.998660
Iteration: 90. Residual: 0.998575
Time elapsed: 76.560300
```